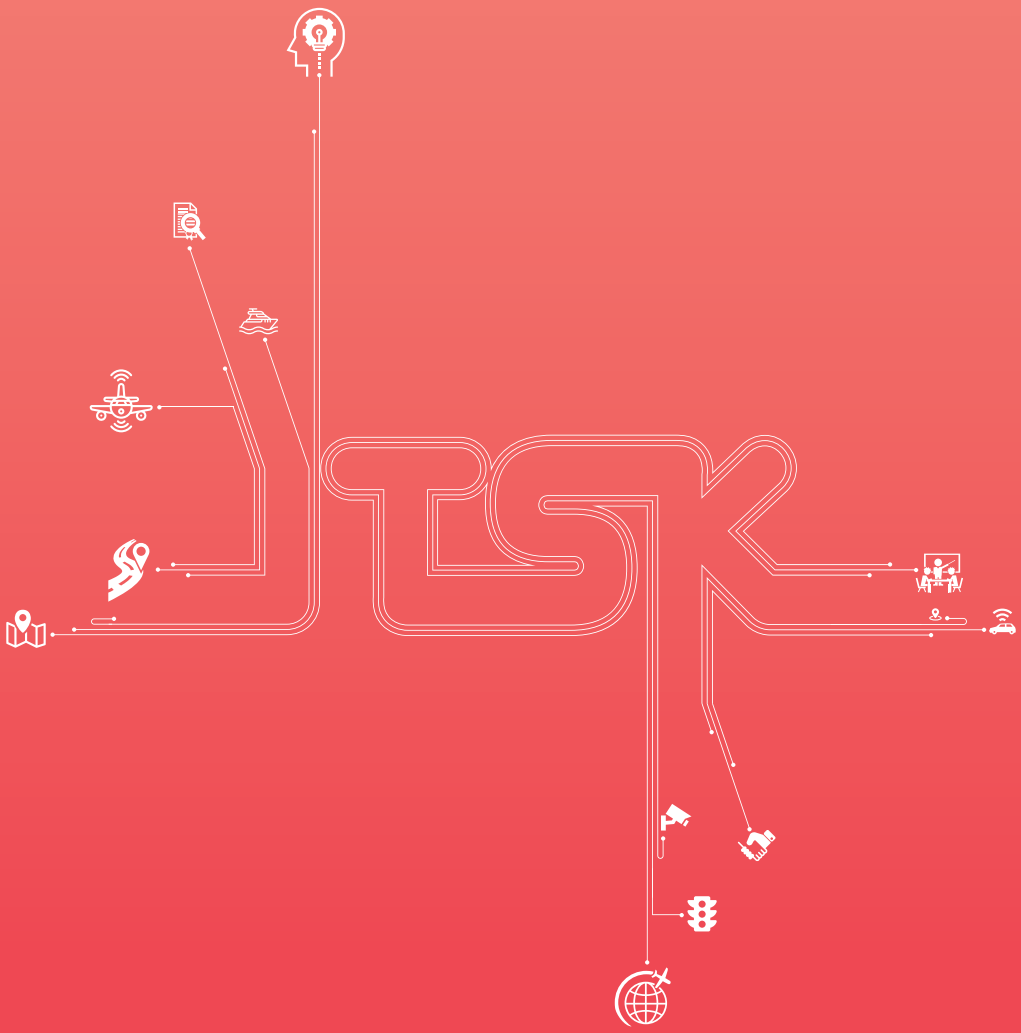
ITS KOREA & Korean ITS Industry Brief

Intelligent Transport Society of Korea

ITS KOREA Intelligent Transport Society of Korea



ITS Intelligent Transport Society of Korea KOREA

Welcome

I am Chang-Yeon Kim, chairman of ITS Korea (Intelligent Transport Society of Korea).

I am pleased to share this report with you all. ITS Korea has been playing a leading role in the history of Korea's ITS development and implementation based on National Transport System Efficiency Act enacted in 1999. ITS Korea has been committed to solve traffic and environmental issues as a representative ITS organization in Korea facilitating the cooperation among government, industry and academia.

ITS Korea is working on standardization, performance evaluation, ITS standard verification, R&D, overseas business & international cooperation, and project consulting under the slogan of "Smart Move, Better Life."

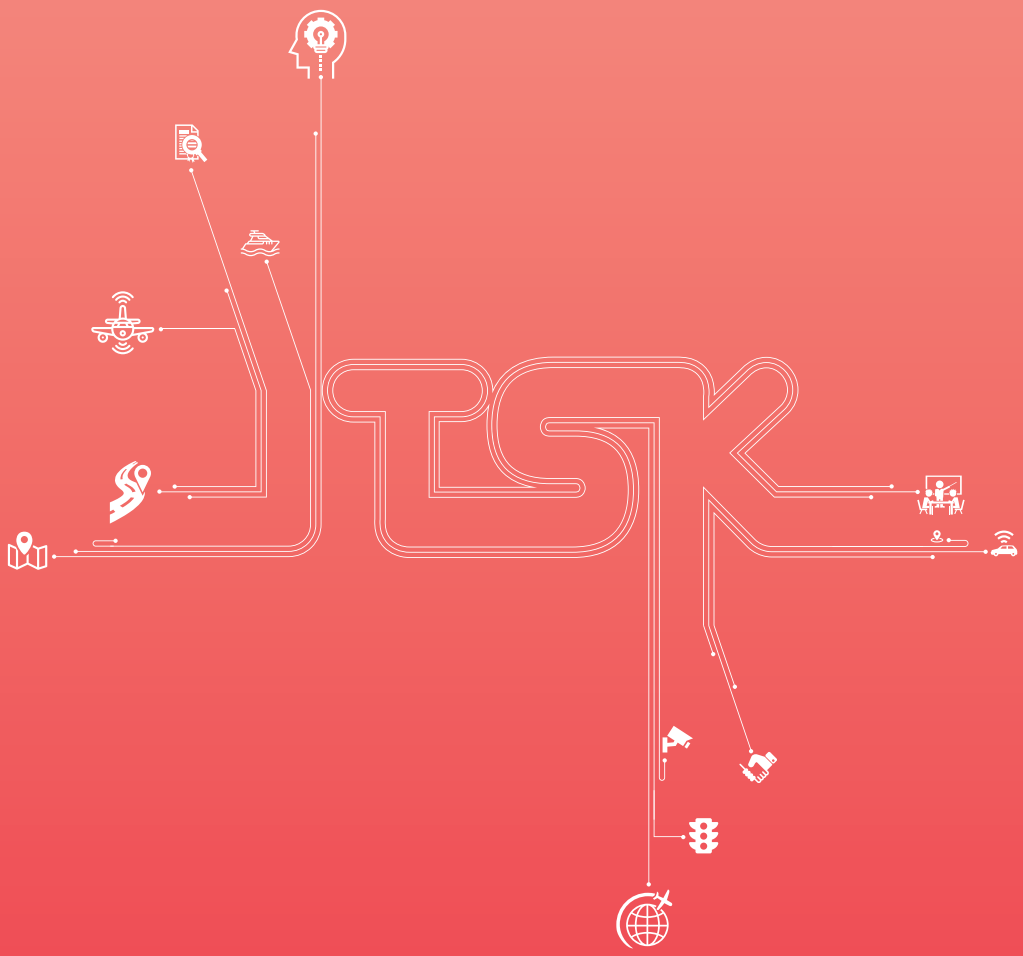
As a result of our efforts, we have contributed to ITS implementation and development in Korea including increasing the modal share of public transportation in Korea.

We have been promoting the recognized Korean ITS such as smart card, BIS (Bus Information System), ETCS (Hi-Pass), etc. to the worldwide. In addition, we are preparing the ITS 4.0 such as C-ITS, MaaS, automated driving and UAM.

Facing the post pandemic era now, I hope the world will work together to create a better transport using ITS.

I look forward to your cooperation and support.

Chang-Yeon Kim
Chairman, ITS KOREA



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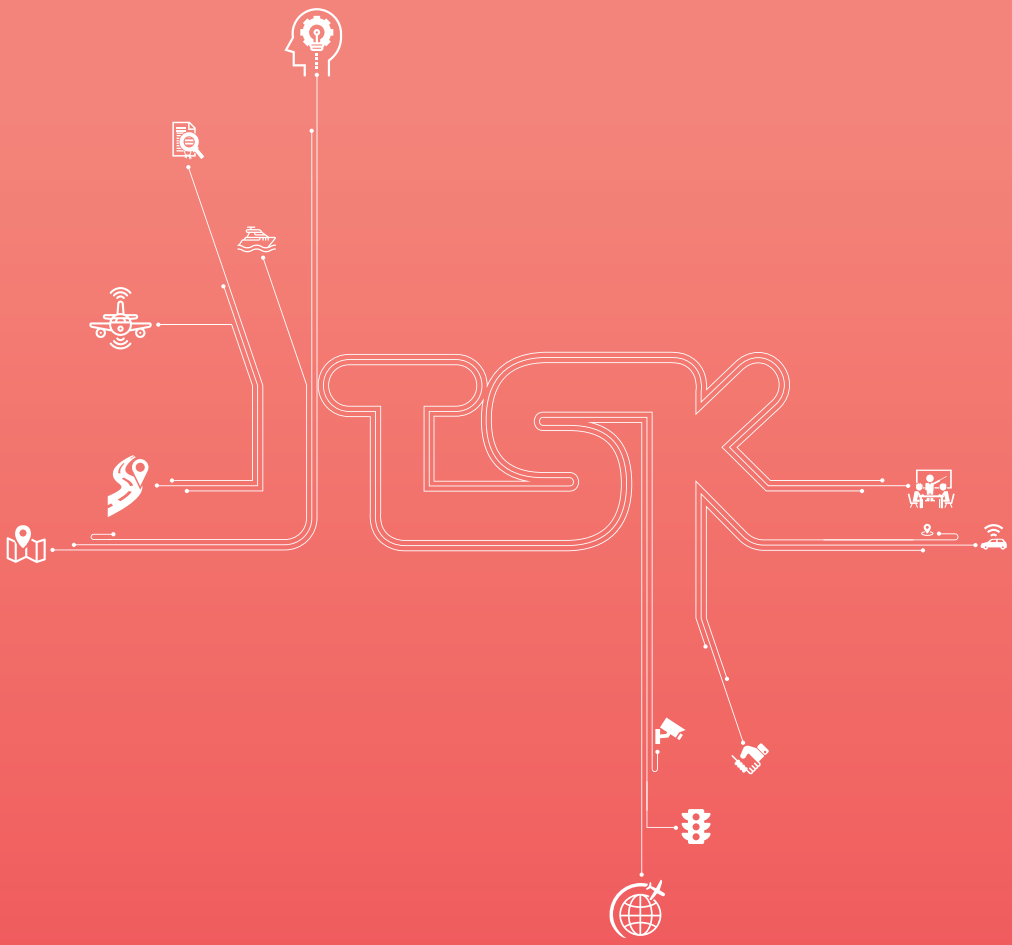


Part 1

Introduction of ITS KOREA

Introduction of ITS KOREA

ITS KOREA, right in the core of ITS industry in Korea,
reaching out to the world of tomorrow

Goals of ITS KOREA

ITS KOREA (Intelligent Transport Society of Korea) was established in year 1999 to leverage Korea's advanced ITS technologies to drive new global trend of ITS products and services. As the bridge for private and public sectors and academia, ITS KOREA is open to digest the industrial opinion, to propose the policy and to promote ITS business, propose R&D and many other activities to boost up the industry.

- To establish close cooperation relationship among private sectors, public sectors, and academia
- To provide the technical advice on the national ITS policy and strategies
- To strengthen international status by leading various international cooperation and overseas marketing
- To secure advanced technologies by conducting specialized and creative researches and strengthening core abilities
- To vitalize the market and promote growth in ITS industry by organizing and attending conference, exhibition, congress, forum, and so on

Relevant Laws and Regulations

- National Transport Systems Efficiency Act (Article 91. Foundation of Intelligent Transport Society of Korea, ITS KOREA)
- It states that ITS KOREA is founded to foster growth of ITS as well as to effectively establish and manage ITS including ground, maritime, air transportation accredited by Minister of Ministry of Land, Infrastructure and Transport (MOLIT) and ITS KOREA was appointed as official organization to take this role by law (Feb. 2011).

Main Tasks

Standardization
- Build Standard Basis Environment
- Support Standard Development
- Disseminate and Maintain of Standard, Support Private Driving Standard Development

Standard Observance Verification & Certification
- ITS Standard Conformity Assessment
- ITS Testing / Inspection
- RSE ID Allocation

Performance Evaluation
- Inspection for Approval Construction & Regular Inspection
- Education, Public Relations, Training, Technology Exchange
- Regulation, Technology, Method Development
- Information, Collection & Dissemination

Designated by MOLIT as National Oranization for
- ITS Standards
- ITS Standard Observance Verification
- ITS Performance Evaluation
- International Cooperation
- C-ITS Pre-deployment

COSD(Cooperation Organization for Standards Development)
by Korean Agency for Technology and Standards(KATS)

Dedicated ITS Educational Institute
by Ministry of Employment and Labor

ITS Inspection Body
by KOLAS(Korea Laboratory Accreditation Scheme)

Project Consulting
- Project Action Plan
- Project Ordering, Contract Assist
- Project Launching and Processing, Quality Control
- Inspection for Completion

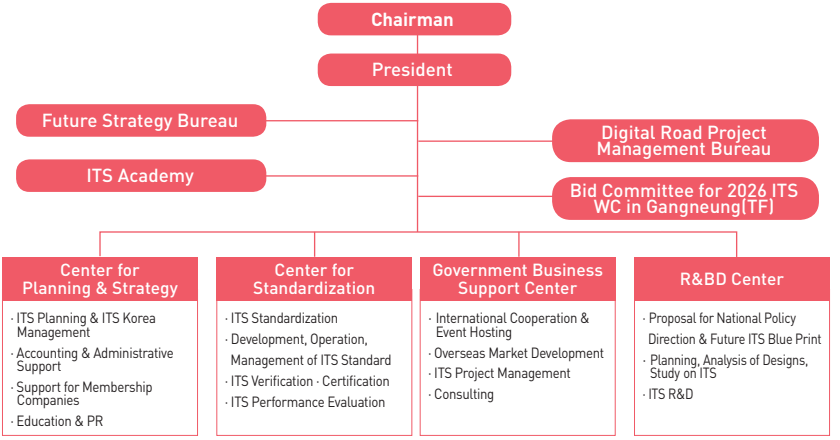
R & D
- Policy on Road and ITS
- Grand Scale of National R&D
- Projects Evaluation, Investigation, Analysis

Education
- Develop the Education Courses and Materials
- Conduct Basic and Professional Education
- Professional Instructors and Joint Education Program
- Manage Training Courses

Overseas Business
- Overseas Maketing Research
- Promote Korea ITS Technology
- Customized ITS Consulting
- 1:1 Business Matching
- ODA Project Development

Global / Domestic Alliance
- International Cooperation with the ITS Related Organization
- Assist Membership Company
- Organize Domestic & International Conference

Number of Employee : 97



History of ITS KOREA

History

2014-present

- Designated as National Organization for C-ITS Pilot Project for Local Governments by MOLIT
- Designated as National Organization for International Cooperation on ITS by MOLIT
- Accredited as KOLAS Inspection Agency for ITS Performance Evaluation
- Designated as Joint Training Center for Transportation / ITS by MOEL (Consortium for HRD Capacity Building Program)
- Designated as Exclusive National Organization for C-ITS Pilot Project by MOLIT

2010-2013

- Designated as Exclusive National Organization for ITS Standard by MOLIT
- Designated as Cooperating Organization for Standards Development (COSD) by KATS
- Establish and Operate ITS Standards of Estimate
- Accredited as Statutory Body
- Host the 17th ITS World Congress in Busan, Korea
- Designated as National Organization for ITS Performance Evaluation by MOLIT

2002-2009

- Designated as National Organization for ITS Standardization by MOLIT
- Designated as National Organization for ITS Standards Observance Verification by MOLIT
- Host International Workshops & Seminars
- Operate ITS Standards Assembly
- Host the 5th Seoul ITS AP Forum

1998-2001

- Establish the Long-term Development Plan for ITS Korea
- Establish ITS Korea / as Registered Organization
- Host the 5th ITS World Congress, in Seoul, Korea

Publications

All about ITS 1, 2

Issued on 2020.05.29.
USD 80

2021 Estimation Guides in ITS

Issued on 2021.03.18.
USD 20 (free online)

2021 ITS Investment Overlook in Korea

Issued on 2021.03.18.
USD 20 (free online)

News Letter (online)

Issued every Monday
for members

Monthly ITS

Issued every first Tuesday
for members

Standard ITS

Issued every 6 months
free of charge

Standardization

- *Designated the organization dedicated to ITS standardization by MOLIT (Ministry of Land, Infrastructure and Transport)*
- *Designated Cooperation Organization for Standards Development (COSD) by KATS (Korean Agency for Technology and Standards)*
- *Administration of the ITS Standards Assembly (Private Standards Bodies)*

Contributing to laying the foundation of ITS industry by carrying out standardization on behalf of MOLIT, administrating private standards bodies, and doing international standards cooperation activities, etc.

Laying the Foundation for Standards
- Preparation of systems related to standards
- Participation in the revision of national ITS architecture

Standard Development and Support
- Development and reorganization of national standards (KS) in the ITS area
- Support for the development and maintenance of technical regulations
- Administration of ITS general assembly

Standard Dissemination and Maintenance
- Regular training for ITS Standardization
- Support for cooperative activities of international standards
- Publication of ITS terminology dictionary, Korean ITS standardization activity report, etc.

Main Activities

- Supporting International Standardization Activities (ISO/TC 204)
- Supporting ISO/TC204 WG 1,5,9,10,18 Specialist Activities
- Develop the Technical Regulations and Support the Related Activities
- Develop the Technical Regulations Conformity Test
- Standardize De Facto Standards
- Administrate the Standards Assembly
- Establish and Publish Total 75 Standards
- Operate the National ITS Data Registry and ITS Architecture Website

- Carry out the standardization training course and education class every year

- Build and operate the website for National ITS Standards (National ITS Data Registry of Korea)

http://dr.its.go.kr

Verification of ITS Standards Observance

- *Designated ITS Standards Observance Verification Organization by MOLIT (Ministry of Land, Infrastructure and Transport)*
- *Designated the organization dedicated to ITS standardization by MOLIT (Ministry of Land, Infrastructure and Transport)*

Evaluating and determining whether or not systems subject to national standards meet the relevant ITS standards through objective test methods defined by third party when a new ITS is built or changed

Target systems

- Systems that are established (or changed) based on the implementation plan approved by the project operator
- Systems that are established by an operator after obtaining permission from relevant authorities
- Reference systems in connection with the verification target systems

Target Technologies

- Basic transport information exchange (between centers)
- Public transportation (bus) information exchange (between centers)

Verification of ITS Standard Observance

- The application of the national technical regulation "the basic traffic information exchange"
- The application of the national technical regulation "the basic traffic information exchange II"
- The application of the national technical regulation "the basic traffic information exchange III"
- The application of the national technical regulation "the basic traffic information exchange IV"
- The application of the national technical regulation "the public transport (bus) information"
- The application of the national technical regulation "ETCS by DSRC"

Conformance Test of ITS Standard

- ETCS System Conformance Test
- OBU Conformance Test
- Traffic Information Collection&Provision by DSRC Conformance Test
- Toll Violation Enforcement System Conformance Test
- Tunnel Integrated Wireless Communication System Conformance Test
- Tunnel Incident Detection System Conformance Test
- Other ITS Related Conformance Test

Performance Evaluation

- *Designated organization dedicated to ITS Performance Evaluation by MOLIT (Ministry of Land, Infrastructure and Transport)*
- *Accredited inspection agency evaluating VDSs & AVIs by KOLAS (Korea Laboratory Accreditation Scheme)*

Improving traffic information traffic information quality by ensuring that the functions of ITS equipment are kept above a certain level according to ITS performance evaluation standards of MOLIT

Target equipment

- Vehicle Detection System (VDS)
- Automatic Vehicle Identification (AVI)
- DSRC Traffic Information System
- Incident Detection System (IDS)
- High Speed Weight In Motion (HS WIM)

Conformance Test of ITS Standard

Contributing to ITS quality improvement by testing whether the performance of ITS-related equipment products and services meet performance requirements of ITS group standards

Target System

- Electronic Toll Collection System (ETCS)
- On Board Unit (OBU)
- ANPR (Automatic Number Plate Recognition)
- Low Speed WIM System (LS WIM System)
- Tunnel Radio Rebroadcasting System
- Automated Tunnel Incident Detection System

To issue KOLAS inspection report for ITS Performance Evaluation

- Target devices : VDS (Vehicle Detection System), AVI (Automated Vehicle Identification)
- Execution : Inspection for project completion, Regular inspection
- Methods : In accordance with the guidelines of ITS project implementation – VDS and AVI Performance Evaluation (latest version)
- After the inspection is completed, the official KOLAS inspection report will be issued

Project Management & Consulting

- *Designated ITS project consulting organization [Article 14 of ITS project implementation guidelines]*
- *Designated Project management organization dedicated to C-ITS pilot projects for local governments [by MOLIT]*

Evaluating and determining whether or not systems subject to national standards meet the relevant ITS standards through objective test methods defined by third party when a new ITS is built or changed

Planning of ITS Project	Consult the Ordering Body about Project Implement Action Plan Fundraising Method RFP and Bidding Guide Manual of Technology Proposal Pre-research and Analyze the Current Condition of Implement site
Conducting of ITS Project	• Manage the Implement Process • Report the Daily / Weekly / Monthly Process • Quality Control • Safety Management • Implement Management
Completing of Project	• Verification Standard Observance • Inspection for Completion • Evaluation of Unit and Integration Test • Evaluation of System Performance • Post Research & Analyze • Comparison Analysis of Before and After

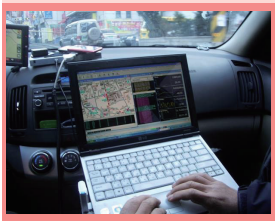
Work Scope of ITS Project Management by Period

01 Planning of ITS Project

- Consult the Ordering Body about Project Implement Action Plan Fundraising Method RFP and Bidding Guide Manual of Technology Proposal
- Pre-research and Analyze the Current Condition of Implement site

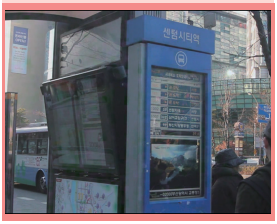
02 Conducting of ITS Project

- Manage the Implement Process
- Report the Daily / Weekly / Monthly Process
- Quality Control
- Safety Management
- Implement Management



03 Completing of ITS Project

- Verification Standard Observance
- Inspection for Completion
- Evaluation of Unit and Integration Test
- Evaluation of System Performance
- Post Research & Analyze
- Comparison Analysis of Before and After

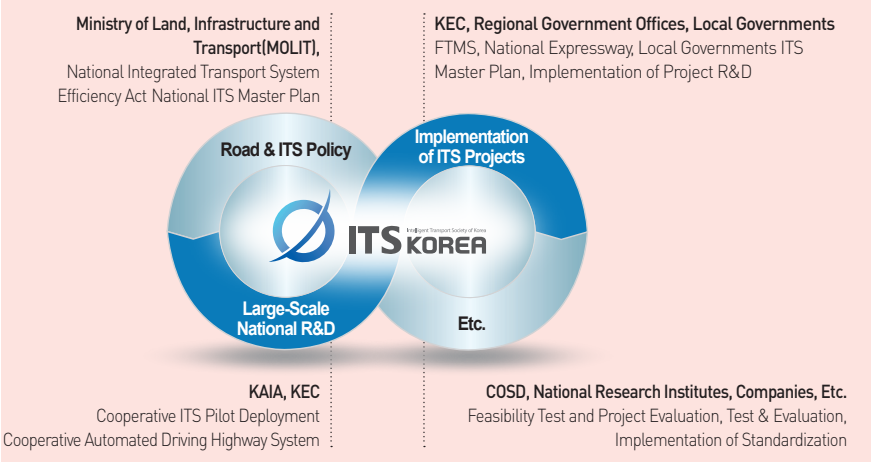


Research & Development

• Designated organization dedicated to management of C-ITS pilot project [by MOLIT]

Leading development of ITS industry by directly carrying out tasks for related policy · academic research, and technology development to support national ITS policy and to present the blueprint of future ITS

Proposal of National Policy Direction	• Study on the establishment of ITS policy of central/local government & road management organization • Study on laying foundation for Standardization, performance criteria, diagnosis evaluation, etc. • Planning, design, analysis and evaluation study for systematic ITS project
Proposal of Future ITS Blueprint	• National R&D proposal according to future traffic environment change • Development of new ITS fields & new growth Creation • Carrying out the development of C-ITS standardization and certification standard
Establishment of Leading Research System	• Establishment of a roadmap for research that has not yet been conducted • Customer-oriented & Field-compatible Research • Support for Korea's ITS export based on various research experience and development technology



KAIA (Korean Agency for Infrastructure Technology Advancement)
KEC (Korea Expressway Corporation)
COSD (Co-operation Organization for Standards Development)

Overseas business & International Cooperation

• Designated organization for international cooperation on ITS by MOLIT (Ministry of Land, Infrastructure and Transport)
• Operation of ITS International Business Assistance Center (intl.its.go.kr)

Contributing to Korean ITS export by carrying out international cooperation and supports for overseas market entry on behalf of the government

ITS KOREA assists Korean ITS businesses that want to enter overseas market as well as promotes overseas business. For overseas countries hoping to introduce ITS or to work with Korea, ITS KOREA also provides the customized consulting, the opportunities for sharing Korean ITS technologies and experience, and business matchmaking.

Global Cooperation to Provide the Chance to Share ITS Knowledge and Experience

- Host ITS Roadshow hosted 29 times in 22 countries which are evaluated as potential export market, since 2009.
- Organize Exhibition and Seminars to promote Korean ITS technologies and services
- Hold Invitation Workshop to provide professional training course for sharing ITS policy and technologies

ITS Roadshow

Exhibition

ITS Invitational Workshop

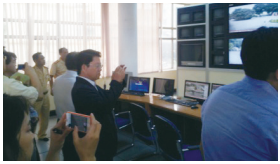
ODA Project Development in ITS

- Arrange EDCF loan and KOICA grant for carrying out overseas ITS projects
- Encourage overseas countries to establish ITS by using various Korea ODA like KSP and funding program proposed by government ministries (Ministry of Land, Infrastructure and Transport, Ministry of Foreign Affairs and etc.)
  - ODA for ITS projects in Colombia, India, Ukraine, Vietnam, Mongolia, and Indonesia proposed for funding.
    * In case of insufficient budget for ITS projects in your country, take advantage of funding assistance in Korea
    * ODA (Official Development Assistance), EDCF (Economic Development Cooperation Fund)
    * KOICA (Korea International Cooperation Agency), KSP (Knowledge Sharing Program)

Providing the Customized ITS Consulting for Overseas Countries

- Conduct Feasibility Study to lay the groundwork for successful projects
  - ITS KOREA conducted F/S on ITS construction projected in 4 cities in Colombia and in Santo Domingo, the Dominican Republic.
- Establish Project Master Plan for actual ITS project execution
  - Review and analyze the local transportation conditions, relevant policies and technologies on behalf of the client country
  - Provide the budget and the detailed action plan for project implementation
  - ITS KOREA established ITS Masterplan for Colombia in 2019-2020
  - ITS KOREA established Egypt Alexandria Urban Transport Modernization (ITS) Master Plan Project in 2020
  - Basic design and pilot project of BIMS for Jakarta, Indonesia in 2020-2021
  - PC for Establishment of Intelligent Transport Systems (ITS) Master Plan and Pilot System for Jakarta Metropolitan Area in 2021-2024
  - Transportation Improvement MP and Feasibility Study of Ring Road for Mitigating Traffic Congestion in Guatemala Metropolitan Area in 2021-2024

Analysis of local traffic conditions



Site Inspection

Specification for ITS

Global Business Hub for Korean & Overseas ITS Projects

- Arrange 1:1 Business Matching and Networking
- Search and introduce the optimal business partner for both Korean and oversea companies, if required for ITS project
- Build business network and strengthen cooperation among international ITS agencies (Signed MoU with 31 organizations from 29 countries ; Netherlands, Germany, Russia, Malaysia, Mongolia, USA, Sweden, Singapore, UK, India, Indonesia, Japan, China, Kazakhstan, Canada, Colombia, Croatia, Thailand, Turkey, Poland, Australia, Peru, El Salvador, Hongkong, Latin America
- Provide the best course of Technical Visits for introducing various traffic centers on demand

1:1 Business Matching

MoU Signing

Technical Visit

Overseas Project List

No.	Name of Project	Year	Project Owner
1	Transportation Improvement MP and Feasibility Study of Ring Road for Mitigating Traffic Congestion in Guatemala Metropolitan Area	2021-2024	KOICA
2	PC for Establishment of Intelligent Transport Systems (ITS) Master Plan and Pilot System for Jakarta Metropolitan Area	2021-2024	KOICA
3	Basic design and pilot project of BIMS for Jakarta, Indonesia	2020-2021	MOLIT
4	Project Management Consulting for ITS Implementation in Medellin, Colombia (2nd Year)	2020-2021	MOLIT
5	Egypt Alexandria Urban Transport Modernization (ITS) Master Plan Project	2020-2021	MOLIT
6	Establishment of National ITS Master Plan for Colombia	2019-2020	MOLIT
7	Project Management Consulting for ITS Implementation in Medellin, Colombia (1st phase)	2019	MOLIT
8	Feasibility Study on National Standard-based Interoperable Automatic Fare Collection System in Philippines Program	2018	KEXIM
9	Improving Urban Traffic Management in Medellin, Colombia	2018	MOLIT
10	Support for the Establishment of Bus System Reform Strategy in Bandung, Indonesia	2017	KEXIM
11	Implementing an Automated Fare Collection System for Public Transport in Cairo and Alexandria, the Arab Republic of Egypt	2017	KEXIM
12	The Master Plan for Integrated Center System of Southern Expressway Network of Vietnam	2017	MOLIT
13	Feasibility study on Metro Manila's ITS implementation for EDCF	2017	ICAK
14	Public-Private Partnership for Urban Transportation Infrastructure in Colombia	2016	KEXIM
15	Feasibility Study to Install an Integrated Traffic Management Center, Malaysia	2016	ICAK
16	The Master Plan for Intelligent Transport Systems for Medellin, Colombia	2016	MOLIT
17	ITS invitational workshop for Colombia (2nd year)	2016	KOICA
18	Support for the Development of Transportation Infrastructure and Public Transport System in Bandung, Indonesia	2015	KEXIM
19	Traffic Management Plan for Jaber Causeway Project	2015	Hyundai Autoever
20	Nationwide Smart City ICT Master Plan for Kingdom of Saudi Arabia	2015	NIPA
21	ETCS feasibility study for Mongolia	2015	NIPA
22	ITS invitational workshop for Colombia(1st year)	2015	KOICA
23	Technical Assistance: Feasibility Study on establishment of BRT in Ulaanbaatar	2013	ADB
24	F/S of the establishment of ITS in Dominican Republic	2010	KEXIM
25	F/S of the establishment of ITS for 4 cities in the Republic of Colombia	2009	KEXIM

- MOLIT : Ministry of Land, Infrastructure and Transport of Korea
- KEXIM : Export-Import Bank of Korea
- ICAK : International Contractors Association of Korea
- KOICA : Korea International Cooperation Agency
- NIPA : National IT Industry Promotion Agency
- ADB : Asian Development Bank

Domestic / Global Cooperation

- *ITS organization in Korea*
- *Facilitating mutual cooperation with public and private sectors*

Conducting activities to share information on ITS-related policies, market, technology trend and collaborate on it for consolidating the private sector capacity of the ITS industry and maintaining a cooperative system between industry and academic research

- Operating member's meeting
- Hosting ITS Seminars
- Maintaining alliance with ITS related organizations
- Proposing Policies for ITS system improvement

ITS KOREA is your best partner for Global Business

- International Cooperation Exchange and Cooperation with Overseas ITS Organization Promote the Advanced Korean ITS

- MoU(Memorandum of Understanding) Signing

- Attend / Host ITS AP Forum and Exhibition
- Attend / Host ITS World Congress

Gateway to the Hub of the Global ITS

(Strengthen the Network and Meet the Right Contact Point for Your Business)

- Host the International/ Domestic Seminar
- Establish Forum Upon Members Needs and Request along with Market trend

- Business Matching (Find the Right Partner in Korea and Around the World)

- Membership Only Events (e.g. hope day, workshops, symposium and etc.)
- Arrangement for ITS Service & Technology Tour in Korea for Foreign Business Visitors

International ITS Workshop

• To show Korean ITS experience & know-how
• To build mutual cooperation with overseas countries

Objectives

- To understand concept, background and necessity ITS introduction in Korea
- To learn Korean strategies including laws and policies to effectively deploy ITS in Korea nationwide
- To learn individual ITS services in aspect of technology – Advanced Traffic Management Systems, Bus Information System, and Electronic Toll Collection System and etc.
- To learn the recent technological developments in ITS
- To exchange the statistical facts and ideas on urgent issues facing in each city and find out the customized solutions to deal with those problems
- To strengthen future cooperation in ITS area

KOICA ITS Workshop 2019

- Title: Capacity Building for Achieving Effective Transportation Using ITS
- Duration: 21 days
- Number of Participants : 15 participants from 8 countries (Azerbaijan, Egypt, Gambia, Indonesia, Laos, Nigeria, Peru, Tanzania)
- Language : English

Detailed Program Schedule

Date / Time	Program Description
Day 1	Arrival
Day 2	KOICA Orientation

- Introduction to KOICA & Program
- ICC(International Cooperation Center) tour
- Hompage registration
- Welcoming luncheon
- Introduction to daily life in Korea
- Training on basic Korean
- Training on ODA or gender issue

Day 3	Orientation / Lecture / Country Report

- Orientation
- [Lecture 1] Current status of ITS in Korea
- Presentation on the country report (by each city)
- Action plan methodology

Day 4	Lectures

- [Lecture 2] National ITS policy & plan
- [Lecture 3] ITS standardization
- Group Discussion on action plan

Date / Time	Program Description
Day 5	Lectures / Study Visit

- [Lecture 4] Transportation Policy in Seoul city
- [Study Visit] Seoul TOPIS & hands-on experience of public Transportation
- [Study Visit] LG CNS

Day 6	Field trip

- [Field trip] KIAP(Korea Intelligent Automotive Parts Promotion Institute)
  - Poving ground for driving
- [Field trip] Busan Traffic Information Center

Day 7	Field trip

- [Field trip] Samwon FA
  - Transportation Card system and facilities
- Busan City Tour

Date / Time	Program Description
Day 8	Field trip
Gyeongju Cultural experience	
Day 9	Free time
Day 10	Lectures / Study visit
[Lecture 5] Introduction of ITS in expressway Move to Anyang city [Study visit] Anyang U-traffic center	
Day 11	Lectures
[Lecture 6] Traffic signal management & control [Lecture 7] Traffic center system Group work on Action plan	
Day 12	Lectures / Study visit
[Lecture 8] Weigh-in-motion system Move to Korea Expressway Corporation (KEC) [Study visit] Smart Highway Demonstratio	
Day 13	Lectures
[Lecture 9] Bus information system [Lecture 10] Electronic Payment for Public Transportation Group work on Action plan	
Day 14	Cultural experience
Seoul City Tour	

Date / Time	Program Description
Day 15	Free time
Day 16	Lectures / Study visit
[Lecture 11] ITS communication and Network [Study visit] KEC traffic information center Group work on Action plan	
Day 17	Lectures / Study visit
[Lecture 12] Traffic information and Big data [Study visit] NTIC (National Traffic Information Center)	
Day 18	Lectures
[Lecture 13] Parking information system [Lecture 14] ITS project process flow Group work on Action plan	
Day 19	Lectures
[Lecture 15] ITS performance evaluation Review and final check-up on Action plan Farewell Dinner	
Day 20	Action Plan / Closing Ceremony / KOICA Evaluation
Action plan presentation by each and giving feedback	
Day 21	Departure

Welcoming Luncheon

Lecture

Study visit to TOPIS

Study visit To KEC center

Cultural Experience

Study visit to C-ITS demonstration site

Education

• Designated joint training center for Consortium for HRD Capacity Building Program (Strategy field) by Ministry of Employment and Labor

Providing systematic education programs and professional education to strengthen the capability of ITS workers and Training value-creating talented persons for development and promotion of ITS industry

Specialized ITS training

Training of ITS experts based on practical abilities as a joint training center of the Ministry of Employment and Labor

- Practical training for each job
- Combination of theories and practical training
- Demand-focused training reflecting feedback from the field works

Customized ITS training

Providing customized training that meets individual company's request to foster workforce

- Flexible program to meet corporate requirements
- Training program development based on the analysis of jobs of trainees
- Discussion about training direction and content with HR personnel

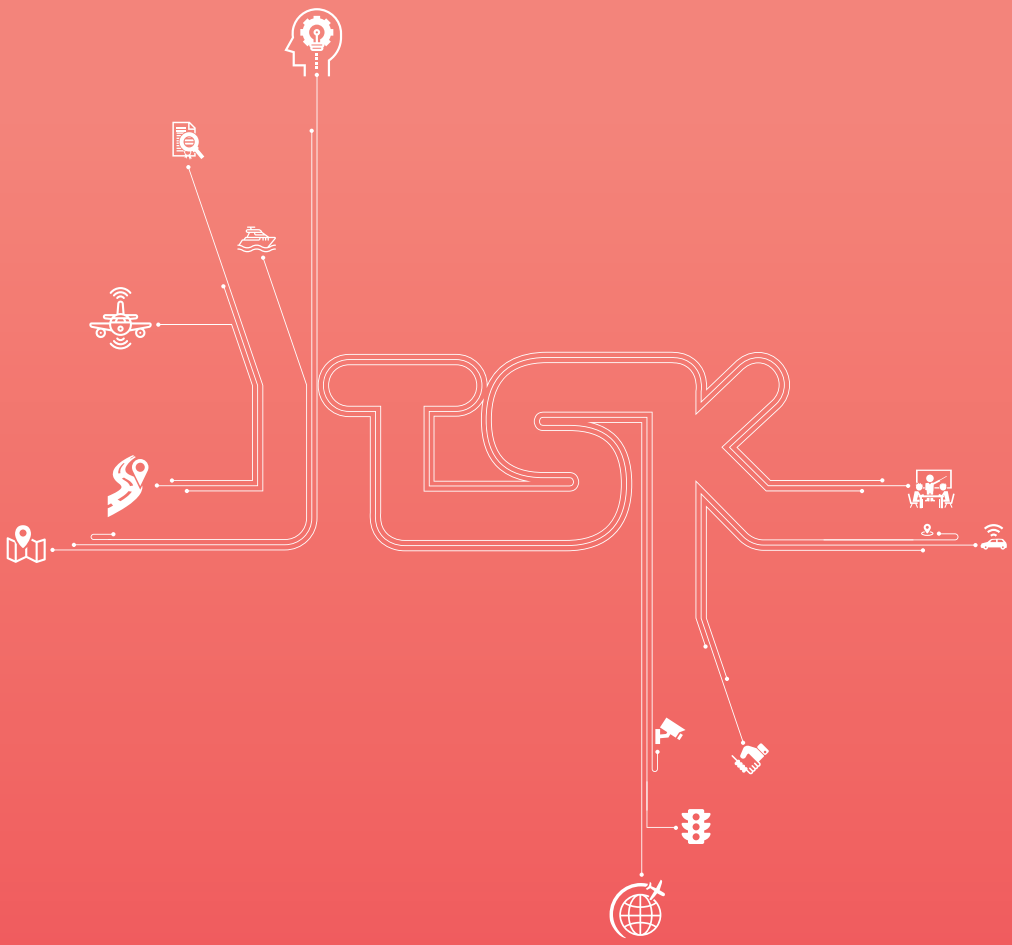
ITS Education Courses

• Program

	Project Planning & Management	System Design & Implementation	System Operation & Management
Advanced	Understanding Big Data and How to utilize it for ITS		
	Advanced and connected Technology with C-ITS		
Upper Intermediate	Development of ITS Overseas project	Network & Security Solutions for ICT Integrated Monitoring System	Quality Management of ITS System
	How to make a Proposal for Overseas Project	V2X Communication and Security Technology	Operation and Maintenance of Sever and Database for Traffic Center
	How to make a Proposal for Public ITS project	Services Specification and Implementation for C-ITS	Operation and Maintenance of communication for ITS
Intermediate		How to Utilize Network Technology for ITS	
	Understanding and Practice on EMME4	Technology and Application on Smart Tolling	Operation and Maintenance for ETCS
	Understanding and Practice on VISSIM	Technology and Application on Incident Detection System	Operation and Maintenance for TTMS (Tunnel Traffic Management System)
	ITS Project Management based on Case Study	Implementation and Operation for Signal Control System	Operation and Maintenance for FTMS/ATMS
Beginner	Blueprint and Bill of Quantity for ITS Project	Detailed Design of ITS System	
Pre-Beginner	Basic Practice for ITS Project		

Member List of ITS KOREA

ex Korea Expressway Corporation	DAEBO	GITSN	HYUNDAI MOBIS	HYUNDAI	posco ICT	KETC
METABUILD CO., LTD	NEIGHBOR SYSTEM	SK telecom	VITZRO SYS	SAT	소스텔 RFDACS	KoROAD
ETRI	KR INDUSTRY COMPANY	THINKWARE	싸인텔레콤 www.signtelecom.com	SD SYSTEM	HDC	NDS
UTi	HANIL STM	주식회사 대로 DAERO CO., LTD	DAYLI Blockchain	SMARTVISION	HYUNDAI AutoEver	SAMWON FA
Traffic	SK holdings	JW	Hanwha Systems	ERICSSON LG	LG Electronics	TmaxTibero
LOTTE DATA COMMUNICATION	KSI	LG CNS	DAELIM CORPORATION	LEDO	INPEG	UNISECU
iTtelecom	iTRONICS	KEON-A Information Technology Co.,Ltd	GnT Solution Inc.	BusanUlsan Expressway Corporation	선불하이패스카드	WIABLE
eSys	AUTOCRYPT	TRACOM	RANIX	TOPES	AirPoint	DAEYEONG UBITEC Co.,LTD.
SAMWON FA	Global (주)지정보통신 Information & Communication Technology	wavecom	RK RoadKorea Inc.	(주)엘케이시스템 LKsystem	Rex Gen INNOVATION FOR HUMAN	Innowireless
SEO JIN	Hyundai ITS Electron Co., Ltd.	HMC (주)에이치엠씨 Hanwul Multimedia Communication	KCI KOREA CONSULTANTS INTERNATIONAL	Korea Smart Card Co., Ltd	easytraffictechnologies	EunSung
MORU Industrial Systems	Wayties	TDC SYSTEMS LIMITED	(주)대한티피에스 Korea Total Power Solution	SONGAM	KSL KOREA SURGE LAB	강릉시
ONLINE	K3global Co., Ltd	High Gain Antenna	HNTech	DaeU media systems	CEST	Best Bucheon City Urban Corporation
novacos	ITS	DAEJU	Seoul Tech	EB CARD	HANIL DNS CO.,LTD.	UNISEOU
TSMART (주)티스마트	STC Networks	DSCO	광명D&C	CHEMTRONICS	DILAB	WAYS1 MAP INNOVATION WAYS
Continental The Future in Motion	INNOCA	here	KISTLER measure. analyze. innovate.	ENB GROUP	ANT	ETTIFOS
MONIC	carnavi.com	Anritsu	Media Devices	(주)동방데이타테크놀러지 DONGBANG DATA TECHNOLOGY LTD	SA TECH	HYPERSENSING
jastecM	MPEON	KETI Korea Electronics Technology Institute	HanMec	DLSV	ivs Intelligent Video & Sound	LAON ROAD
Bluekite	CUDO COMMUNICATION	DELI-i	BUREAU VERITAS	ShinKwang	LX Korea Land and Geospatial InformatiX Corporation	(주)엘엔디테크 LED&DISPLAY
Penta SECURITY	NHNETWORKS 엔에이치네트웍스(주)	woojoo telecom	KI&T Korea Information & Technology	Seoul Facilities Corporation	가온ITS(주)	SAESOL TECH
SHINSUNG NS TECH	LG U+	algo-thing	JDSOLUTION	kt	Fantasia BUCHEON	



Part 2

Korean ITS Industry Brief

Chart of KOREAN ITS Companies

Company Name	Traffic Management	Public Transportation	Electronic Payment	Traffic Information Integration/ Management	Traveler Information	Advanced Vehicle/Road	Commercial Vehicle Operation	Others
AIRPOINT Co., Ltd.			●	●				
algo-thing corp.	●					●		
AUTOCRYPT Co., Ltd.							●	●
Bucheon City	●	●	●	●		●		
Bucheon City Urban Corporation	●	●	●	●				
CARNAVICOM Co., Ltd.	●		●			●		
CEST Co., Ltd						●		
Chemtronics				●				
DAEBO COMMUNICATION & SYSTEMS Co., Ltd	●	●	●	●		●	●	●
DAEYEONG UBITEC Co., Ltd	●	●	●	●		●		
Easy Traffic Technologies, Co., Ltd.	●							
EB CARD	●	●	●	●		●		
Ericsson-LG	●	●	●	●	●	●	●	
essys Co., Ltd			●			●		●
ETRI						●		
Ettifos Co.	●		●	●				●
Eunsung.Trasys Co. Ltd.	●							
Gangneung City	●	●	●	●	●	●		
GITSN Inc.		●	●	●				
HANATECH SYSTEM Co., Ltd.	●	●		●				
HANILSTM Co., Ltd	●		●	●				
Hanwha Systems Co., Ltd	●	●	●	●	●			
HighGain Antenna			●			●		
HYPERSENSING, Inc						●		
HYUNDAI ITS ELECTRON CO., LTD	●	●		●	●	●	●	
Innowireless	●	●		●		●		
InPEG Vision Co.,Ltd.	●	●	●	●				
IT TELECOM Co., Ltd	●	●	●	●	●			
ITRONICS CO., LTD			●	●	●			
JastecM Co.,Ltd.							●	
Jin Woo Industrial Co., Ltd	●	●	●	●	●			
Keon-A Information Technology Co., Ltd	●							●
Korea Consultants International Co., Ltd	●	●	●	●				
Korea Electric Traffic Co., Ltd. tional Co., Ltd	●			●		●		
Korea Expressway Corporation	●		●	●		●		
KOROAD	●			●		●		

Company Name	Traffic Management	Public Transportation	Electronic Payment	Traffic Information Integration/ Management	Traveler Information	Advanced Vehicle/Road	Commercial Vehicle Operation	Others
KR industry Company								●
KT				●		●		
LAON ROAD	●			●		●		
LG CNS	●	●	●	●	●	●	●	●
LG U+	●			●		●		
LOTTE Data Communications Company	●	●	●	●	●	●	●	●
L&D Tech Co., Ltd	●							
METABUILD Co., Ltd	●			●				
MORU Industrial Systems Co., Ltd	●							●
MQNIC Co,.Ltd.	●	●		●	●	●	●	
NDS Corporation	●	●		●		●		
Neighbor System	●	●	●	●				
NOVACOS Co., Ltd	●			●				
Penta Security Systems Inc								●
POSCO ICT	●	●	●	●		●	●	
RANIX			●			●	●	
RexGen Co.,Ltd	●			●				
ROADKOREA Inc.	●	●						
Saesol Tech Inc.								●
SAMWON FA Co., Ltd	●	●	●		●			
SAT(System and Application Technology) Co., Ltd) Co., Ltd			●			●		
SA TECH CO.,LTD	●	●		●				
SDsystem	●	●	●	●	●	●		
SEOUL TECH CO., LTD	●	●		●				●
Signtelecom Co., Ltd.	●	●		●			●	
Songam Syscom Co., Ltd	●	●		●				
sTraffic	●	●	●	●	●			
THINKWARE Systems Corporation	●			●	●	●		
TmaxData Co., Ltd	●	●		●				
Tmoney Co., Ltd		●	●				●	
TOPES Co., Ltd	●			●				
TRACOM. Co., Ltd.	●	●		●				
UNISECU INC	●							
WAYS1	●			●		●		
Wayties Inc.						●		
WIABLE Corp.				●				

AIRPOINT Co., LTD.

Company Overview

Airpoint has total solutions in the ETCS (Electronic Toll Collection System) field, such as DSRC (Dedicated Short Range Communication) chip solution, OBU(On Board Unit) and RSE(Road Side Equipment). Especially, using the chip solutions(RF IC, Modem IC) which were developed and manufactured from Airponit, the problem of 'Delay' has been sloved. Futhrermore modem chip and RF chip are developed and supplied as one-chip solution(RF IC+Modem IC+CPU) since 2020. OBU which launched as RF type, IR type, and rear-view mirror type have sold more than 150,000 units a year in Korea. ETC RSE, the one equipped on the road side for communication with OBU, it also has lots of sales references to many road construction companies and local governments of Korea.

Business Area

1st category

☐ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

☐ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
- Multi Modal Information/Management - Bus Rapid Transit System/Solution
- Pedestrian/Disabled Support System

■ Electronic Payment
- Electronic Toll Collection - Electronic Parking Payment - Electronic Fare Payment

■ Traffic Information Integration/Management
- Traffic Information Integration - Traffic Information Center Traffic Data Management

☐ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

☐ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

☐ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

☐ Others ( )

2nd category

■ Hardware ■ Software ☐ SI ☐ Consulting ☐ Others ( )

Ongoing ITS project or R&D

Project
- ETC authentication system design and offering (Korea Expressway Corporation)
- DSRC Modem Chip, RF Chip design and offering(AEC-Q100 Certificate)
- DSRC ETC RSE design and manufacturing (Korea Expressway Corporation)
- DSRC ATMS RSE design and manufacturing (Local Government)
- China ETC Chip, OBU design and offering for Before Market

R&D
- ETC One-Chip Solution design(RF IC+Modem IC+CPU)
- Developed a piecemeal vehicle electronics wireless connection part applying BLE-based wireless payment standard

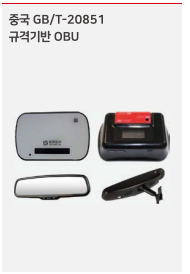
Others

Patent No

- Confirmation of small business in the management innovation type
- Certificate of foreign-invested company registration
- Certificate of environmental management system
- Confirmation of part material specialized company
- Certificate of TL9000 & ISO9001
- Certificate of IPO candidate selection
- Certificate of Innobiz membership
- Certificate of R&D rediscovery task TTA
- Certificate of 5.8GHz DSRC, OBU and TTA

ITS Product & Technologies

1. ETC OBU(On-Board Unit)



OBU is a terminal attached to a vehicle so that drivers can pay tolls through wireless communication without stopping when using expressways and toll roads. It is a system that automatically settles tolls through communication between vehicle terminals and tollgate facilities using DSRC (Dedicated Short-Range Communication)

2. ETC RF Chip

Solution required for OBU development, used to develop TTA-compliant ETCS and ATMS (Automatic Traffic Management System)
- Frequency range (Receiver : 5.79 ~ 5.84GHz / Transmitter : 5.79 ~ 5.84GHz)
- Modulation (ASK modulation / Modulation index : 50 ~ 100%)
- Nominal output power : +5dBm / ±2dB tolerance / 25dB output range with 0.5dB step / 50 ~ 100% modulation index with 5% step (2.5% step size between 75% and 95%)
- Data rate
  · Receive / Transmit : 1.024Mbps - For Korea
  · Wake-up : 14Kbps, Receive : 256Kbps, Transmit : 512Kbps - For China

3. ETC Modem Chip

Solution required for OBU/RSU development, compatible with 5.8Ghz DSRC RF TTA standard Used for development of ETCS and ATMS (for domestic and overseas market)
- CPU : ARM Cortex-M3
- Memory : 512KB internal
- Clock Generation : Three Analog PLL for CPU & System / Audio / Modem
- DSRC Modem embedded
- Flexible memory interface : Two SPROM Interface
  · Quad IO supported
  · 32-bit addressing supported
- External audio codec interface
  · I2S with DMA : use four buffer
  · Audio Decoder : Wave/Wavpack supported

AIRPOINT Co., LTD.

4. ETC SoC(Modem IC+RF IC)

ETCS OBU is a specialized solution for change development. It supports high-performance MCU and sound source and is equipped with various peripherals to be used for TTA-compatible ETCS and ATMS development (both domestic and overseas market)
- Embedded Processor Unit (CORTEX™-M3) - ARMv7-M(Harvard) architecture - Thumb® / Thumb-2 ISA support - 3-stage + branch speculation pipeline - 1.25 DMIPS/MHz
- Frequency range - Receiver : 5.79~5.85GHz - Transmitter : 5.79~5.85GHz
- Radio Access Type : TDMA, TDMA-FDD
- Data rate - Receive mode : 1.024Mbps - Transmit mode : 1.024Mbps
- Modulation - ASK modulation - Modulation index : 50~100%
- Sensitivity (with 0dBi antenna) - 14KHz wake-up (85% ASK) : -48dBm - Normal frame (85% ASK) : -65dBm

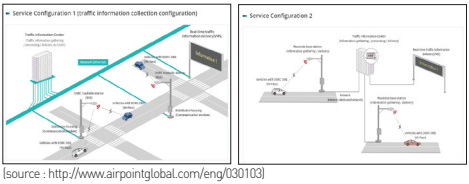
5. ETC RSE(Roadside Equipment)

RSE

Collect the location data of vehicles and transmit them to the central servers through the real-time 5.8GHz communication a DSRC vehicle terminal (OBE) and roadside base station (RSE).
Thereafter, the system provides processed and useful traffic information to VMS, DSRC vehicle terminals (OBE).

<Product Components>

RSE main assembly (built-in antenna)	5.8GHz band, 10mW	1EA
Antenna (Patch-Omni)	7dbi±1dB	1~3EA
Communication cable	RJ-45 (LAN), 4p Conn. (RS-422), power+24VDC	1EA

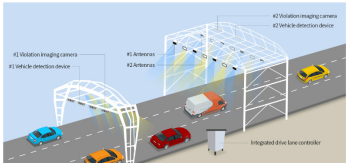


(source : http://www.airpointglobal.com/eng/030103)

<Product Features>
- LAN communication and remote control function
- DSRC communication function
- Debugging Features
- Frame mode
- Case-related functions
- Protect Features
- Vibration / shock

6. Smart Tolling System

It is a system that automatically charges tolls without stopping while driving on the highway using DSRC even if a terminal is not installed. A next-generation toll payment system in which the unmanned camera of the toll booth recognizes the license plate number, calculates the distance traveled, and notifies the driver of the toll.



General Information

Company Name : Airpoint Co., Ltd.
Website : www.airpointglobal.com
Address : 204, 187, Techno 2-ro, Yuseong-gu, Daejeon, Republic of Korea

Contacts

Name : Duna Kim
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Fax (office) : 82-42-485-5460
Phone (mobile) : 82-10-9087-5024
E-mail : toona21@airpoint.co.kr

algo-thing corp.

algo-thing

Company Overview

algo-thing Co., Ltd. is a startup that aims to solve urban problems by collecting and analyzing energy, frequency, and vibration using a complex sensor of a 60GHz radar and camera.

Business Area

1st category

■ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

☐ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
- Multi Modal Information/Management - Bus Rapid Transit System/Solution
- Pedestrian/Disabled Support System

☐ Electronic Payment
- Electronic Toll Collection - Electronic Parking Payment - Electronic Fare Payment

☐ Traffic Information Integration/Management
- Traffic Information Integration - Traffic Information Center Traffic Data Management

☐ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

■ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

☐ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

☐ Others ( )

2nd category

■ Hardware ■ Software ☐ SI ☐ Consulting ☐ Others ( )

Ongoing ITS project or R&D

We developed a solution to solve the parking and black ice problem by analyzing the parking surface information and road environment information collected through radar and camera through artificial intelligence and linking with the service through the LTE network. I want to connect.

Others

We have 4 patents related to on-street parking and road environment measurement, and 1 patent is pending.
- Complex sensor-based unmanned constant monitoring system for moving objects
- On-street parking management device and method therefor
- Parking management system using smart mobility information
- Method and device for measuring road surface condition using sensor data
- A device and method for monitoring a parking area for the disabled using radar

algo-thing corp.

ITS Product & Technologies

Product Offerings

Smart road parking management solution

- Parking surface information collection solution based on complex sensors using radar and camera
- Stand-alone device configuration reduces installation and maintenance costs

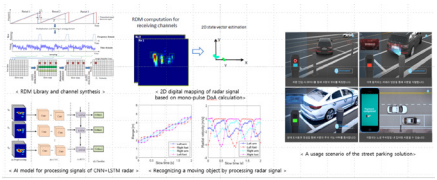
Black ice detection road surface environment measurement solution

- Standard settlement process
- 35mm to 120mm forward, recognizing
- Between the car and the calculator

Technologies

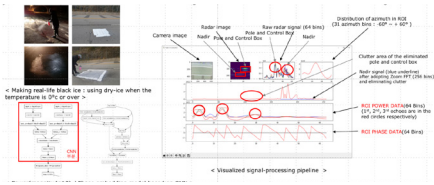
A solution for smart parking-lots based on integration of sensors for radar and cameras.

- Identifying location of cars approaching to or departing from a parking space and determining region of interest (ROI) by processing signals from radar sensors.
- Processing ROI only : This solution can be adopted into low-capacity mobile devices as the volume of video data is reduced by 70% or more.
- Working as a stand-alone device based on a number-plate recognizing engine and wired and wireless LTE communications function.



A technology for processing radar data signal

- Feature Vectorize (convlstm, signal2vec) for peaks in a spectrum.
- Adopting Echo Spectrum into Seq2seq(Autoencoder) and Attention models to classify physical properties.



General Information

Company Name : algo-thign Corp.
Website : www://algo-thing.com
Address : 2st 5F, 20, Pangyp-ro 289beon-gil Bundang-gu Seongnam-si Gyeonggi-do, Rep of KOREA

Contacts

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Fax (office) : 82-70-8668-3310
Phone (mobile) : 82-10-5552-9776
E-mail : sgcho@algo-thing.com

AUTOCRYPT Co., Ltd.

AUTOCRYPT

Company Overview

AUTOCRYPT is a global leader in automotive and mobility security technologies. Since its spinoff from Penta Security Systems Inc., AUTOCRYPT was recognized as the Best Auto Cybersecurity Product/ Solution of 2019 by TU-Automotive and acknowledged by MarketsandMarkets as one of the top five V2X cybersecurity market leaders in the world. AUTOCRYPT continues to pave the way for the mobility revolution using a multi-layered, holistic approach. Through its diverse product lines, AUTOCRYPT offers V2X security for cars and infrastructure, V2G security for EVs and the Plug&Charge process, in-vehicle security for cybersecurity compliance, and fleet management solutions for all types of mobility services.

Business Area

1st category

☐ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

☐ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
- Multi Modal Information/Management - Bus Rapid Transit System/Solution
- Pedestrian/Disabled Support System

☐ Electronic Payment
- Electronic Toll Collection - Electronic Parking Payment - Electronic Fare Payment

☐ Traffic Information Integration/Management
- Traffic Information Integration - Traffic Information Center Traffic Data Management

☐ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

☐ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

■ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

■ Others (Automotive and Mobility Cybersecurity for Connected Car and C-ITS)

2nd category

☐ Hardware ■ Software ☐ SI ■ Consulting ☐ Others ( )

Ongoing ITS project or R&D

AUTOCRYPT is actively involved in many government-funded C-ITS projects across South Korea, including C-ITS implementation projects for Seoul, Sejong, Gwangju, Ulsan, and the Province of Jeju. Some of AUTOCRYPT's recent work includes establishing a V2X authentication system for Korean highways, a big data traffic control center for operation in Sejong, ongoing maintenance and support for the Traffic Information Center of Jeju, and ITS-related consulting for Korea Transportation Safety Authority. AUTOCRYPT's recent R&D work includes the development and testing of cybersecurity solutions for OEM Level 4 autonomous vehicles, development of abnormal behaviour management technology for aftermarket V2X devices, and advanced feature upgrades for V2X authentication systems.

AUTOCRYPT Co., Ltd.

Others

ITS-Related Patents

- Method and system for issuing CSR certificate for vehicle-to-anything communication
- Method and apparatus for machine learning
- Method and system for bridging ECA and DCM and managing enrolment certificates for V2X authentication systems

Industry Awards

- Forbes Asia 100 to Watch 2021
- Automotive Cybersecurity Company of the Year by AutoTech Breakthrough Awards 2020
- Global Cyber Achievement Award by apmaIAC Cyber Mobility Awards 2020
- Best Auto Cyber Security Product/Service by TU-Automotive Awards 2019

ITS Product & Technologies

Product Offerings

AutoCrypt V2X - an authentication and encryption system for V2X (vehicle-to-everything) communications, including vehicle-to-vehicle (V2V), vehicle-to-infrastructure (V2I), and vehicle-to-pedestrian (V2P)

AutoCrypt PKI – a public key infrastructure (PKI) system that provides certificate management used to authenticate end entities such as cars and traffic lights in the ITS, built and designed to comply with US SCMS, European CCMS, and Chinese C-SCMS

AutoCrypt IVS – an in-vehicle security system consisting of an Intrusion Detection System (IDS) and Advanced Firewall (AFW), blocking malicious threats from the outside and monitors communications within the vehicle, while responding to any abnormal behaviours in real-time

AutoCrypt PnC – a set of secure communication modules and certificate management systems that protects both the electric vehicle and its supply equipment (EVSE) during the Plug&Charge (PnC) process, ensuring secured vehicle-to-grid (V2G) communications in compliance with ISO-15118

AutoCrypt FMS – a custom development service to provide secure fleet management for a variety of mobility services, from ridesharing platforms to demand-responsive transport (DRT) services

Technologies

V2X Security Technologies

- Secures the broadcast and receival of basic safety messages (BSM) and other information between the onboard units (OBU) of vehicles, roadside units (RSU) of pedestrians, and the mobile devices of pedestrians
- A local certificate manager, AutoCrypt LCM, stores and manages all certificates
- Designed for both WAVE and C-ITS
- Ultrafast verification speed exceeding 5G requirements

PKI Technologies

- Enrolls new end entities into the system, provisions identification and pseudonym certificates, and revokes certificates based on reported misbehaviour

In-Vehicle Security Technologies

- Security reinforcement and monitoring for electronic control units (ECU)
- IVS DRA, an integrated management system, provides in-vehicle security updates and management by downloading logs and the latest policies and rules through a remote management server

Plug&Charge Security Technologies

- PnC security and PKI create robust and convenient authentication, authorization, and billing system
- Complies with ISO 15118-2 standard for PnC charging and communications and VDE 2802-100-1
- Supports Open Charge Point Protocol (OCPP), verifying the contracts between charging station management systems (CSMS) and mobility operators

General Information

Company Name : Autocrypt Co., Ltd.
Website : www.autocrypt.io
Address : Sewoo Building 8F, 115 Yeouigongwon-ro, Yeoungdeungpo-gu, Seoul, Korea

Contacts

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Department : Domestic Sales Department
Phone (office) : 82-2-2125-4010
Phone (mobile) : 82-10-2217-1100
E-mail : domestic@autocrypt.io

Bucheon City

Company Overview

Bucheon City, a creative city of UNESCO, is a vibrant cultural metropolis in the Republic of Korea known for its rich contributions to modern arts such as comics, film, and music.
Bucheon City is the proud home to the Bucheon Philharmonic orchestra, Korea's top orchestra, and the Bucheon International Fantastic Film Festival, which is filled with thrills audiences with tales of love, fantasy, and adventures. Bucheon is also known as a high-tech city that has smart transportation systems and is implementing people-centered smart cities.

Business Area

1st category

■ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

■ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
- Multi Modal Information/Management - Bus Rapid Transit System/Solution
- Pedestrian/Disabled Support System

■ Electronic Payment
- Electronic Toll Collection - Electronic Parking Payment - Electronic Fare Payment

■ Traffic Information Integration/Management
- Traffic Information Integration - Traffic Information Center Traffic Data Management

☐ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

■ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

☐ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

☐ Others ( )

2nd category

■ Hardware ■ Software ■ SI ■ Consulting ■ Others (Smart City Infrastructure such as Self-Network)

Ongoing ITS project or R&D

Ongoing ITS Project
- Real-time-based bus route dynamic allocation system
- Cloud computing-based BIS sharing business at home and abroad
- Smart Parking System : Pre-payment system, Immediate parking fee discount system
  · Smart Parking Sharing Hub Center : Sharing and integration public and private parking information

R&D Division : Smart Intersections Based on AI(Adaptive Signal System)

Bucheon City

Others

Smart Bus Information Terminal
- 2-Apr 2015 : Technical Patent Registration
- 25-Nov 2015 : Design Patent Registration
- 22-Mar 2015 : Government Procurement Excellence Designation

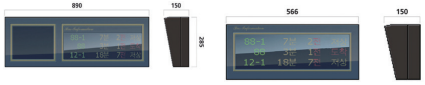
Smart Parking Lot Unmanned Settlement System
- 31-Jul 2019 : Design Patent Registration

Cloud computing based BIS sharing Cooperation Project at home and aborad
- 2016 Seosan City
- 2018 Namwon City, Oksheon County, Boeun County
- 2018 Mongolian Ulaanbaatar City

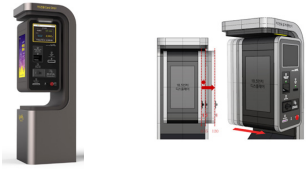
ITS Product & Technologies

Product Offerings

Smart Bus Information Terminal
- Real-time LED module defect detection function
- 33% increase in module resolution the distance
- Real-time media delivery
- Light weighting

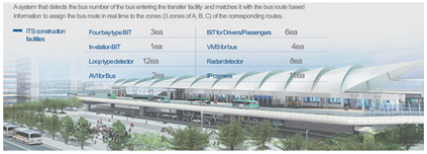


Smart Parking Lot Unmanned Settlement System
- Standard settlement process
- 35mm to 120mm forward, recognizing
- Between the car and the calculator

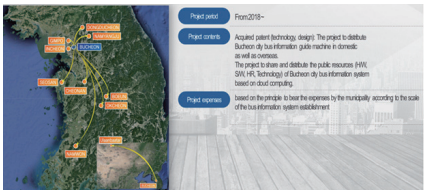


Technologies

Real-time-based bus route dynamic allocation system : To operate bus routes 2,700 times from 14 bus stops into 6 bus stops, ITS is applied and 8 ITS unit systems are integrated and integrated to create new technologies. A system that detects the bus number of the bus entering the transfer facility and matches it with the bus route based, Information to assign the bus route in real time to the zones (3 zones of A, B, C) of the corresponding routes.



Cloud computing-based BIS sharing Cooperative Project : A project to share BIS with local governments that do not have the resources to do BIS service. BIS public resources (human resources, technical resources, hardware and software resources) held by local governments are shared with local governments that do not have resources under the cloud computing environment to eliminate disruption of public transportation information services and promote balanced development.



General Information

Company Name : Bucheon City
Website : www.bucheon.go.kr
Address : Bucheon City, 210, Gilju-ro, Bucheon-si, Gyeonggi-do, Republic of Korea (Postal Code 14547)

Contacts

Name : Kim, Dong-Suk
Department : Transportation Project Division
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Fax (office) : 82-032-625-3839
Phone (mobile) : 82-10-2260-7964
E-mail : kylkyn@gmail.com

Bucheon City Urban Corporation

Company Overview

Bucheon City Urban Corporation was established on July 1, 1999, Since then, we have managed and operated Parking, Transportation, Sports, Atmospheric environment and Cultural facilities. In addition, the company has been continuously expanding its business area with regional urban development.

In particular, Bucheon City Urban Corporation is the only public institution in Korea that has accumulated the related technologies and experiences through the 15-year traffic information center operation.

Recently, cities are trying to evolve into Smart Cities, and the development of transportation technologies is a key area of Smart City construction. Bucheon City Urban Corporation is preparing to play a leading role in the Smart City era through continuous advancement of human resources in urban development and ITS.

Business Area

1st category

■ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

■ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
- Multi Modal Information/Management - Bus Rapid Transit System/Solution
- Pedestrian/Disabled Support System

■ Electronic Payment
- Electronic Toll Collection - Electronic Parking Payment - Electronic Fare Payment

■ Traffic Information Integration/Management
- Traffic Information Integration - Traffic Information Center Traffic Data Management

☐ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

☐ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

☐ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

☐ Others ( )

2nd category

☐ Hardware ☐ Software ■ SI ■ Consulting ☐ Others ( )

Ongoing ITS project or R&D

- Concept Design and Pre-Feasibility Study for Smart Mobility Platform in Ulaanbaatar, Mongolia (2020~)
- Development of unmanned payment device for public parking lot for the disabled(2019~2021)
- Development of vehicle recognition technology using TPMS(Tire Press Management System)(2021~)

Bucheon City Urban Corporation

Others

Business Registration(License)
- Certificate of Transportation, Information and Communications Engineering

Patents
- Self-diagnosis of LED display module failure using power consumption status change.
- Automatic height adjustment device for vehicle height recognition and parking fee payment using vehicle license number.

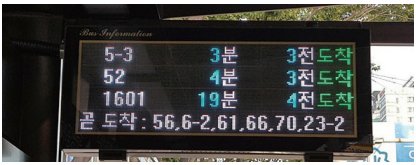
ITS Product & Technologies

Product Offerings

Bus Information Terminal
- LED Display type (4Tires 12Raws)
- LCD + LED Display type (3Tiers, 10Raws)
  - Bus Information Terminaljointly developed with Bucheon City
  - Designed web service-based information distribution
  - Simplify system construction with centralized system operation

LCD+LED(3Tiers, 10Raws)

LED(4Tires 12Raws)



Payment device for public parking lot for the disabled

- **Specification**
  - Dimension: 500(w) x 1800(h) x 210(d)(mm)
  - Power: AC 220V, 60Hz
  - OS: Android8.0
  - Display Interface: 543 x 317.4mm(23.8Inch), 1920 x 1080(FHD)
  - Payment method: credit card, mobile pay
  - IoT Beacon Bell, Barcode reader
- **Product Features**
  - Display interface height can be adjusted(40Cm) automatically according to the user's height. (Wheel chair user)
  - Applicable to various public facilities as well as parking lots

LED(4Tires 12Raws)

Technologies

1. Intelligent transportation system construction design&consulting.
2. City control center (traffic) design and operation plan consulting.

General Information

Company Name :
BucheonCityUrbanCorporation
Website : http://www.bcits.go.kr
Address : 920ksan-ro, Bucheon,
Gyeonggi14551, Rep.ofKorea

Contacts

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Phone (mobile) : 82-10-6266-5276
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CARNAVICOM Co., Ltd.

carnavi.com

Company Overview

Since established in 2001, Carnavicom has developed automobile electronics including navigation, Hi-Pass and dashcam. The reason why Carnavicom focuses on automobile electronics is that a car is not just a means of transportation but also a part of life which people would spend a long time with.
Currently, Carnavicom is making continuous efforts to produce LiDAR(Light Detection and Ranging), DCU(Domain Controll Unit) and WAVE communication devices as ICT technology is quickly expanding to the automobile industry and technologies for convenience and safety are emerging.

Business Area

1st category

■ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support - Traffic Enforcement - Parking Management

☐ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
- Multi Modal Information/Management - Bus Rapid Transit System/Solution - Pedestrian/ Disabled Support System

■ Electronic Payment
- Electronic Toll Collection - Electronic Parking Payment - Electronic Fare Payment

☐ Traffic Information Integration/Management
- Traffic Information Integration - Traffic Information Center Traffic Data Management

☐ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

■ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

☐ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

☐ Others ( )

2nd category

■ Hardware ■ Software ☐ SI ☐ Consulting ☐ Others ( )

Ongoing ITS project or R&D

Autonomous Car
- LiDAR sensor
- V2X(Vehicle to Everything) communication unit
- DCU for automotive sensor control
- ADAS

Automotive electronics
- Dashcam
- ETCS(Electronic Toll Collection System)
- Navigation

Marine-safety
- Marine navigation
- Maritime unmanned vessel technology
- e-Navigation service
- Distress location transmitter
- NVR for small vessel

CARNAVICOM Co., Ltd.

Others

Certification

- KS Q ISO 9001:2015 / ISO 9001:2015
- KS I ISO 14001:2015 / ISO 14001:2015
- IATF 16949:20116

Patent : 43 patents(LiDAR 24, V2X 3, Marine15, Others 1) registered including

- Road shape recognition and collision prevention LiDAR system
- LiDAR dashcam and object detection method
- Laser Transmitter Module and Devices
- Angle adjustable light beam optical system LiDAR sensor and its control method
- Communication device with integrated antenna for providing V2X communication and established in a vehicle

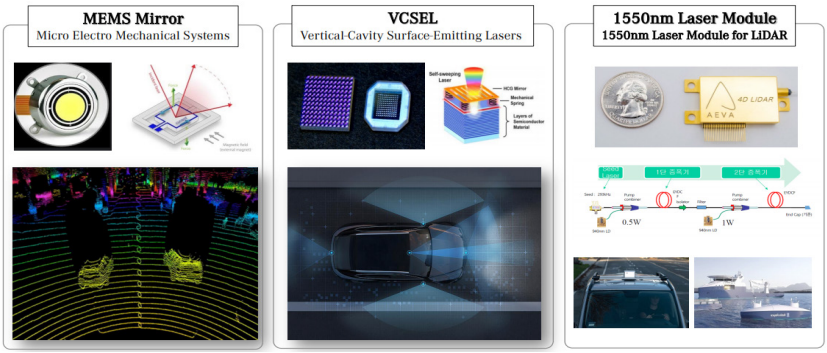
ITS Product & Technologies

LiDAR Sensor

Device to measure shape and distance of environment and objects using laser.

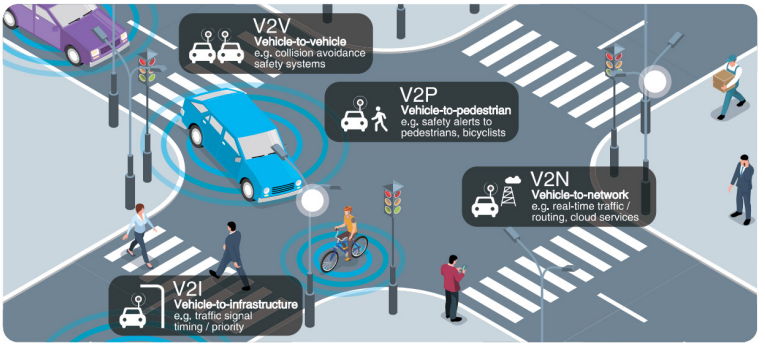
			
Model	**VL-R16**	**VL-R2**	**VL-R330**
Laser source	905nm PLD	905nm PLD	905nm PLD
Distance Range	up to 150m	up to 100m	up to 100m
FOV	145°(H) x 10°(V)	120°(H) x 3°(V)	330°(H)
Angular resolution	0.125°(H) x 0.625°(V)	0.25°(H) x 3°(V)	0.25°(H)
Frame rate	30Hz(Max)	15Hz(Max)	15Hz(Max)
Operating temperature	-40℃ ~ 85℃	-40℃ ~ 85℃	-40℃ ~ 85℃
Eye safety	Class 1	Class 1	Class 1
Readiness(SOP)	POC(Co-Testing with OE maker in Korea)	May. 2021	Sept. 2021

Development of LiDAR technology



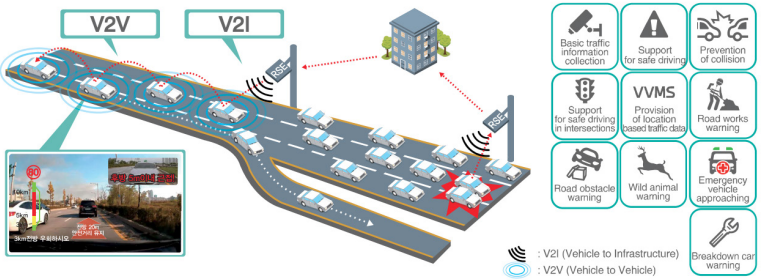
V2X Communication

V2X communication is a networking technology that supports mutual information transfer between Vehicle to Vehicle(V2V), Vehicle to Infrastructure(V2I), Vehicle to Network(V2N), and Vehicle to Pedestrian(V2P). It enables new value-added services such as vehicle safety improvement, efficient control, and internet linkage.

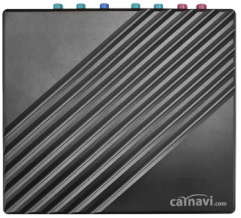


C-ITS(Cooperative-ITS) services based on V2X communication

C-ITS is a system providing vehicle safety information such as traffic conditions, sudden stop, and fallen objects to drivers in real time through V2X communication.



CW-500C1(V2X communication OBU)



Frequency Ragne	LTE : 2.4GHz, V2X : 5.855GHz ~ 5.925GHz
Standards	IEEE 802.11p, 1609.2, 1609.3, 1609.4, SAE J2735
CPU	NXP i.MX6Q processor
Memory	1Gb DDR3
Storage	(Int) 8Gb Flash Memory (Ext) micro SD(SDHC) support
Interface	10/100 Mbps Ethernet x1, RS232 x1, CAN2.0 A/B x 2
Input voltage	12V DC

CARNAVICOM Co., Ltd.

OBU (On Board Unit)

- DSRC based OBU in WAVE & ITS-G5
- Compliant with USDOT J2945/1, IEEE802.11p, 1609.x, J2735
- Support LTE (cat.4 / rel.10)

RSU (Road Side Unit)

- DSRC based RSU in C-ITS
- Compliant with USDOT RSE v4.1, IEEE802.11p, 1609.x, J2735
- Support LTE (cat.4 / rel.10)

Software 3rd service

- We support development for enabling WAVE standard software on hardware of customer.

Software Tool

- V2X performance measurement tool
- RSSI, PER (Distance, time), Mark on a map

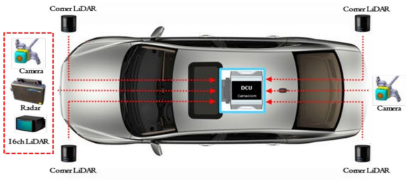
- Display V2X services on smart phone
- Support on WAVE & ITS-G5

DCU

Integrated control device for autonomous vehicles using deep learning-based sensor fusion technology.

- Control of AV based on recognition and judgement of surrounding using sensors such as LiDAR, Camera and RADAR

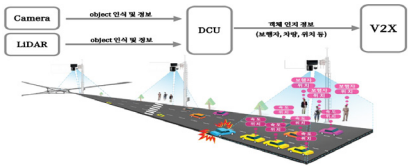
Fusion(Cam+LiDAR+RADAR) DCU



Sensor fusion DCU provides information for autonomous driving(L3) by accurately recognizing the surrounding environment by integrating Cameras, LiDARs, and RADARs

- Matching front image and point cloud
- Create side and rear point clouds
- High detection distance/recognition accuracy
- Alignment of rear image and point cloud

DCU with V2X



Real-time monitoring is possible by recognizing the surrounding environment using various sensors and interlocking with the control system using wireless communication (V2X)

- Sensor fusion (Camera + LiDAR + RADAR)
- Vehicle condition monitoring
- Linkable with RSU
- For Autonomous Vehicle
- Traffic situation control system

carnavi.com

Dashcam

Vehicle video recording device. Records event videos of driving, parking and moments before and after collision and provides information that helps identify the situation of the accident.

ETCS

Electronic toll collection system that makes it possible to pay tolls for highways through wireless communication in a car while driving. There are RF and IR type.

Dashcam

- Supply exclusive dashcam to Mercedes-Benz Korea, Strength in B2B market and PIO business
- Sony Exmor R STARVIS Sensor
- Front/Rear Full HD 2Ch
- Forward Vehicle Start Alert
- Lane Departure Warning System
- Dual Save
- Format Free
- Low Voltage Block
- Voice Guidance System
- Audio Recording
- PC Viewer Support
- External GPS Support(Option)

ETCS

- Supply exclusive ETCS to Mercedes-BenzKorea, developing next-generation ETCS

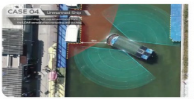
ETCS		
Model	MBH-1000	MBH-2000S
Applied Vehicle	Benz	Benz
Date of Cert.	2016.04	2018.04
Type	RF	RF

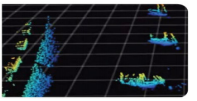
Marine safety

Marine Navigation

- Emergency distress signal transmission function
- Entry and departure report function
- Route search function(reflection of location information of islands, water depth, facilities, farms, dangerous goods)
- Warnings and alarms when operating in dangerous and prohibited areas
- Dangerous attitude automatic alarm transmission funtion

Maritime unmanned vessel technology





- Accurate recognition of facilities and obstacles in narrow waterways and berths
- Longer detection distance than land(0.3km ~ 1km)
- Applicable to autonoous ships and collision avoidance
- Securing visibility in sea fog or at night
- Automatic recognition of objects
- Multiple LiDAR/RADAR combinations are possible depending on the vessel size and purpose

General Information

Company Name : Carnavicom Co., Ltd.
Website : www.carnavi.com
Address : 13-25. Songdogwahak-ro 16beon-gil, Incheon, Republic of Korea

Contacts

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E-mail : twkim@carnavi.com

CEST Co., Ltd

Center for Embedded Software Technology

Company Overview

CEST has intensively developed the IT technology for Autonomous driving to the V2X environment to achieve the highest level of technology in the short-distance wireless communication field. We aim to provide service based on new technology to various fields such as V2X solutions for a safe traffic environment, drivers, and pedestrians. CEST is the only company to offer complete V2X solutions – Road-Side Units, On-Board Units, Hardware products, and Software stacks from PHY/MAC to the Application Layer.

Business Area

1st category

☐ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

☐ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
- Multi Modal Information/Management - Bus Rapid Transit System/Solution
- Pedestrian/Disabled Support System

☐ Electronic Payment
- Electronic Toll Collection - Electronic Parking Payment - Electronic Fare Payment

☐ Traffic Information Integration/Management
- Traffic Information Integration - Traffic Information Center Traffic Data Management

☐ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

■ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

☐ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

☐ Others ( )

2nd category

■ Hardware ■ Software ☐ SI ☐ Consulting ☐ Others ( )

Ongoing ITS project or R&D

We are joining an R&D project on Autonomous driving based public transport systems(KAIA), Establishment of PG based vehicle-infrastructure communication environment integrated control system(KIAPI), Pedestrian detector-RSU interlocking for demonstration evaluation of urban road autonomous driving(KIAPI) and V2X System building of Communication shaded area(especially Development V2X device for a car) and joining other R&D projects with public institutions, universities and companies.

Others

Certificate of patent registration
- Transmission power of road-side unit control method and apparatus.
- Communication system and method thereof

Patent application
- Traffic information managing system based on wave and method of managing traffic information using the same.
- Method and apparatus for generating crossroad information using electronic map.
- System for detecting of signal violation vehicle WAVE-based and detection method thereof
- Processing method and apparatus for intersection traffic information using electronic map.

Etc
- Certificate of Venture company.
- Certificate of corporate research institute.
- Pass the KOREA Plugtest(OBU, RSU).
- Installed road-side unit in the tunnel(Technopolis-ro) for the first time in Korea.

ITS Product & Technologies

V2X communication products and services
- WAVE Stack technology
- V2X messages service via online
- Development and production of communication equipment(OBU, RSU) for WAVE/LTE, 5G communication
- Overall V2X communication performance measurement
- Scalability considerations for increasing the module

DSRC | OBU(VW400-BK)
- On board unit for V2X Communication
- Frequency Bands: 5855-5925 MHz
- Channel Bandwidth: 10MHz
- Data rate: 3, 4.5, 6, 9, 12, 18, 27Mbps
- Modulation:BPSK/QPSK/16QAM/ 64QAM OFDM
- Transmit Power class: C(Max. Trans. Power under 100mW, EIRP under 33dBm)
- Standards Conformance: IEEE 802.11p, IEEE 1609.2/3/4 -2016, SAE J2735-2020
- Temperature range: -40°C ~ +70°C

CEST Co., Ltd

DSRC | RSU(VW400-RSU)

- Road side unit for V2X Communication
- Frequency Bands: 5855-5925 MHz
- Channel Bandwidth: 10MHz
- Data rate: 3, 4.5, 6, 9, 12, 18, 27Mbps
- Modulation: BPSK/QPSK/16QAM/64QAM OFDM
- Transmit Power class: C(Max. Trans. Power under 100mW, EIRP under 33dBm)
- Standards Conformance: IEEE 802.11p, IEEE 1609.2/3/4 -2016, SAE J2735-2020
- Temperature range: -40°C ~ +70°C

Online V2X Services

- It can communicate V2X messages via Online
- Online V2X Services that do not require road-side unit products and can receive C-ITS service messages.
- Only necessary message services can be selected and used, and flexible services such as adding and changing messages can be used during the service.
- Rapid maintenance without the need for field visits.

Technologies

Connected automated driving technology (V2X platform)

- Development of WAVE Stack essential for V2X System.
- Product and development V2X Communication device for WAVE/LTE and 5G
- High Accurate Positioning system using WAVE/LTE and 5G communication
- Real-time monitoring and server engine technology for communication devices and services.
- Traffic situation monitoring based on HD-MAP
- Easy-format interface development to on-board-unit for customer

Online V2X Services

- Receive C-ITS service message from Virtual RSU(Online)
- Create an easy testing environment online.
- It is possible to build a convenient C-ITS services environment that can save time and money.
- On-site visits are not required for maintenance, Quick troubleshooting, and technical support.

General Information

Company Name : CEST Co., Ltd
Website : www.cest.co.kr
Address : #403, #404, #405, #408 IT Convergence building 47, Gyeongdae-ro 17-gil, Buk-gu, Daegu, Republic of Korea

Contacts

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E-mail : sdwoo@cest.co.kr

Chemtronics

CHEMTRONICS

Company Overview

CHEMTRONICS has focused on the development of new technologies through expanding the R&D sector to automotive electronics and communications and we are about to develop products which can compete with those made by global market leaders.
The development of V2X (DSRC/C-V2X) technologies, which are core parts in future automotive road environments for safety and automated driving, is a result of our willingness to face and overcome challenges and endless technological development and will serve as the starting point of our development roadmap to be a leading player in the industry of the future.

Business Area

1st category

☐ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic - Enforcement - Parking Management

☐ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
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☐ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

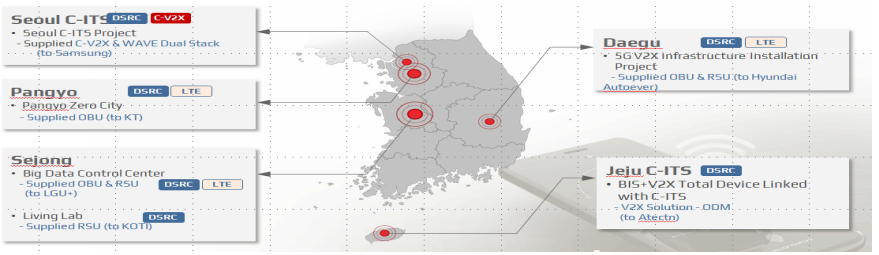
☐ Others ( )

2nd category

■ Hardware ■ Software ☐ SI ☐ Consulting ☐ Others ( )

Ongoing ITS project or R&D

Business

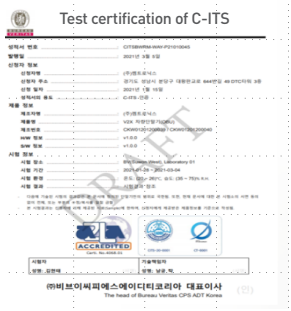


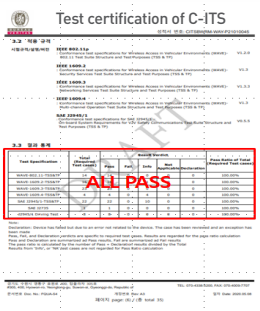
Chemtronics

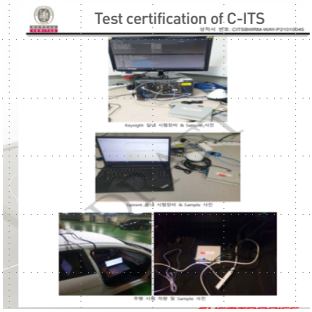
Others

Verifications

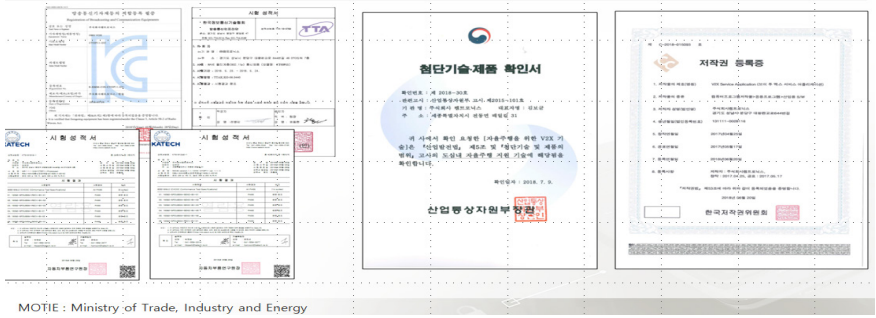
- **Essential V2X certifications for Korea C-ITS officially issued from ITS Korea Express**
  - 802.11p, 1609.2/3/4 , J2945, J2735 verification completed (by BV Korea)







- **KC certification and related reports, High technology product certification recognized by MOTIE**
  - Completion of technical copyright registration for V2X C-ITS service and application (V2V / V2I)



ITS Product & Technologies

Product Offerings

Products

RSU Comm. Part	OBU(Gen1)	V2X Module
		 [Gen1] [Gen2]
▪ DSRC + LTE Supported ▪ IEEE 802.11p/ IEEE 1609.X	▪ DSRC+LTE Supported ▪ IEEE 802.11p/IEEE 1609.X	▪ IEEE 802.11p Compatible ▪ Transceiver, Modem integrated(Gen2)
RSU Controller	**OBU(Gen2)**	**Smart Antenna**
		
▪ ARM Cortex-A8, 1GHz(DDR3L-512MB) ▪ Ethernet, RS-232C, RS-485/422	▪ DSRC+C/V2X Supported ▪ IEEE 802.11p/IEEE 1609.X ▪ 3GPP Release 14	▪ DSRC+LTE+Wifi+BT + Broadcasting all in one

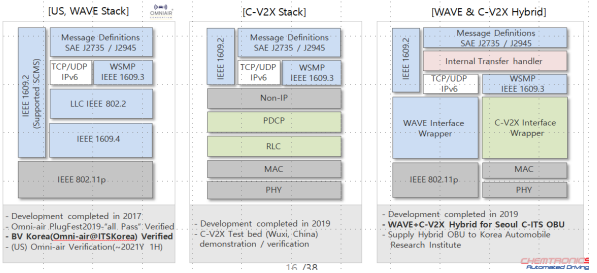
CHEMTRONICS

Technologies

Software Stack

Supply all V2X stacks (self-development): First in Korea

Own self-developed V2X Software Stack "WAVE & C-V2X"



Applications

Category	Chemtronics	CSAE (China Standard)	SAE J2945	3GPP TR 22.885 V14.0.0
Vehicle Basic Safety	Forward Crash Warning (FCW)	Forward Collision Warning (FCW)	Forward Crash Warning (FCW)	Forward Crash Warning (FCW)
	Intersection Movement Assist (IMA)	Intersection Collision Warning (ICW)	Intersection Movement Assist (IMA)	IMA at a Blind Intersection
	Left Turn Assist (LTA)	Left Turn Assist (LTA)	Left Turn Assist (LTA)	Left Turn Assist (LTA)
	Blind Spot Warning/Lane Change Warning (BSW/LCW)	Blind Spot Warning/Lane Change Warning (BSW/LCW)	Blind Spot Warning/Lane Change Warning (BSW/LCW)	-
	Emergency Electronic Brake Lights (EEBL)	Emergency Brake Warning (EBW)	Emergency Electronic Brake Lights (EEBL)	-
	Control Loss Warning (CLW)	Control Loss Warning (CLW)	Control Loss Warning (CLW)	Control Loss Warning (CLW)
Basic Information	Location Based Vehicle Data Collection	In-Vehicle Signage (IVS)	-	-
	Location Based Traffic Information Provision	Speed Limit Warning (SLW)	-	-
Safety Driving Support	Hazardous Location Notification	Hazardous Location Warning (HLW)	-	Road Hazard Warning
	Road Feature and Weather Notification	-	-	-
Intersection Safety Support	Road Work Zone Warning	-	-	Road Works Warning
	Signalized Intersection Violation Warning	Red Light Violation Warning (RLVW)	-	-
	Intersection Right Turn Conflict Warning	-	-	-
Public Transportation	Transit Vehicle Operation Management	-	-	-
	School Bus Warning System	-	-	-
Pedestrian Care	School and Silver Zone Warning	-	-	-
	Pedestrian Collision Warning	Vulnerable Road User Collision Warning (VRUCW)	-	Vulnerable User Safety/ at a Blind Intersection
Accident Alert	Collision Prevention Support	-	-	-
	Emergency Approaching Alert	Emergency Vehicle Warning (EVW)	-	Emergency Vehicle Alert (EVA)
	Vehicle SOS Application	Abnormal Vehicle Warning (AVW)	-	Emergency Stop
Payment	Toll Collection	Vehicle Near-Field Payment (VNFP)	-	-
Other Functions		Do Not Pass Warning (DNPW)	-	Do Not Pass Warning (DNPW)
		Green Light Optimal Speed Advisory (GLOSA)	-	-
		Traffic Jam Warning (TJW)	-	Traffic flow control/Queue warning

In-house V2X stack

Supported US, EU and 3GPP Standards

Interoperability Testing

- Omniair 2019 Plugfest Tested
  "IEEE 802.11p/1609.2/3/4"
- KOREA/CHINA/US
  SAE J 2735

OMNIAIR CONSORTIUM

General Information

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DAEBO COMMUNICATION & SYSTEMS

DAEBO COMMUNICATION & SYSTEMS CO., LTD.

Company Overview

DBCS is specialized in traffic IT service. It was established in 1996 for efficient operation and enhancement of IT system installed for the convenient and safe use of highways. We are contributing to the development of national industries and improvement of national life through the sustainable development of techniques, fostering of talents and innovation activities, and etc. And we provide total services throughout the traffic IT field from designing the traffic systems of national roads and municipality roads, as well as highways to the establishment, operation, and management of them.

Business Area

1st category

■ Traffic Management
- Traffic Signal/Control · Incident Management · Traffic Information · Safe-driving Support · Traffic Enforcement · Parking Management

■ Public Transportation
- Bus Information/ Management System · Public Transportation Information/Management
- Multi Modal Information/Management · Bus Rapid Transit System/Solution · Pedestrian/Disabled Support System

■ Electronic Payment
- Electronic Toll Collection · Electronic Parking Payment · Electronic Fare Payment

■ Traffic Information Integration/Management
- Traffic Information Integration - Traffic Information Center Traffic Data Management

☐ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

■ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

■ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

■ Others (Smart Tolling, C-ITS, VES, DSRC, VDS)

2nd category

■ Hardware ■ Software ■ SI ■ Consulting ☐ Others ( )

Ongoing ITS project or R&D

Project : C-ITS/ hipass [ETCS]/ DSRC Traffic Data Collection System/ Maintenance ITS BIS, BMS/ Image-based Intelligent Transportation System/ AVI/ UTIS

R&D : Multi-functional CCTV/ Smart Tolling System/ High Speed Track Measurement System for Railways

Others

Certification

- ISO9001:2008, ISO/IEC 20000, 27001
- CMI(Capability Maturity Model Integration) Level.3
- Non-stop, Multi-lane ETCS Performance Test(Smart Tolling)
- Qualification as the Outstanding Company for Service Quality from MKE(Ministry of Knowledge Economy)

Technology Ranking

- Ranked 2nd (148M$) among about 9,000 IT companies in Korea.

(million $ unit)

Technology Ranking on IT System Construction Ability in 2018

Ranking	Company	Amount
1	KDN	163
2	DBCS	148
3	SK TNS	122
4	GS Neotek	137
5	F2 Telecom	119
6	GS ENC	106
7	HDC I-Controls	85
8	SKT	84
9	KT Service(South)	82
10	Global Telecom	81

Patents

- Method for Detecting Lane in Toll Collection Apparatus based on Multi-lane
- Apparatus for Detecting Axle and Method Thereof
- Apparatus for Displaying Traffic Information and Control Method Thereof

*Obtaining about 90 patents related to ITS Technology

Awards

- Achievement Award for a Maintenance Work of Merit from KEC(Korea Expressway Co.)
- Korea National Quality Award (Presidential Prize)
- The Highest Standing Award (Prime Minister's Award)

DAEBO COMMUNICATION & SYSTEMS

ITS Product & Technologies

Products & Technologies

Hipass(ETCS)

DAEBO implemented about 600 ETCS lanes with the highest market share in Korea. Not only do we have the total solutions for ETCS, but also provide the efficient and optimized services. We've provided a consultation for the implementation to many foreign countries such as Malaysia, Indonesia, Iran, and etc.

Solution	Specification	Solution	Specification
Antenna	▪ IR: 850nm ▪ RF: 5.8Ghz	OBU	▪ IR: 850nm ▪ RF: 5.8Ghz
VES	▪ 2 megapixel ▪ CMOS Sensor	Smart Card	▪ ISO7816 ▪ ISO14443A, B
Vehicle Detector	▪ Range: 3~7m ▪ Object: Ø30mm	DFS	▪ 4*8 LED Module ▪ RS-422 Interface
LCS	▪ DSRC Control Unit ▪ TCP/IP Interface to Server		

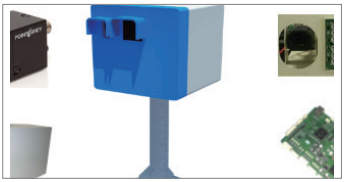
Smart Toiling

In addition to the successful implementation of hipass by DAEBO in Korea, we've developed the advanced ETCS, Smart Tolling, which guarantees traffic free flow of smart highway by collecting tolls from vehicles in the multi-lanes. Smart Tolling yields the better benefits than the ETCS in terms of the environment, the individual and social economy.

C-ITS(Cooperative-ITS)

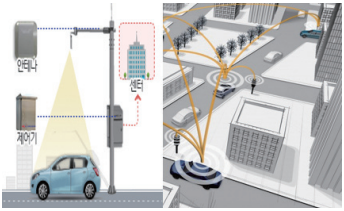
C-ITS, advanced intelligent transport system, is a technology, utilizing a V2I and V2V communication system that enables to communicate among vehicles. C-ITS will provide new service for road users, bring major social and economic benefits and values, and lead to greater traffic efficiency and safety. DAEBO is the initial company to develop and implement C-ITS in Korea and is expected to open the new ITS paradigm in the near future.

DAEBO COMMUNICATION & SYSTEMS CO. LTD.



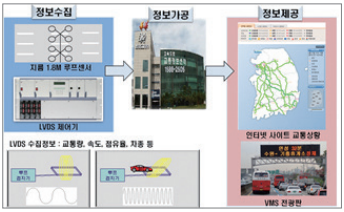
VES(Vehicle Enforcement System)

VES is required for TCS, ETCS and Smart Tolling in order to collect tolls from drivers efficiently and completely. Also, it prevents illegal activities that occur when collecting tolls. VES consists of Lens, controller, lightening, and etc., and we provide the total VES solutions with the highest performance.



DSRC(Dedicated Short Range Communication)

DSRC is a wireless communication technologydesigned to allow automobiles in ITS to communicate with other automobiles or infra technology.Itcollects real-time traffic information and provides it, processed by a traffic center to drivers through DSRC communication between RSE installed on the roadside and vehicles equipped with OBU.



VDS(Vehicle Detection System)

VDS detects real-time information such as traffic volume, speed, and etc. of vehicles through loopsensors installed on the roads. We install facilities on the roads to collect data and implement control center for the data processing in order to provide useful and informative traffic information to users in various ways.

General Information

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Contacts

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DAEYEONG UBITEC Co., Ltd.

DAEYEONG UBITEC Co.,LTD.

Company Overview

DAEYEONG UBITEC was established in March 1988, as a professional engineering company in Korea. Since then, we have been contributing an important part in ICT infrastructure building in and outside of the country by providing our clients with top quality engineering consulting services namely Planning, Feasibility Study, Design, Analysis, Supervision, Evaluation of ICT projects.
Based on our accumulated experience and technology in the domain of Telecommunication Network, ITS, BRT, GIS, e-Government, e-Procurement, U-city, etc., our customized approach combined with our passion for customer value has enabled us to sustain our growth and lead the Korean IT service industry for more than 24 years. Daeyeong Ubitec is on its way to becoming the world's leading consulting firm in ICT field. We will keep striving to provide quality expert services and to satisfy our customers' needs.

Business Area

1st category

■ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

■ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
- Multi Modal Information/Management - Bus Rapid Transit System/Solution
- Pedestrian/Disabled Support System

■ Electronic Payment
- Electronic Toll Collection - Electronic Parking Payment - Electronic Fare Payment

■ Traffic Information Integration/Management
- Traffic Information Integration - Traffic Information Center Traffic Data Management

□ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

■ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

□ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

□ Others ( )

2nd category

■ Hardware ■ Software ■ SI ■ Consulting □ Others ( )

Ongoing ITS project or R&D

Name of Project	Name of Authority	Project Period
Overseas		
Intelligent Transport System Consultancy Services in Kazakhstan (CSP-3)	ADB (Asian Development Bank)	12.01.02~12.07.01
Consultancy Services for Development of Intelligent Transportation System (ITS) in Kazakhstan	ADB (Asian Development Bank)	11.12.29~12.06.21
Public Security Innovation Project in the Republic of Angola	ANP(Angola National Police)	11.11.30~14.05.31
Feasibility Study for Establishment of Intelligent Transportation System in the Addis Ababa in Ethiopia	KENCA (Korea Engineering & Consulting Association)	11.09.01~11.12.31
Feasibility Study for Establishment of Intelligent Transportation System in the Addis Ababa in Ethiopia	KENCA (Korea Engineering & Consulting Association)	11.09.01~11.12.31
Technical Assistance of Public Transport Information and Communication Technology in Mongolia	ADB (Asian Development Bank)	11.06.15~11.12.15
Feasibility Study for Construction of ITS Project in the Dominican Republic	Korea Exim Bank	10.06.08~10.10.13
Consulting Service for Ulaanbaatar ITS Project in Mongolia	Ulaanbaatar City Government	07.12.07~10.06.30
Consulting Service for Toll Road ITS FS Project in Indonesia	KIPA/LG CNS	07.04.01~07.06.30
Establishment of ITS & Bus Information Management System Project in Iran	KENCA (Korea Engineering & Consulting Association)	07.03.08~07.11.30
F/S for Establishment of Traffic Signal System in Argentina	KOPIA (Korea Plant Industries Association)	06.12.01~07.04.30
Domestic		
Supervision on Installation of National Road ITS in Busan in 2011	Korea Institute of Construction Technology	11.11.28~11.12.30
Detail Design for Construction of Digital Traffic Management System in 2011	Korea Expressway Corporation	11.09.02~11.10.31
2nd Detail Design for Construction of Infrastructure U-Traffic Information Telecommunication Network-based	Seoul Metropolitan Government	11.08.02~11.09.20
Responsible Supervision on Construction of ITS in Mokpo-Gwangyang Line (1st)	Honam District of Korea Expressway Corporation	11.07.05~11.12.31
Supervision on Construction of TTMS in Jeonju-Gwangyang Line (2nd)	Honam District of Korea Expressway Corporation	11.01.18~11.06.20
Detail Design on Digital Traffic Management System FTMS, TTMS in 2011	Korea Expressway Corporation	11.03.11~11.11.15
Responsible Supervision on Construction of ITS in Iksan City (4th)	Iksan-si, Jeollabuk-do	10.12.09~11.05.23
Responsible Supervision on Construction of BIS (phase 3)	Seoul Metropolitan Government	10.03.01~11.02.20
Detail Design on Re-Construction of ITS Infrastructure in National road No. 1 (Public Administration-Daejeon Yooseong city)	Korea Expressway Corporation	10.10.27~10.11.05
Responsible Supervision on Construction of BIS (phase 2)	Seoul Metropolitan Government	09.10.16~10.02.28

DAEYEONG UBITEC Co., Ltd.

Others

Certification

- Overseas Construction Business - Int'l Organization Procurement
- Registration of Electricity Business - InfoSystem Supervision &ICT Engineering Business
- KS Q ISO 9001/ ISO 14001 - INNO-BIZ / MAIN-BIZ

Patent

- Certificate of Appreciation (Indonesia-MCIT), 2010.12.13
- Award of Honour (Mongolia – UCG), 2010.06.21
- Presidential Commendation, 2008.10.19
- Minister of Construction and Transportation Commendation, 2006.07.19
- Korea Rail Network Authority Commendation, 2008.12.23
- Chairman of Korea Communication Commission, 2010.10.18

ITS Product & Technologies

Product Offerings

Intelligent Transportation System(ITS)

- Integration of traffic management center system (H/W and S/W)
- Development of S/W related to ITS
- Design / Supervision for ITS in expressway
- Toll Collection System (TCS)
- Design / Supervision for Transportation Management System (TMS)
- Operation and Maintenance (O&M) of Traffic Lights
- On-line traffic survey and data processin

DAEYEONG UBITEC Co.,LTD.

Technologies

Category	Items	Registration No.	Established Date	Expired Date
Patent	Metho D For Converting Compressed Moving Pictures In an Image	10-0312411	1988-11-18	2018-11-18
Patent	A Restoration Method Using K-shortest Control Paths in ATM	10-0411247	2001-12-26	2021-12-26
Patent	Recording Device of Multiplex Data for Vehicle	10-0943410	2009-10-27	2029-10-27
Patent	High Linearity RF Mixer Applicable to Zigbee System	10-0966581	2009-12-01	2029-12-01
Patent	Facility for Protecting Optical Cable used in Information and Communications	10-0959409	2010-01-28	2030-01-28
Patent	Apparatus for Connecting Underground Tunnel CCTV Camera and Ground Monitor for Information and Communications	10-0977307	2010-01-28	2030-01-28
Patent	Rotary Joint Apparatus Having Multiple Channels for Transferring Data and Electric Current	10-0988549	2010-05-04	2030-05-04
Patent	Apparatus for Guiding Train Operation Information Using Mobile Communication Network	10-1214929	2012-05-04	2032-05-04

General Information

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Easy Traffic Technologies, Co., Ltd.

Company Overview

EasyTrafficTechnology is a company that makes a safer and more convenient city by freeing the world from traffic lights using good technology. Here's what we did for this:

- Using 4G LTE technology, a wireless LTE modem for signal equipment was developed to free the communication environment between the control center and the controller.
- Using a smartphone app and center-based remote control technology, an emergency vehicle priority signal control system was developed to allow emergency vehicles to freely pass through signal intersections.
- Using AI camera technology, a real-time sensitive control system was developed to reduce congestion in the city.

Business Area

1st category

■ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

☐ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
- Multi Modal Information/Management - Bus Rapid Transit System/Solution
- Pedestrian/Disabled Support System

☐ Electronic Payment
- Electronic Toll Collection - Electronic Parking Payment - Electronic Fare Payment

☐ Traffic Information Integration/Management
- Traffic Information Integration - Traffic Information Center Traffic Data Management

☐ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

☐ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

☐ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

☐ Others ( )

2nd category

☐ Hardware ■ Software ☐ SI ☐ Consulting ☐ Others ( )

Ongoing ITS project or R&D

R&D
- With Korea National Police Agency, "Development of AI signal control system in autonomous driving environment" Project
- With Korea National Police Agency, "Development of AI Signal Control System in Congested Road Network" Project

Others

On going ITS Project

- "Development of Smart Emergency Vehicle Priority Traffic Signal Control System in Gangneng-City ITS" Project
- "Development of automatic traffic pattern generation SW for traffic signal control in ITS" Project
- "Development of AI-Camera based traffic respinsive control system in ITS" Project

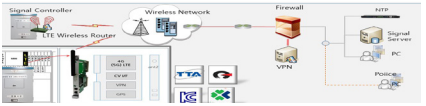
ITS Product & Technologies

Product Offerings

AI camera-based signal control system

- A ahaptive service that automatically adjusts the signal time according to the traffic volume in each direction by installing the latest AI-camera
- about 10~15% reduction in delay time

Wireless communication device for signal controller



- As a signal controller-only device that connects the communication between the center and the signal controller by wireless LTE, it greatly improves the difficulties of maintenance and repair of faulty lines that occur in the existing telephone/wired method.

Emergency vehicle priority signal controlled by the control center

- A system that controls the priority signal remotely by tracking the location and route of the smartphone mounted on the emergency vehicle at the control center
- about 40~60% reduction in travel time of emergency vehicle

Our Refrence

Technologies

2013
- Development of wireless communication device for traffic signals and integrated wired and wireless signal system for the first time in Korea
- National Police Agency signal controller wireless communication device standard establishment + Contribute to vitalization of domestic signal market

2015
- Developed Korea's first center-type emergency vehicle priority signal system
- 50% reduction in Golden Time + Presidential Award + Creation of a new market

2017
- Complete wirelessization of Seoul's traffic signal system, the largest in Korea
- Reduced communication/maintenance fee by 40% and urban congestion by reducing the failure rate to zero

2021
- Developed the first AI camera-based signal control system in Korea
- Reduce intersection congestion, create new markets

General Information

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EB CARD

EB CARD

Company Overview

EB CARD is a global Automatic Fare Collection System(AFCS) providing management, consulting, technology service, system installation and company operation. EB CARD is one of the LOTTE pre-paid Card Affiliated company with priority given to Seoul-metropolitan area. The LOTTE Pre-paid Card Affiliates is a digital payment platform that provides fare collection system and customer service across multiple transit authorities and modes of transportation. Combining unique service experience, comprehensive capabilities across all of the industries and business and extensive micro payment, EB CARD collaborates with clients to help them operate high-performance businesses and governments. EB CARD has an abundance of excellent specialist in the field of pre-paid payment business/ transit payment service/ pre-paid, credit, online, mobile payment system. We provides cutting-edge system to ensure customer convenience based on optimal and comprehensive technologies as a reputable and reliable supplier.

Business Area

1st category

■ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

■ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
- Multi Modal Information/Management - Bus Rapid Transit System/Solution
- Pedestrian/Disabled Support System

■ Electronic Payment
- Electronic Toll Collection - Electronic Parking Payment - Electronic Fare Payment

■ Traffic Information Integration/Management
- Traffic Information Integration - Traffic Information Center Traffic Data Management

☐ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

■ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

☐ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

☐ Others ( )

2nd category

■ Hardware ■ Software ■ SI ■ Consulting ■ Others (Mobile Payment, Wearable pre-paid card)

Ongoing ITS project or R&D

- Project of Automatic Fare Collection(AFC) system in Ferry Transportation in Korea
- L-PAY (LOTTE global payments platform)
- Consulting and Proposal of Automatic Fare Collection(AFC) system of Peru /THE KOREA TRANSPORT INSTITUTE

- Proposal with consortium in Vietnam and Malaysia for Automatic Fare Collection(AFC) system
- Development of Mobile Payment Application including Smart-watch.

Others

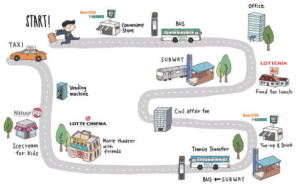
Certification
- KS Q ISO 9001:2009 / ISO 9001:2008
- KS I ISO 14001:2009 / ISO 14001:2004

Patent
- Automatic Traffic Card System Charging Mileage Points
- Method for managing a stolen or lost card and card reader therefor
- System for Managing for Non-payment Fees of Food Waste and Method therefor
- Traffic Law Violation Enforcement System
- Apparatus for charging a transportation card and method therefor
- Apparatus for compress credit card number and method of the same

ITS Product & Technologies

Pre-paid Payment Business

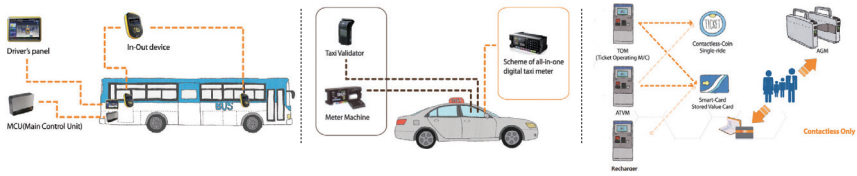
Domestic & international AFCS Business,
NFC Business and U-city Business, Smart card



Pre-paid/Credit/Online/Mobile payment

Transit Payment Service

Payment for bus, taxi, subway and supply related equipment



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Ericsson-LG

Company Overview

<About Ericsson-LG>

Ericsson-LG (formerly LG-Ericsson) was launched as a joint venture between Ericsson and LG Electronics, in July 2010. The company is a leader in the Korean telecommunication industry, providing customized solutions for operators and corporations, with a portfolio ranging from mobile, fixed network infrastructure and enterprise.

<About Ericsson>

Ericsson is the driving force behind the Networked Society – a world leader in communications technology and services. Our long-term relationships with every major telecom operator in the world allow people, business and society to fulfill their potential and create a more sustainable future.

With approximately 115,000 professionals and customers in 180 countries, we combine global scale with technology and services leadership. We support networks that connect more than 2.5 billion subscribers. Forty percent of the world's mobile traffic is carried over Ericsson networks. And our investments in research and development ensure that our solutions – and our customers – stay in front.

Founded in 1876, Ericsson has its headquarters in Stockholm, Sweden. Net sales in 2014 were SEK 228.0 billion (USD 33.1 billion). Ericsson is listed on NASDAQ OMX stock exchange in Stockholm and the NASDAQ in New York.

Business Area

1st category

■ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

■ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
- Multi Modal Information/Management - Bus Rapid Transit System/Solution
- Pedestrian/Disabled Support System

■ Electronic Payment
- Electronic Toll Collection - Electronic Parking Payment - Electronic Fare Payment

■ Traffic Information Integration/Management
- Traffic Information Integration - Traffic Information Center Traffic Data Management

■ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

■ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

■ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

☐ Others ( )

2nd category

■ Hardware ■ Software ■ SI ■ Consulting ■ Others (Managed Services)

ITS Product & Technologies

Communication technology and services are crucial parts of C-ITC, in this area, Ericsson has leading competence and market traction. Ericsson has been leading or acting in ITS related research projects like CoCar, CoCarX, Converge, HeERO, the Swedish roadmap for a connected and cooperative transport system, ELVIIS. Ericsson also invests heavily in research in relevant areas for ITS, such as communication technologies for the Networked Society, including Transport specific applications. Among CITS domains, Ericsson offerings are focusing on ICT Infrastructure, Traffic Management and Transport Transactions.

ICT Infrastructure

The rapidly growing demand for communication and connected services for road, rail and public transport requires a strong and future-proof ICT Infrastructure. Ericsson delivers and operates ICT Infrastructure and services for road, rail and public transport based on our leading products and services for telecommunication.

Connected Roads and Traffic for safety and more efficiency. Connected Public Transport for more attractiveness.

- Multi-service Backbone Networks
- Railway Telecommunications
- Road/Rail surveillance
- Tunnel/Metro Coverage
- Onboard Connectivity

Traffic Management

Road, rail and public transport is facing growing challenges regarding safety, efficiency and sustainability. By connecting vehicles, transport infrastructure, travelers and goods - new possibilities arise to manage traffic in a more efficient and safe way. Ericsson solutions enable a truly cooperative and intelligent transport system – based on our leading products and services for telecommunication.

Connected traffic can be managed more efficiently.

- Traffic Management Services
- Connected Traffic Cloud
- Connected Traffic Analytics

Transport Transactions

Ericsson creates better conditions for sustainable travel by supporting new business models and partnerships for travel service providers and giving the customers one-stop access to a range of travel services such as public transportation, car sharing, car rentals, bike rentals and taxi.

Smart fees and payment enabling multimodal transport

- Road user charging
- Fear collection
- Passenger information

General Information

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Website : www.ericssonlg.com
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Contacts

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eSSys Co., Ltd.

eSSys Co., Ltd.

Company Overview

eSSys vision is to become the global IT leader in Automotive Industry. Founded in the year of 2005, eSSys now reached the position of Korean Market Leader for Before Market DSRC OBE
eSSys is working on a joint venture project with leading ITS System Integrators of Korea for the realization of WAVE and Working close with Korean Express way corporation and a consortium member for the WAVE ETCS in Korea.
eSSys is the world best supplier for a global Information Technology component of Bluetooth and Wi-Fi modules & Telematics unit (e-Call, Cubis-T)
Lead by the Veterans of Automotive Industry, strictly following quality principles, and with tie up with International companies, eSSys will achieve its vision in the near future

Business Area

1st category

☐ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

☐ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
- Multi Modal Information/Management - Bus Rapid Transit System/Solution
- Pedestrian/Disabled Support System

■ Electronic Payment
- Electronic Toll Collection - Electronic Parking Payment - Electronic Fare Payment

☐ Traffic Information Integration/Management
- Traffic Information Integration - Traffic Information Center Traffic Data Management

☐ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

■ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

☐ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

■ Others (Telematics Unit for Safety, Bluetooth/WiFi for Automotive)

2nd category

■ Hardware ■ Software ☐ SI ■ Consulting ☐ Others ( )

Ongoing ITS project or R&D

- V2V, V2I Communication Solution using WAVE Technology
- ISRM OBE for Korea & China ETCS
- Road Side Equipment for Korea & China ETCS
- Bluetooth & WI-FI module for Automotive
- Telematics Unit for Safety & e-Call system Unit for EU

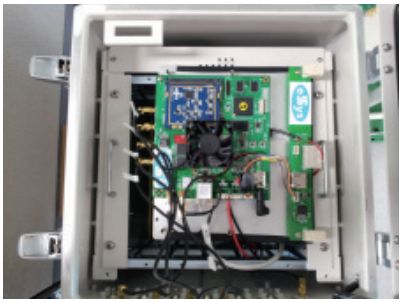
Others

- TS16949 / ISO9001 / ISO14000 / SQ (Supplier Quality) : Certified by Hyundai-Kia Motors / Inno-Biz Club
- Awarded with the Presidential Award for Best Company (2008)
- Awarded with the Best Venture Company of Korea (2008)

ITS Product & Technologies

V2V, V2I Communication using WAVE Technology

〈V2V, V2I 기반 도로 · 자동차 협업 서비스 예시도〉



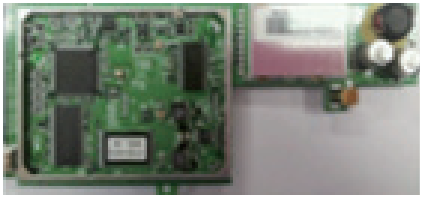
Wireless vehicular networks operating on the dedicated short-range Communications frequency bands are the key enabling technologies for the emerging market of intelligent transport system.

- ETCS OBE and RSE : Used for toll collection application.
- Safety OBE and RSE : Used for transferring safety messages between vehicles and between Vehicles and RSE.

eSSys Co., Ltd.

ITS Product & Technologies

ISRM OBE for Korea & China ETCS



Before Market In Side Room Mirror OBU (ISRM OBU) for DSRC Based Electronic Toll Collection System. This is an OBU for before market application which is preinstalled in car before sales to user. That is when a user want to buy a car, they can choose the before market OBU option and will be preinstalled in the car before been delivered to user. It is of much convenient to user that they don't need to install OBU by themselves.

OBE : It is used for electronic toll collection

Road Side Equipment for Korea & China ETCS

RSE stands for Road Side equipment. It provides a bidirectional short range communication with multiple OBE installed in the cars. The RSE controls the protocol, schedules the activation of the OBE, reads from or writes to the OBE, and assures message delivery and validity. RSE is typically, but not necessarily, installed at a fixed location on the roadway.

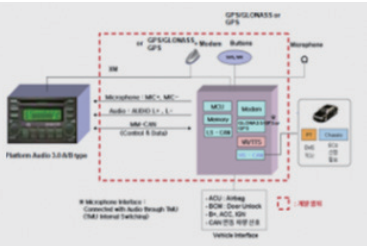
eSSys Co., Ltd.

Bluetooth & WI-Fi module for Automotive

Bluetooth and Wi-Fi Module for global AVN Application, eSSys is one of leading supplier of Bluetooth and Wi-Fi modules for Automotive Industry in Korea and across the globe.

Telematics Unit for Safety

e-Call system Unit for EU]



General Information

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Contacts

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ETRI

Company Overview

ETRI (Electronics and Telecommunications Research Institute) is the largest government funded research institute in Korea, which strives to advance science by means of formulating innovative ideas; developing new techniques; and training professional individuals in the area of information telecommunications to ultimately enhance social and economical aspects of the modern society.

Business Area

1st category

☐ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
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- Pedestrian/Disabled Support System

☐ Electronic Payment
- Electronic Toll Collection - Electronic Parking Payment - Electronic Fare Payment

☐ Traffic Information Integration/Management
- Traffic Information Integration - Traffic Information Center Traffic Data Management

☐ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

■ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

☐ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

☐ Others ( )

2nd category

■ Hardware ■ Software ☐ SI ☐ Consulting ☐ Others ( )

Ongoing ITS project or R&D

- SMART Highway

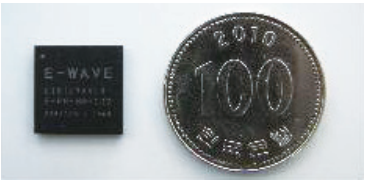
Others

WAVE Handover technology

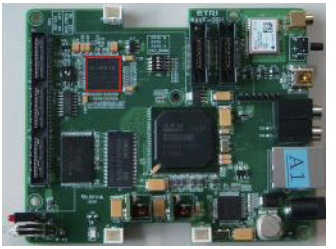
ITS Product & Technologies

- Development of WAVE chip
- Development of WAVE Communication module prototype
- Development of WAVE Software
- Development & Research on advanced vehicular communication technologies (Physical/MAC/Networking/Application Layers)

WAVE chip



WAVE Communication module prototype



General Information

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Phone (mobile) : 82-10-7175-3582
E-mail : hsoh5@etri.re.kr

Ettifos Co.

ETTIFOS

Company Overview

Ettifos is a 5G-focused V2X communication solutions provider founded in 2018. Our vision is to connect all entities in motion, creating a world with no accidents, net-zero emissions, and reliable autonomous vehicles for everyone.
Always keeping the user in mind, Ettifos continues to create innovative, reliable, and versatile solutions for 5G-connected mobility communication, applications in autonomous driving, and connected mobility-related data services.
Our latest products include Sirius (a 5G NR-V2X test platform compatible with 3GPP Rel 16 sidelink) and the Smartphone V2X Device (compatible with DSRC or LTE-V2X).

Business Area

1st category

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☐ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

■ Others ( )

2nd category

■ Hardware ■ Software ☐ SI ☐ Consulting ☐ Others ( )

Ongoing ITS project or R&D

Ongoing ITS Project

1. **Development of 5G NR-V2X communication technology for above level 4 autonomous driving services** (Led by Ministry of Science and ICT and Institute of Information & Communications Technology Planning & Evaluation)
2. **C-ITS Highway Pilot Project** (Led by Ministry of Land, Infrastructure and Transport and Korea Expressway Corporation)
3. **Development of connected platform technology based on V2X that can cope with external conditions (e.g. bad weather)** (Led by Ministry of Science and ICT and the National IT Industry Promotion Agency)

4. **Sensor sharing scenario test using 5G V2X** (Led by Ministry of Land, Infrastructure and Transport and Korea Expressway Corporation)

R&D

1. **Software-based 5G NR-V2X and 4G LTE-V2X Dual Mode Test Platform**
2. **Smartphone V2X Device Version 2.0**

ITS Product & Technologies

Product Offerings

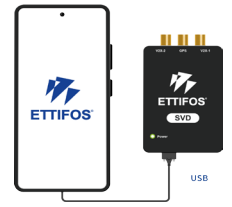
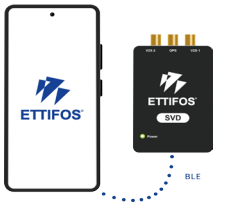
1. **Sirius (5G NR-V2X Test Platform)**
   An all-in-one 5G NR-V2X test platform that allows research developers and companies alike to carry out functional and performance testing, as well as rapid prototyping day-1 and advanced use cases to discover 5G NR sidelink technology's full potential.

Specifications

V2X radio	5G-NR sidelink
Frequency band	5.9 GHz ITS band
Bandwidth	10/20/40 MHz
Subcarrier spacing	15/30/60 kHz
Processor	Quad Cortez-A72, Quad Cortez-A53
OS	Linux
I/O	USB 3.0, USB 2.0, USB-C, Ethernet
Antenna	2 x NR-V2X, 1 x GPS
Power supply	9V DC
Dimension	TBD

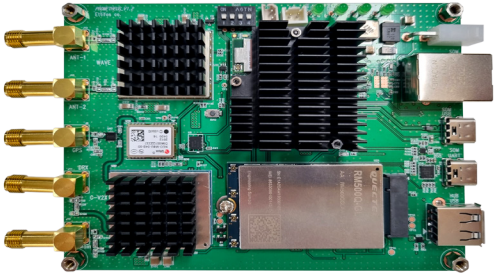
2. **Smartphone V2X Device (SVD)**
   A compact V2X module allowing users to receive V2X services in overlay form on their smartphones.

Specifications

	SVD Ver 1.0	SVD Ver 2.0
		
V2X radio	DSRC	DSRC
Smartphone connectivity	Wired (USB-C)	Wireless (BLE)
Processor	-	NXP i.MX8XL
OS	-	Linux
Power supply	5V DC	5V DC
Dimension	65 (W) x 25 (H) x 85 (D) mm	TBD

Ettifos Co.

3. V2X Development Kit



Develop your own applications using V2X technology with our Software Development Kit. Supports dual or single mode operation (DSRC and LTE-V2X).

We provide:

- SDK and API for user applications
- SAE J2735 messages (BSM, TIM, PVD, RSA, SPaT/MAP) with sample codes

The V2X development kit can be applied to an OBU or RSU (see below).

Specifications

Processor	NXP i.MX8M
RAM	1GB LPDDR4
OS	Linux
Connectivity	Wi-Fi/Bluetooth (Optional)
I/O	Ethernet / Debug (USB Micro-5P) / USB 2.0
Antenna	2 x LTE-V2X, 2 x DSRC, 1 x GPS
Power supply	12V DC
Dimension	127 (W) x 113 (H) mm

a. OBU

We provide:

- SDK and API for user applications
- SAE J2735 messages (BSM, TIM, PVD, RSA, SPaT/MAP) with sample codes

Specifications

Processor	NXP i.MX8M
RAM	1GB LPDDR4
OS	Linux
Connectivity	Wi-Fi/Bluetooth (Optional)
I/O	Ethernet / Debug (USB Micro-5P) / USB 2.0
Antenna	2 x LTE-V2X, 2 x DSRC, 1 x GPS
Power supply	12V DC
Dimension	140 (W) x 45 (H) x 130 (D) mm

ETTIFOS

b. RSU

We provide:

- SDK and API for user applications (Software customization support)
- Simple Network Management Protocol (SNMP) for management
- SAE J2735 messages (BSM, TIM, PVD, RSA, SPaT/MAP) with sample codes

Specifications

Processor	NXP i.MX8M
RAM	1GB LPDDR4
OS	Linux
Connectivity	Wi-Fi/Bluetooth (Optional)
I/O	Ethernet / Debug (USB Micro-5P) / USB 2.0
Antenna	2 x LTE-V2X, 2 x DSRC, 1 x GPS
Power supply	PoE (802.3at)
Dimension	TBD

ITS Product & Technologies

Technologies

1. 5G NR-V2X

- Software Defined Radio (SDR) L1/L2/L3 for vehicles and infrastructure
- V2X architecture will:
  - Be forward compatible
  - Provide scalable deployment scenarios
  - Be cost effective for infrastructure

2. C-ITS - DSRC and C-V2X

3. Software

- Protocol stacks
- Applications
- Device control managers
- Supports US and European V2X protocol stacks for both DSRC and C-V2X on application-specific devices, general-purpose PC, and mobile phones
- API and development tools that can handle V2X messages

General Information

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Eunsung.Trasys Co. Ltd.

Company Overview

(Derived Data-Driven Smart Control Systems) - Eunsung.Trasys Co.Ltd aims to establish a next-generation intelligent transportation system in preparation for autonomous driving. Eunsung will develop core technologies such as 'Lidar-based pedestrian automatic detection system' and 'GPS-based PM control system' and further establish next-generation smart city transformation and infrastructure by applying data integration technologies, visualization, and processing technologies that are accumulated away from existing IT infrastructure control.

Business Area

1st category

■ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

☐ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
- Multi Modal Information/Management - Bus Rapid Transit System/Solution
- Pedestrian/Disabled Support System

☐ Electronic Payment
- Electronic Toll Collection - Electronic Parking Payment - Electronic Fare Payment

☐ Traffic Information Integration/Management
- Traffic Information Integration - Traffic Information Center Traffic Data Management

☐ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

☐ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

☐ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

☐ Others ( )

2nd category

☐ Hardware ■ Software ☐ SI ☐ Consulting ☐ Others ( )

Ongoing ITS project or R&D

Lidar-based pedestrian automatic detection system

· **(Automatic detection of pedestrians)** Personal information protection is possible compared to CCTV, and recognition rate/perception speed is excellent due to low lighting/diary impact.

GPS-based PM control system

· **(Efficient control through walking data analysis)** Analysis of walking data provides optimal signal cycles to increase control efficiency to reduce congestion costs

Others

Patent

· Crosswalk safety pedestrian system with traffic lights / 10-1810662
· Cognitive reinforced traffic signal system / 10-2050492
· Vehicle message display device / 10-2025402
· Composite Signal Light / 10-2194543

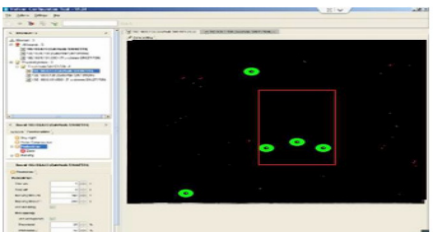
Certification

· Smart pedestrian crossing system and device and method / 10-2020-0009081
· Crosswalk detection method for recognizing pedestrian crossing intention / 10-2021-0552874

ITS Product & Technologies

Product Offerings



Eunsung.Trasys Co. Ltd.

Induction-response system method

Fully induction control

- Suitable for intersections with heavy traffic or where traffic volume prediction is difficult
- Sensors are installed in all directions at the intersection, and traffic signals in each direction are determined based on the collected information.

Half induction control

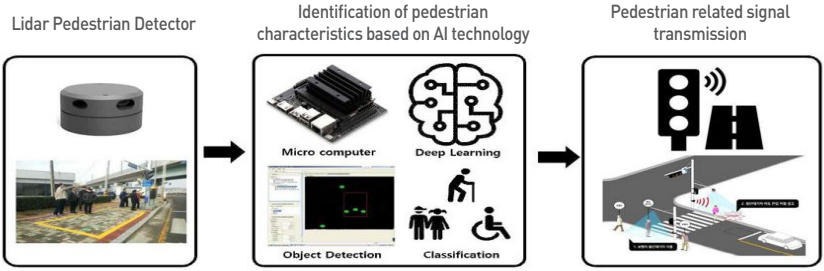
- Suitable for areas with low demand for sub-roads at intersections where main roads and sub-roads meet
- Eunsung guaranteed traffic volume on the main road with heavy traffic by installing sensors only on left-turn lanes

Traffic volume-density control

- Suitable for local roads with high access speed (independent intersections)
- After collecting traffic volume, signal queue length, and delay time, different maintenance times are applied for each intersection.
- Similar to fully sensitive control, but higher effect is expected

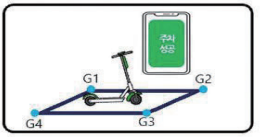
Technologies

Lidar-based pedestrian automatic detection system



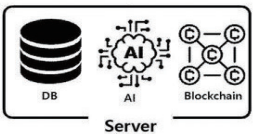
EunSung

GPS-based PM control system



Parking guidance in designated parking spaces

Establishing the right PM culture



GPS data collection during PM driving

Marketing and traffic control using route data

General Information

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Fax (office) : 82-61-983-0297
Phone (mobile) : 82-10-2016-6677
E-mail : eunsung21@nate.com

Gangneung City

Company Overview

Gangneung is the most popular tourist city in Korea with beautiful nature, traditional sites, and unique festivals.
After hosting the 2018 Winter Olympics, this city has been changing into an International Smart City. This city will be a role model of ITS which makes citizens and tourists satisfied with safe and convenient mobility. Gangneung is the only city harmonizing Human & Technology, Tradition & Modern Culture, and the Past & the Future.

Business Area

1st category

■ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic - Enforcement - Parking Management

■ Public Transportation
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- Multi Modal Information/Management - Bus Rapid Transit System/Solution - Pedestrian/ Disabled Support

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☐ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

☐ Others ( )

2nd category

■ Hardware ■ Software ■ SI ☐ Consulting ☐ Others ( )

Ongoing ITS project or R&D

Field system

Basic traffic information
- Traffic Monitoring CCTV / Variable Message Sign / DSRC-RSE / Incident management

Smart signal information
- Smart Intersection system / Roundabout Safety System / Emergency Vehicle Pre-emption

Parking information

Center system

- ITS operating system / Smart signal control system / Traffic analysis / Big data & visualization platform

Others

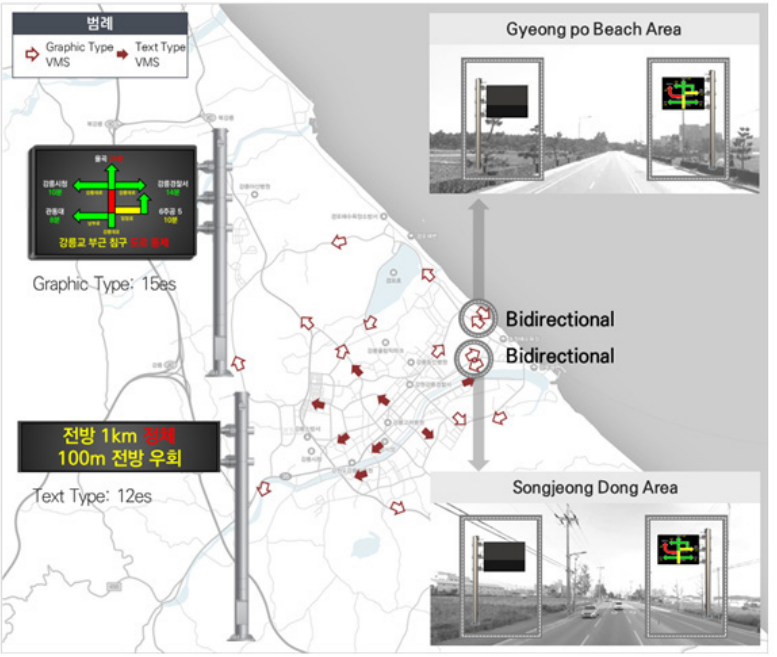
MaaS Platform for Gangneung Tourism

- Personal mobility sharing service
- Digital platform for store

ITS Product & Technologies

Traffic Information system

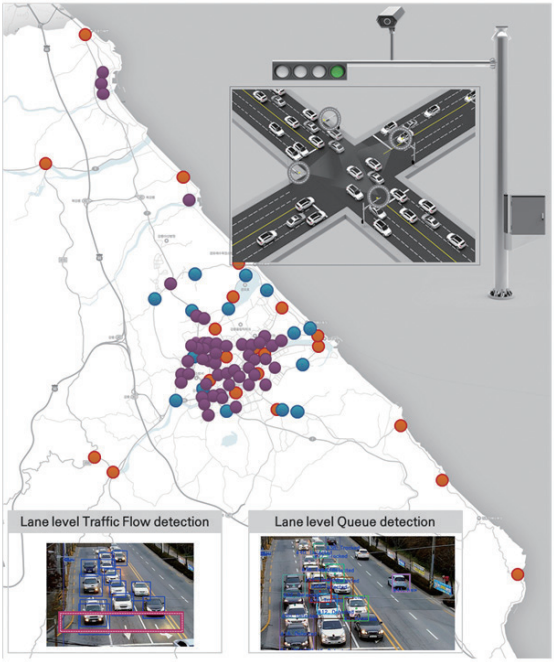
- variable Massage sign will install 27 sites in Gangneung city to providing traffic information.



Gangneung City

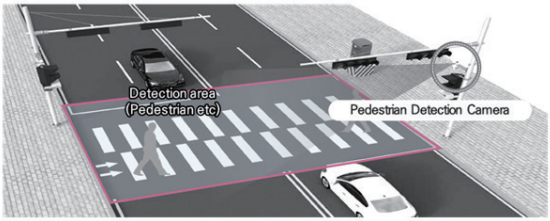
Smart Intersection System

- Deep learning based camera install 88 intersection in Gangneung city for collection real time traffic data



Pedestrian Detection System

- Install pedestrian detection camera at crosswalk in 90 sites.
- Using image processing algorithm, detection moving objects on crosswalk



강릉시 GANGNEUNG CITY

Technologies

Traffic information processing

Generates reliable integrated communication information through convergence and correction of collected traffic information-based data. Data collected through DSRC-RSE, A-AVI, etc. are processed through the process of misinformation determination, section traffic time calculation, and traffic speed calculation. This data is fused to compensate for missing data, and traffic information.

Smart Signal information processing

It calculates basic data for signal control through smart intersection data and provides a real-time responsive signal control environment. Data types include traffic volume, queue length, vehicle model, density, etc., and calculate improved saturation based on video solution and use it for real-time response signal control such as emergency vehicle support, remote control signal.

General Information

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GITSN Inc.

Business Area

1st category

☐ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
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☐ Others ( )

2nd category

■ Hardware ■ Software ☐ SI ☐ Consulting ☐ Others ( )

Ongoing ITS project or R&D

- Construction technology Innovation Project
- Traffic system efficiency project

Others

1. Intelligence based smart shopping method using RFID
2. Data storage method according to the size of ASN.1 file
3. System and data linkage device which interlocks data using ASN.1, Outgoing data encoding method through heterogeneous system using ASN.1 & data linkage method with heterogeneous system
4. Integrated processing terminal for traffic data using ASN.1, Integrated processing method for traffic data using ASN.1 & Controlling method of integrated processing terminal for traffic data using ASN.1
5. Intelligent energy saving type BIT (Bus Information Terminal)

ITS Product & Technologies

1. BIT (Bus Information Terminal) Total Solution

- Cutting edge functions such as information of bus location, bus service route search, bus stop search, and etc. installed
- Patent technology based energy reduction function installed – Green BIT
- It collects and processes real-time information of location, speed, and etc of running buses and provides relevant information to passengers, drivers, transportation companies, and person in charge in local government.
- Structure of BIS: Bus information center, BIT (Bus Information Terminal), Vehicle terminal, Wireless Data Network, GPS

2. Standard Communication S/W for Traffic System

- Gitsn is the only one to contain the original technology of ASN.1 Toolkit, which is the core standard S/W for ITS info-communication
- Gitsn has joint ownership of the license with the MLTM (Ministry of Land, Transport, and Maritime Affairs)

A. GN-B101 (Independent Type)

B. GN-B201 (Shelter Standing Type)

General Information

Company Name : GITSN Inc.
Website : www.gitsn.com
Address : #811, Woorim e-Biz Center I, 170-5, Guro-Dong, Guro-Gu, Seoul, Korea

Contacts

Name : Kim Cheol Hong
Department : R&D
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Fax (office) : 82-2-2108-2085
Phone (mobile) : 82-11-212-4182
E-mail : chkim@gitsn.com

HANATECH SYSTEM Co., Ltd.

Company Overview

HANATECH SYSTEM has been growing and developing into a leading company thanks to our customer's supporting and encouraging which inspired us to thrive with great strides in globalizing our business strategy and expanding our global presence in key emerging markets.
Our growth vision embodies our commitment to achieving both quantitative growth and quantitatively building our brand and our human capital. We aspire to be an industry leader in our businesses as we strategically develop and invest in new enterprises and business engines that will drive future growth. We will continue to build a corporate culture that fosters mutual growth and prosperity for our employees as well our stakeholder alike.

Business Area

1st category

■ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

■ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
- Multi Modal Information/Management - Bus Rapid Transit System/Solution
- Pedestrian/Disabled Support System

☐ Electronic Payment
- Electronic Toll Collection - Electronic Parking Payment - Electronic Fare Payment

■ Traffic Information Integration/Management
- Traffic Information Integration - Traffic Information Center Traffic Data Management

☐ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

☐ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

☐ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

☐ Others ( )

2nd category

■ Hardware ■ Software ☐ SI ☐ Consulting ☐ Others ( )

Ongoing ITS project or R&D

- Improvement of obsolescence equipment in New-DAEGU BUSAN Expressway
- Construction of u-City in Sejong City
- Construction of ITS in Jeju Province

Others

Certification - ISO 9001:2009 / ISO 9001:2008

Patent

- CCTV Camera Controller
- Virtual image displaying apparatus for load control
- Unmanned Vehicle Photographing Equipment
- Lighting controller in vision system
- Apparatus for vehicle regulation with vehicle black box
- FPCB(flexible printed circuit board) base plate eccentric test device

ITS Product & Technologies

HD CCTV Controller
Model : HCC19-L7

-Function
• HD CCTV controller
• LCD Monitor 7 inches insertable
• Set the control and status monitoring through CCTV
• HD-SDI character generator (optional)

-Specification
• CPU : 32bit, Real-time OS
• Communication : 3 Serial ports(RS232/422/485), 5 Ethernet HUB ports
• Control : Lens, Pan/Tilt, Preset
• State : Door, Fan/Heater, Temp, In/Out Power etc
• UPS : 220V 60Hz, 30min Backup, Removable (include Camera)
• Size : 19inch x 4U, Standard Rack

CCTV Character Generator
Model : HNO-NDCK

-Function
- CCTV Video signals and the video signal of characters and symbols (an arrow, etc.) expressing
- Video Source Loss function
- 15inch 1U Size simple installation
- power supply Data communication via the control variable character

-Specification
- Video Signal : NTSC, BNC type
- Communication : RS232C(RJ45 type)
- Stat LED : PWR, TxD, RxD, V-L
- Text D/L : By external port
- Power Consumption : 10W under
- Input Power : AC220V 50/60Hz
- Size : 15inch x 1U

Video vehicle detectors
Model : HNV-VVK

-Function
• Passing vehicle by using the camera Videos of the vehicle traffic volume, speed, and the center transmits share analysis
• Detection area of up to 06 car lanes set
• Traffic / Speed / Occupancy rate : Superior /Superior / higher
Korea Institute of Construction Technology)

-Specification
• CPU : 32bit ARM
• MEM : 32MB
• Communication : 4 Ethernet ports,
• LED : Vehicle detection On/Off
• OS : Real time OS, Linux
• Vehicle data collection and communication
• Power: AC220V
• Size : 15inch x 1U

Integrated video detection camera
Model : HMNH-CAMVC

-Function
• Shoot the image vehicle detection in video transmission controller
• CE Certification

-Specification
• System : Camera / lens / housing
• Integrated CCD : 1.4 ", 410,000 pixels
• Lens : Zoom x25
• Material: Aluminum
• Front: plat heated glass
• Sun Shield
• Power : AC220V
• Weight: about 3kg

• Surge Protector
• Model : HSPD-120K

-Function
• Surge voltage and current on the outside of the unstable install equipment to protect against

-Specification
• Input : AC230V(50/60Hz)
• Maximum protection current : 120KA
• Connection Type: Parallel
• Built-in thermal fuse
• Status LED : Power, Protect
• Mode : L-N, L-G, N-G
• Operating temperature : -40℃ - 80 ℃
• Cable Specifications : AWG #12
• Weight: about 450g

CE certified multi-function power supply
Model : HCUI-1000C

-Function
• Stable AC power supply
• The temperature of the enclosure, fan / heater operation status, Door's open position to collect
• CE Certification

-Specification
• CPU : 8bit u-processor
• MEM : 256KB
• Communication : 3 Serial ports (RS232/422/485 select) 1Ethernet port
• The front window of the TCP / IP settings function
• LED : Check the operation status, etc.
• Power Capacity : 1KVA
• Output Stability : ± 2%

General Information

Company Name : HANATECH SYSTEM Co., Ltd.
Website : www.hanatek.co.kr
Address : D-1412, Gwangmyeong Techno Park
1345, Soha-dong, Gwangmyeong-si
Gyeonggi-do, korea, 423-795

Contacts

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HANILSTM Co., Ltd.

HANIL STM

Company Overview

HanilSTM is an SI enterprise in the field of ITS (Intelligent Transportation System). HanilSTM provides one-stop solutions for building-up and managing ITS related businesses, which cover proposal, design, development and maintenance. HanilSTM has a branch in Vietnam that is playing an important role strategically in launching overseas business in the field of ITS. HanilSTM keeps on carrying out research and development with its own research institute. HanilSTM has accumulated a lot of know-how based on domestic and overseas experiences and has many experts specialized in various parts, so that it can provide better services, products and caring even after sales.
HanilSTM will be a trustworthy business partner for you

Business Area

1st category

■ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

☐ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
- Multi Modal Information/Management - Bus Rapid Transit System/Solution
- Pedestrian/Disabled Support System

■ Electronic Payment
- Electronic Toll Collection - Electronic Parking Payment - Electronic Fare Payment

■ Traffic Information Integration/Management
- Traffic Information Integration - Traffic Information Center Traffic Data Management

☐ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

☐ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

☐ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

☐ Others ( )

2nd category

■ Hardware ■ Software ■ SI ■ Consulting ☐ Others ( )

Ongoing ITS project or R&D

Ongoing ITS Project
- Incheon International Airport expressway FTMS and Toll System Design · Construction
- Construction of Gangnam Circular Expressway Operation Facility
- Construction of Restraint System for Old Diesel Automobiles
- Sangju-Yeongcheon Expressway ITS Design · Construction

R&D projects
- Development and Demonstration of Smart Safe Society Solutions using Big data and Deep learning
- Development of Operation Technology for V2X Truck Platooning

- Development of Roadway Systems based on LDM and V2X for Cooperative Automated Driving
- Development of Multi Lane Automatic Number Plate Recognition System with a Single Camera
- Development of Energy Saving Smart- plug for ITS

Others

Certification:

- NET* (Multi-Lane ANPR) * New Excellent Technology
- ISO 9001:2008 - ISO 9001:2008
- Certification for Eco Label - Inno-Biz / Main-Biz
- Registered agency for traffic effect analysis and improvement measure establishment

Patent: 25 patents registered including

- An apparatus for recognizing plate number of a vehicle
- An apparatus for recognizing plate number of a vehicle

ITS Product & Technologies

Product Offerings

Smart power management device	Multi-Lane ANPR	CCTV camera
		
Video server	**Radar**	**Multi-function controller**
		

Technologies

Traffic information center	Traffic CCTV	AVI (ANPR)
		
VDS	**VMS**	**Accident detection system**
		

General Information

Company Name : HANILSTM Co., Ltd.
Website : www.hanilstm.com
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Contacts

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E-mail : straycat@hanilstm.com

Hanwha Systems Co., Ltd

Company Overview

started from the information systems business of Hanwha around 1995 when the nation announced the ROK as the 'IT powerhouse'.
It achieved independence as Hanwha S&C in 2001 and declared tot take the 2nd leap through the integration with Hanwha Systems in 2018. ICT Division of Hanwha Systems growing as the advanced IT solution provider builds the advanced information systems in the various areas including financial, manufacturing, petrochemical, and construction fields. Especially, it shows the performance of achieving the digital innovation in all areas including the civil and defense areas on the basis of the advanced IT services including the 4th industrial revolution key items of AI, big data, blockchian, cloud and ITS.

Business Area

1st category

■ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

■ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
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- Pedestrian/Disabled Support System

■ Electronic Payment
- Electronic Toll Collection - Electronic Parking Payment - Electronic Fare Payment

■ Traffic Information Integration/Management
- Traffic Information Integration - Traffic Information Center Traffic Data Management

■ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

☐ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

☐ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

☐ Others ( )

2nd category

■ Hardware ■ Software ■ SI ■ Consulting ☐ Others ( )

Ongoing ITS project or R&D

- Construction of Bongdam-Songsan Expressway ITS(FTMS / TCS / ETCS / One Tolling System)
- Operation of Bongdam-Songsan Expressway ITS(FTMS / TCS / ETCS / One Tolling System)
- R&D of Smart Toll Collection System
- R&D of V2X Communication System using WAVE

Others

Certification

– ISO 9001:2008, ISO/IEC 20000-1:2005, ISO/IEC 27001:2005

– CMMI Level 5: 2011

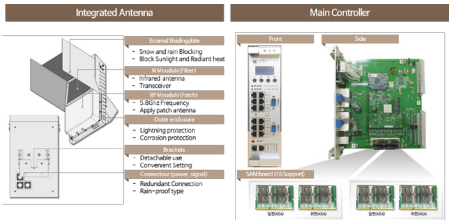
Patents

– ROADSIDE EQUIPMENT AND OPERATING METHOD FOR TOLL COLLECTION SYSTEM : 2020

ITS Product & Technologies

Product Offerings

Integrated antenna and main controller for Smart Tolling System



- Smart Tolling (multi-lane) can be applied only by setting the S/W environment
- Antenna duplication possible without a separate device (all-in-one board)
- Providing various information through external OLED display
- Redundancy configuration of main controller and communication cable
- High communication accuracy of over 99.5% communication success rate

Technologies

Smart Tolling Systme / Electronic Toll Collection Systme
- Multi-Lane Toll Collection in case of more than 2 lanes
- Classification of vehicle type through laser detector
- Improving image recognition rate by applying artificial intelligence

Real Time Traffic Control
- Gathering Crossroad Traffic Information
– Real time traffic Signal Control

Providing Traffic Information
- providing real time traffic Informaition
- Regardless of time and place using various media such as Variable Message Sing(VMS)

Traffic Law Violation Regulation
- Regulation parking Violation vehicles, speeding vehicles, traffic signal violation vehicles

General Information

Company Name : Hanwha Systems Co., Ltd
Website : www.hanwhasystems.com
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Contacts

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HighGainAntenna

High Gain Antenna

Company Overview

High Again Antenna is sharing the beginning, development, and the future value of the Korean communication industry. High Again Antenna manufactures and supplies products with pride as a pioneer of the Korean communications industry that has led the 50-year history.

Business Area

1st category

☐ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

☐ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
- Multi Modal Information/Management - Bus Rapid Transit System/Solution
- Pedestrian/Disabled Support System

■ Electronic Payment
- Electronic Toll Collection - Electronic Parking Payment - Electronic Fare Payment

☐ Traffic Information Integration/Management
- Traffic Information Integration - Traffic Information Center Traffic Data Management

☐ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

■ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

☐ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

☐ Others ( )

2nd category

■ Hardware ■ Software ☐ SI ☐ Consulting ☐ Others ( )

Ongoing ITS project or R&D

- V2V, V2I Communication soltution using WAVE Technology
- OBE for Korea ETCS – OBE for China ETCS – Compensor for Vehicle - IoT Module(LoRa WAN)

Others

Certification
- IATF 16949, TL9000 (Quality Management System Certification) - from TUV
- Certificate of SQ (Safety Components, Electronic Soldering) - From Hyundai Kia Motors Partner
- ISO 45001 (Occupational Health and Safety Management Systems Certificate) –From TUV

Award
- Technology Innovative SME -From Director of Small and Medium Business Administration)
- Certificate of Excellent Recycled Product -From The Ministry of Trade, Industry and Energy)

ITS Product & Technologies

Product Offerings

V2V, V2I Communication using WAVE Technology

- V2X OBU / V2X RSU
- IEEE 802.11P Standard(Frequency: 5.855~5.925GHz)
- IEEE 1609, J2735 Standard(V2V, V2I Communication)
- OFDM / BPSK, QPSK, 16QAM, 64QAM

V2X OBU

V2X RSU

ETCS System OBU

- Room mirror OBU / Overhead Console OBU
- A vehicle terminal (OBU) device that can pay tolls while driving using a roadside base station (RSU) and a 5.8GHz short-range wireless communication (DSRC) method on a toll road or highway
- Voice guidance, button, LED display, Button type semi-automatic card socket application

Room mirror OBU

Overhead Console OBU

COMPENSATOR

- Frequency: GSM900, GSM1800, UMT2100, LTE800,LTE2600
- System Gain(Downlink / Uplink) : +27 / +27 dB
- Auto Band selection

Technologies

V2V, V2I Communication using WAVE Technology

- Between vehicle technology, Between vehicles vehicle wireless technologies, infrastructure, wireless communications
- By detecting the road obstacle such as wayside sensors in the adjacent base station through attention to all of the cars in a subsequent
- Prevention of traffic accidents caused by icy road obstacles
- The information regarding the sudden stop, rapid deceleration, the vehicle failure of a preceding vehicle deceleration slowly to receive in real time in the in-vehicle terminal rear vehicle technology for preventing a secondary accident

DSRC ETCS Technology

- Electronic toll collection system for toll payment for a vehicle in the running state without stops using the wireless communication between the vehicle device and the toll station antenna installed in a vehicle

COMPENSATOR Technology

- Within the moving vehicle communication service (service data) smoothly within a moving vehicle-mounted to cover a weak electric field area communication signal amplification device that is not provided.

General Information

Company Name : Highgain Antenna
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Contacts

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Hyper sensing Inc

HYPERSENSING

Company Overview

Hypersensing.Inc has been pioneer of C-ITS industries by researching & developing the conventional traffic control system to next level for the government agencies and so on. We do have wide background of R&D networks such as KAIST (autonomous driving system), KTRI(Autonomous cooperative driving demo), KYUNGIL University(Sensor and Information Fusion), SEOUL University(Spatial data analysis), KPU(Computer vision, AI)

Business Area

1st category

☐ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

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- Bus Information/ Management System - ublic Transportation Information/Management
- Multi Modal Information/Management - Bus Rapid Transit System/Solution
- Pedestrian/Disabled Support System

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☐ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

■ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

☐ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

☐ Others ( )

2nd category

■ Hardware ■ Software ■ SI ☐ Consulting ☐ Others ( )

Ongoing ITS project or R&D

- Smart intersection system (C-ITS)for City of Hwa Sung(Proposed for Development)
- Smart intersection system (C-ITS)for Suwon(Proposed for development)
- Demo for City of Ulsan (2 intersection) and developing real-time traffic information system
- Researching on Ai traffic signal optimization(Daejeon City)
- Demo of autonomous cooperative driving Service for City of Sejong with KTRI

Others

Patent

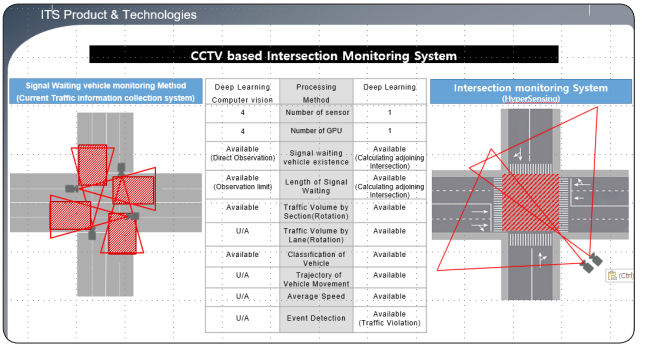
1. Patent Number 10-2418344

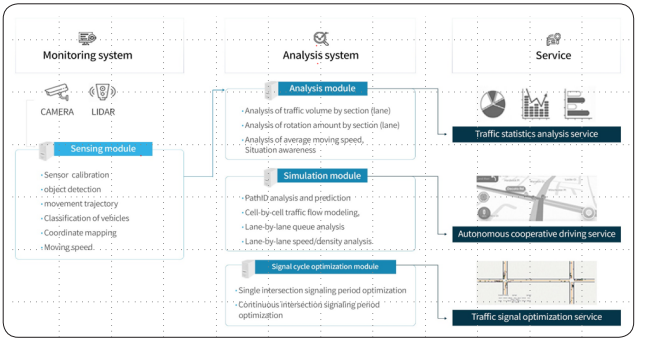
Traffic Information Analysis Apparatus and Method.

2. Patent Number 10-2256205

Device and Method for calculation Vehicle position in image and traffic Analysis system Using the same.

ITS Product & Technologies





General Information

Company Name : HYPERSENSING, Inc
Website : www.hypersensing.net
Address : #631,632, 66 Daewa-ro, 106Beon-gil, Daedeok-gu, Daejeon, Republic of Korea

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Phone (mobile) : 82-10-2032-5730
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HYUNDAI ITS ELECTRON CO., LTD

HYUNDAI ITS ELECTRON CO., LTD.

Company Overview

Hyundai ITS Electron was founded in November 1998. It is a company specializing in the development, manufacture and construction of road sign boards. Major development and manufacturing items are hardware and software of VMS, LCS, MCU, VCU, CCTV products. We also provide consulting and construction related to ITS products to our customers.
Currently, Hyundai ITS Electron develops high-safety technology based on ITS technology and concentrates on product production and technology development.

Business Area

1st category

■ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

■ Public Transportation
- Bus Information/ Management System - ublic Transportation Information/Management
- Multi Modal Information/Management - Bus Rapid Transit System/Solution
- Pedestrian/Disabled Support System

☐ Electronic Payment
- Electronic Toll Collection - Electronic Parking Payment - Electronic Fare Payment

■ Traffic Information Integration/Management
- Traffic Information Integration - Traffic Information Center Traffic Data Management

■ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

■ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

■ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

☐ Others ( )

2nd category

■ Hardware ■ Software ■ SI ■ Consulting ☐ Others ( )

Ongoing ITS project or R&D

ITS Solution and VMS(Variable Message Signs) fire notification system
- Development of new product for Variable Message Signs
- Development of new product for Line Control System
- Development of CCTV System
- Development of VMS fire notification system

Others

Patents
- Apparatus and method for controlling LED display board for defective detection
- Emergency situation guidance system and method in tunnel

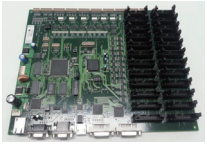
Certification
- Performance certification by government agency
- Good Software certification by government agency

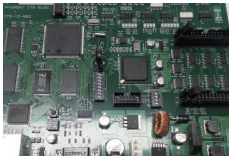
ITS Product & Technologies

Hyundai ITS Electronics develops ITS solutions including Variable Message Sign, Line Control System and Closed Circuit Television System.

Product

Main Control Unit	
	**Communication** - TCP/IP, RS232, DVI **Main Process** - Dual Core 1.8GHz or Higher

Variable Message Sign and Toll Gate Sign Unit		
		**Communication** - TCP/IP, RS232, DVI **Main Process** - 32 bit ARM Processor **Control Unit** - LED Module, Temp Module, Hum Module, Power Module

Line Control System Unit	
	**Communication** - TCP/IP, RS23 **Main Process** - 32 bit ARM Processor

HYUNDAI ITS ELECTRON CO., LTD

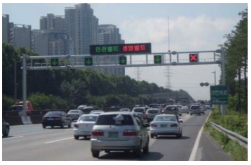
VMS System (Variable Message Signs)

Electric Road Sign and Video Road Sign

Door-Style Road Light Sign and Solar System Application

Side Road Light Sign and Tunnel Road Sign

LCS System (Line Control System)



HYUNDAI ITS ELECTRON CO., LTD.

LCS System (Line Control System)

ITS Product & Technologies

VMS (Variable Message Signs) System Development

- Hardware design of the product
- Development of pc program for users
- Firmware development for device operation
- Development using TCP / IP communication
- Road VMS display development technology

VMS (Variable Message Signs) System Development

- LCS hardware design technology
- LCS software design technology
- Road LCS display development technology

Construction Capability

- Construction of VMS, LCS for roads and highways

General Information

Company Name : HYUNDAI ITS ELECTRON CO., LTD
Address : Neungdong B/D, 3F, Chungkok-Dong, 107Gil 8 Cheonhodaero, Kwangjin-Gu, Korea

Contacts

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Phone (mobile) : 82-10-9897-4172
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Innowireless

Company Overview

Since its establishment in September 2000, Innowireless has focused on developing wireless network optimization solutions such as automatic measurement equipment, benchmarking tools, and post-processing analyzer. We have also provided the cutting-edge technologies such as Big Data Analytics which process the significant volumes of real-time data in a mobile network. Moreover, our subsidiary, Qucell Networks, became the first domestic company to provide 5G Small Cell to mobile service operators. As our overseas sales corporation Accuver has continually been expanding its global networks in Japan, China, USA, UK, and India. Thanks to 220+ customers from more than 50+ countries, we could be the one of the world-leading test equipment companies. In the preparation for the autonomous vehicle industry, we hope to be able to implement V2X device/infra and customized engineering tools for connected car service and ITS.

Business Area

1st category

■ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

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- Bus Information/ Management System - Public Transportation Information/Management
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- Traffic Information Integration - Traffic Information Center Traffic Data Management

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- Pre/On-Trip Traveler Information Service - Telematics Service

■ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

☐ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

☐ Others ( )

2nd category

■ Hardware ■ Software ☐ SI ☐ Consulting ■ Others (Test & Measurement Equipment)

Ongoing ITS project or R&D

- Test & Measurement Equipment (Signal Generator, Signal Analyzer, Handheld RF Test Equipment)
- Engineering Tools for Driving Field Test & Wireless Network Optimization (DM, Channel Emulator, Post-processing Analyzer)
- Big Data Analytics Solution for massive data traffic (GPU DB, AI Solutions, Real-time E2E network probing and analytics)

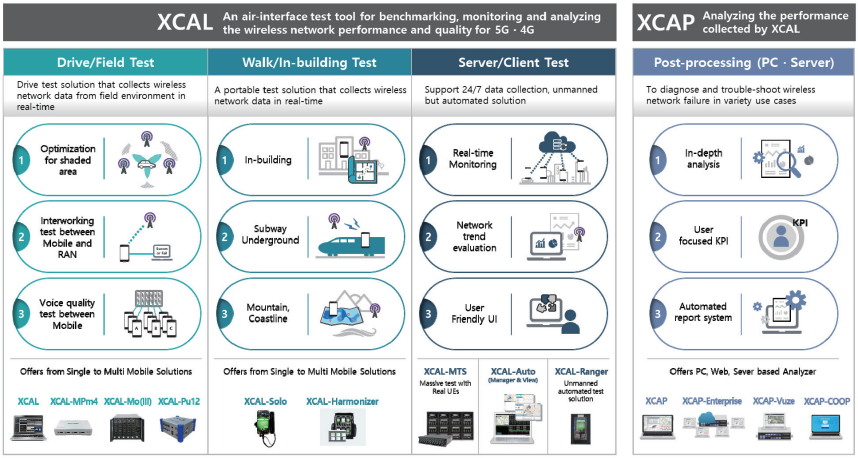
Others

Certification: ISO 14001(Environmental Management System), TL 9000(Quality Management System)
Patents: Domestic patents 185, PCT 84
Awards
- Korea National ICT Award(Ministerial Award, '20)
- Science and ICT Award(Presidential Award, '19)
- Selection of Development project for SME('15)
- Korea National ICT Award(Ministerial Award, '14)
- A tower of $20 million exports of the 49th Trade day('12)
- New Radio Broadcasting Technology Award(Ministerial Award, '10)

ITS Product & Technologies

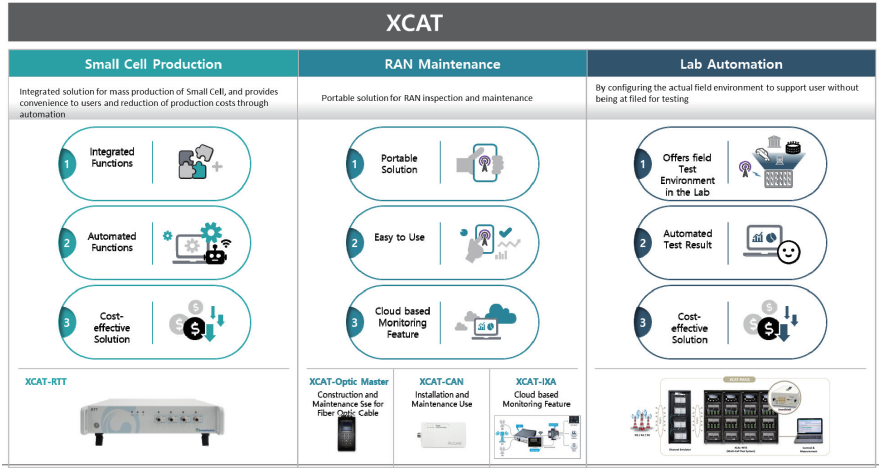
- Network Optimization Solution: XCAL, XCAP

  'Benchmark' and 'Optimize' the wireless network performance in the field and lab environment with outstanding features



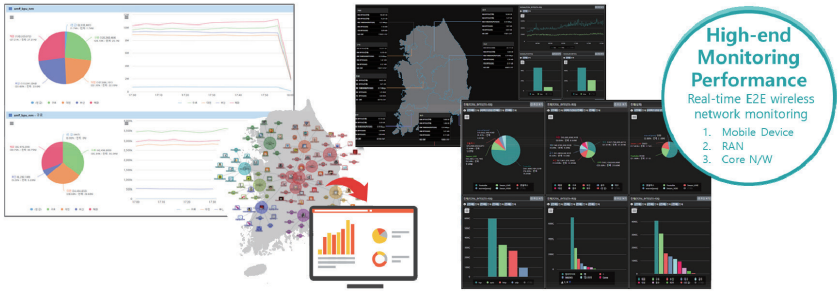
Innowireless

- Test & Measurement: XCAT



- Big Data Analytics: AEGIS

High-end Monitoring Performance of all the interface and network environment from Core NW to Mobile/Vehicle Device (Real-time E2E Wireless network monitoring)



Innowireless

AEGIS E2E probing and analytics solutions

AEGIS	AEGIS-PSee	AEGIS-CLAIR
• Data monitoring from Core N/W to Mobile Device • Performance monitoring, test measurement and statistical data solution	• Laptop based performance monitoring, test measurement and statistical data solution • Recommended for Lab user	• Automatically collects real-time wireless quality data • Focused on data visualization on the map to recognize the information
		

General Information

Company Name : Innowireless
Website : http://innowireless.com/index.asp
Address : Innowireless B/D, 190 Seohyun-ro, Bundang-gu, Seongnam-si, Gyeonggi-do, Korea

Contacts

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Phone (mobile) : 82-10-8912-3566
E-mail : prjana@innowireless.com

InPEG Vision Co.,Ltd.

Company Overview

Inpeg Vision has developed image processing and license plate recognition system by its own technology, and applied in various field of ITS (Intelligent Transport System), and provides core algorithm and technologies to a lot of customers in domestic and overseas market.
With the goals and continuous efforts to make the differentiation of recognition rate, reliability and technology, Inpeg Vision will always take a further step to develop sole image processing technology thereby positioning itself as a pioneer of techniques.

Business Area

1st category

■ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

■ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
- Multi Modal Information/Management - Bus Rapid Transit System/Solution
- Pedestrian/Disabled Support System

■ Electronic Payment
- Electronic Toll Collection - Electronic Parking Payment - Electronic Fare Payment

■ Traffic Information Integration/Management
- Traffic Information Integration - Traffic Information Center Traffic Data Management

☐ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

☐ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

☐ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

☐ Others ( )

2nd category

■ Hardware ■ Software ■ SI ■ Consulting ☐ Others ( )

Ongoing ITS project or R&D

KINTEX - Integrated Total Parking Management System(Parking Guidance/Parking Position Inquiry)
POSCO - Integrated Total Security System
Busan , Gangseo gu - Urban Integrated Traffic & Security System
Gyung-ki Province national Highway ITS - Integrated Intelligent Traffic System
Busan Bank, Head Office - Parking Guidance& Parking Position Inquiry
Japan Gas station - Gas-Station CRM System(48 sites)
Philippines, Subic, Hanjin Apartment - Vehicle Access Control System

Others

Patent Status
- Retention : 38 cases (Country 32cases, Overseas 3cases, Brand 1case, Design 2cases)
- Application : 3 cases - PCT Enrollment : 4cases

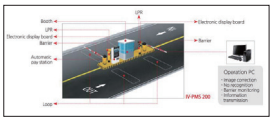
Technical Certification - Total 72 cases
- CE / UL , AVI test (excellent grade : recognition rate 98%)
- NET (New Technology), Excellent Procurement Product 2 case , etc.

Management Certification - Total 33 cases

ITS Product & Technologies

Product Name
: LPR device (for rear)
Model Name : IV-PIRR-100
Overview : This dust and water proof LPR device is installed small space and capture images of entering vehicles and improve recognition rate.

Advantage of product
1. High recognition rate (over 98%)
2. Semi-permanent illuminator
3. Remote maintenance
4. Simple design and installation



Product Name : Parking management system
Model Name : IV-PMS 200
Overview : LPR based advanced access control system enables high-efficient and user convenient parking lot operation overcoming all the weak points of legacy RF card type system.
Advantage of product
1. High recognition rate (98~99%)
2. Vehicle access control
3. GOOD DESIGN certification
4. Durability (IP 45 certification)

Product Name : iCLCU (Camera Lens Control Unit)
Model Name : IV-PIMS-400
Overview : LPR based advanced access control system takes images of entering/leaving vehicles with high-definition mega pixel camera and it automatically recognizes plate number then access control/manage them.

Advantage of product
1. High recognition rate (over 98%)
2. Semi-permanent illuminator
3. Remote maintenance
4. High speed recognition speed

Product Name : Road security camera
Model Name : IV-COHL-400 (for 1 line), IV-COHL-401 (for 2 lines)
Overview : LPR based road security camera system (ITS) capturing all the vehicles passing by the road and provide the real-time information to operator of wanted, stolen and related vehicles.
Advantage of product
1. High recognition rate (98~99%)
2. Various vehicle detection by site environment
3. Semi-permanent IR illuminator
4. Durability (IP 66 certification)

General Information

Company Name : InPEG Vision Co.,Ltd.
Website : www.inpeg.com/eng
Address : 59 Muhaksong-ro, Geumjeong-gu, Busan, Korea.

Contacts

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IT Telecom Co., LTD.

Company Overview

IT Telecom (ITT) is a leading edge Intelligent Transportation System (ITS) company with WAVE (Wireless Access in Vehicle Environment) solutions,the next generation ITS communication technology. ITT has incorporated since 2004 as a turnkey solution provider for ITS communication product development, radio engineering, and maintenance. Also, ITT has proactively developed WAVE technology and successfully finished a field trial in 2010 ITS World Congress in Busan, South Korea.ITT is well positioned to tap and grow in the emerging world WAVE market for V2X, Airport, Train, Subway, Harbor communication network solution. ITT will do our best to provide the leading edge ITS solutions (DSRC/WAWE) to our customers

Business Area

1st category

■ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

■ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
- Multi Modal Information/Management - Bus Rapid Transit System/Solution
- Pedestrian/Disabled Support System

■ Electronic Payment
- Electronic Toll Collection - Electronic Parking Payment - Electronic Fare Payment

■ Traffic Information Integration/Management
- Traffic Information Integration - Traffic Information Center Traffic Data Management

■ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

☐ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

☐ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

☐ Others ( )

2nd category

■ Hardware ■ Software ■ SI ☐ Consulting ☐ Others ( )

Ongoing ITS project or R&D

Korea Government Project("Smart Highway")
- V2X pilot test : providing 100 sets of WAVE OBU's

WAVE OBU samples for Tier 1 Automotive Suppliers
- Hyundai Mobis - Mando

Strategic Partnership with Telco's and global ITS SI companies.
- KRT, POSCO-ICT, SK Telecom, Aldridge Electrical Pty(Australia), Telnorm(Mexico)
- Centron Industries(USA), DMC Wireless(Argentina), JCDC

Others

(Patent No) 10-0745014: Traffic Information Utilization Method by using Complex-type RSE
(Applied No) 10-2012-0012095: Smart Phone SW Architecture and Algorithms to exchange realtimevideo data between driving vehicles by using Smart-phone (or Smart-type terminal)
(Applied No) 10-2012-0158076: Vehicle Management System Architecture and Algorithms to check real-time site situation and vehicle position in airports and harbors.

ITS Product & Technologies

Product Offerings

- Modulation: OFDM(BPSK, QPSK, 16QAM, 64QAM)
- Interoperability: meet the required products
- Data rate: up to 27Mbps
- RF Frequency: 5.850 ~ 5.925GHz

- Modulation: OFDM(BPSK, QPSK, 16QAM, 64QAM)
- Interoperability: meet the required products
- Data rate: up to 27Mbps
- RF Frequency: 5.850 ~ 5.925GHz
- Number of Channels: 7 Channel
- Channel Bandwidth: 10MHz

- Channel Card : 2 RF channels(Max.7 Channels)
- EDCA Test Available
- Multi-channel Operation Test Available
- Protocol Analyzing forV2X Communications
- Can be used for RSU or OBU emulator
- IP/WSM Data Analyzing Available
- Compatibility Test between Other OBU's/RSU's
- Security Test : IEEE 1609.2(Optional)
- LED indicators and alarm notification for system fault detection

Technologies

5.9GHz DSRC WAVE(IEEE 802.11p, 1609.2~4)
- Baseband Modem & Mac
- Embeded software
- Hardware including RF transceiver

5.8GHz Legacy(Korea Standard) DSRC
- Baseband Modem & Mac
- Embeded software
- Hardware including RF transceiver

General Information

Company Name : IT Telecom Co., Ltd.
Website : www.it-telecom.co.kr
Address : 555-9 Hogae-dong, TheOvalley #517

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ITRONICS CO., LTD

iTRONICS

Company Overview

ITRONICS CO., LTD is a leading Korean manufacturer who has its own technology for ITS system & OBU design, Digital Image Processing, ASIC & RF design. It offers full range of ITS system related products and Automotive IT products such as ETC OBU, Vehicle Driving Recorder, Personal Naviagtion Device and so on.

Business Area

1st category

☐ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
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- Bus Information/ Management System - Public Transportation Information/Management
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- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

☐ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

☐ Others ( )

2nd category

■ Hardware ■ Software ☐ SI ☐ Consulting ☐ Others ( )

Ongoing ITS project or R&D

Certification

Project
- Hi-pass system(ETCS)
- RF antenna and Control unit for DSRC Traffic data collection/provision system

R&D
- WAVE RSE & OBE

ITS Product & Technologies

Product Offerings

Hi-pass system(ETCS)
- Original type Hi-pass system
- Slim type Hi-pass system
- Service area type Hi-pass system

- Specification
  Slim type system and Small size lane control unit(15' subrack)
  All in one CCU (CCU, IRCU, RFCU, SAM)
  All in one antenna (IR-DSRC 800~900nm, RF-DSRC 5.8GHz)
  RF antenna and Control unit for DSRC Traffic data collection/provision system
- All in one 5.8GHz RF-DSRC antenna and Control unit
- Range : 100~400m

Technologies

- Hi-pass system(ETCS)
  ETCS means Electronic Toll Collection System using the IR / RF Dedicated Short Range Communication (DSRC) technology which enables communicate with between On-Board Unit (OBU)installed inside the vehicles and Stations (IR RSE, RF RSE) installed in Roadside.
- RF antenna and Control unit for DSRC Traffic data collection/provision system It is the system to deliver the traffic information collected by using Dedicated Short Range Communication (DSRC) technology between ETC based Roadside Equipment and OBU.

General Information

Company Name : ITRONICS CO., LTD
Website : www.itronics.co.kr
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Contacts

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JastecM Co.,Ltd.

Company Overview

JastecM is an automotive IoT device & fleet management solution company established in 2016. We specialize in analyzing vehicle sensor data to integrate with various business models in connected car industry, such as fleet monitoring, car-sharing, used car depreciation analysis, auto finance & insurance etc. We also have been providing our products to Korean and US market. Now JastecM is trying to expand our market into Europe and Southeast Asia.

Business Area

1st category

☐ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
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■ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

☐ Others ( )

2nd category

■ Hardware ☐ Software ☐ SI ☐ Consulting ☐ Others ( )

Ongoing ITS project or R&D

- ISO Development R&D (2021~2025)
- B2B SKB, Hanwha-total, etc
- B2G City of Bucheon, etc

Others

- Indoor and Outdoor continuous positioning switching method / 10-2021-0041415
- Vehicle price estimating method / 10-2020-0188585
- Apparatus for processing vehicle information / 10-2017-017956
- 2020 Nominated as the Best Industry Integration Company, Korean Ministry of Trade, Industry and Energy (Dec. 16th, 2020)

- 2020 Nominated as the Excellent Performance Company for data voucher program, Korea Transport Institute (Dec. 16th, 2020)
- 2019 Nominated as the Export Frontier Enterprise, Govenor of Gyeonggi Province, Korea (Dec. 10th, 2019)
- 2017 Nominated as the Export leading Company, KOTRA (May. 25th, 2017)
- 2016 Nominated as the Promising ICT Company (K-GLOBAL 300), Korean Ministry of Science, ICT & Future Planning (Dec. 29th, 2016)

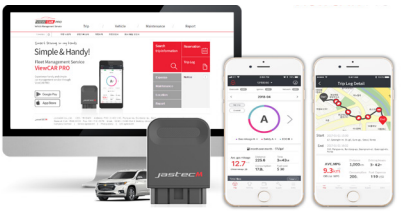
ITS Product & Technologies

Product Offerings

Hardware(von-Series)

<JastecM's vehicle-IoT device (OBD2 based)>

Platform (ViewCAR)



<JastecM's fleet management solution (Web & App)>

Technologies

JastecM has vehicle-IoT device & platform for mobility big-data business. We already setup API service structure from device to end-user level service platform.

Features

1) Reliable & Secured vehicle-IoT Device (OBD-II protocol based)
- Collects driving data and highly compatible with most vehicle models.
- GPS, Gyro/G-sensor, Bluetooth, Wifi Hotspot on board
- LoRa, 3G, LTE supported
- Data remedy technology in out of network area
- Secured boot & network protocol against car hacking
- Easy-to-install (Plug N Play)

2) Enterprise-level fleet management solution
- Web/App based tool for gaining an access to vehicle related services;
  - Trip summary & report (location, route, event, distance etc.)
  - Task monitoring (vehicle idling detection, Geofencing)
  - Reckless driving notification (Harsh breaking, speeding etc.)
  - Driving behavior analysis
  - Vehicle condition & breakdown monitoring
  - Fuel cost management
  - Vehicle consumables management
  - Company vehicle reservation & dispatch

3) Vehicle data management platform
- Highly customizable & flexible data processing by business logic
- RESTful API based for 3rd party developers

General Information

Company Name : JastecM Co.,Ltd.
Website : jastecm.com
Address : C402 Pangyo-ro 242, Bundang-gu, Seongnam-si, Gyeonggi-do, Korea

Contacts

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Jin Woo Industrial Co., Ltd.

JINWOO Industrial Systems
www.jin-woo.com

Company Overview

JINWOO transportation system solution helps to build a faster, safer, more eco-friendly transportation system by incorporating cutting-edge technologies of electronics, electricity, control, and information.
communication fields into a transportation system, such as UTMS, DSRC, ATES, FTMS and TCS / ETCS. Experience our transportation system solution, the fittest of all in the ever-evolving ubiquitous environment.

Business Area

1st category

■ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

■ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
- Multi Modal Information/Management - Bus Rapid Transit System/Solution
- Pedestrian/Disabled Support System

■ Electronic Payment
- Electronic Toll Collection - Electronic Parking Payment - Electronic Fare Payment

■ Traffic Information Integration/Management
- Traffic Information Integration - Traffic Information Center Traffic Data Management

■ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

☐ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

☐ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

☐ Others ( )

2nd category

■ Hardware ■ Software ■ SI ☐ Consulting ☐ Others ( )

Ongoing ITS project or R&D

- Toll Collection System implementation for Korea Expressway Corp. in 2014
- Toll Collection System implementation for Seoul Beltway Corp. in 2014
- Toll Collection System implementation for Daegu-Busan Expressway Corp. in 2014
- Toll Collection System implementation for Cheonan-Nonsan Expressway Corp. in 2014
- Freeway Traffic Management System implementation for Cheonan-Nonsan Expressway Corp. in 2014
- Traffic Law Violation Enforcement System implementation for Seoul, Inchon, Gyeonggi, GyeongNam. in 2014

- Vehicle classification system supply for Korea Expressway Corp. in 2013
- Unmanned Toll System development and supply for Korea Expressway Corp.

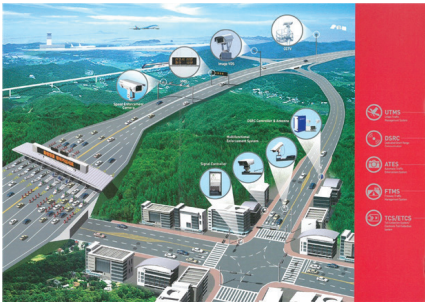
Others

Certification
- ISO 9001:2008 / - ISO 14001:2004 / - OHSAS 18001:2007

Patent
- 8 patents registered in Toll Collection related technologies.
- Unmanned Vehicle Photographing Equipment.
- Automatic Vehicle Number Recognition System.
- Vehicle Speed Detection System.
- Traffic Law Violation Enforcement System.

ITS Product & Technologies

Product Offerings



Technologies

Design, Development (S / W,H / W), Civil Work, system construction, enginnering for Intelligent Transport System (ITS)
- Toll Collection System (TCS)- open Type, Closed Type
- Electronic Toll Collection System (ETCS)
- Freeway Traffic Management System (FTMS)
- Urban Traffic Management System (UTMS)
- Dedicated Short Range Communication (DSRC)
- Automatic Traffic Enforcement System (ATES)
- Traffic Signal Control System

General Information

Company Name : Jin Woo Industrial Co., Ltd.
Website : www.jin-woo.com
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Contacts

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Keon-A Information Technology Co.,Ltd.

KEON-A

Company Overview

KEON-A is a leading manufacturer and exporter of Traffic Enforcement System with domestic market share No.1 in South Korea since foundation of 1987. KEON-A has key solution of traffic enforcement system such as Speed, Traffic Signal, Criminal Vehicle Capturing and etc by using Automatic Number Plate Recognition system (LPR or ANPR).

Business Area

1st category

■ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

☐ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
- Multi Modal Information/Management - Bus Rapid Transit System/Solution
- Pedestrian/Disabled Support System

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- Electronic Toll Collection - Electronic Parking Payment - Electronic Fare Payment

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- Traffic Information Integration - Traffic Information Center Traffic Data Management

☐ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

☐ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

☐ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

■ Others (Traffic Law Enforcement System)

2nd category

■ Hardware ■ Software ■ SI ☐ Consulting ☐ Others ( )

Ongoing ITS project or R&D

- Project of Traffic Signal Control System in Manila, the Philippines
- Project of Speed & Traffic Signal Violation Enforcement System in Almaty, Kazakhstan
- Traffic Signal Control Equipment and Vehicle Mounted Vehicle Plate Number Recognition System in Turkmenistan

Others

Certification
- ISO 9001:2008
- CE

Patent
- Unmanned Vehicle Photographing Equipment
- Automatic Vehicle Number Recognition System
- Vehicle Speed Detection System
- Traffic Law Violation Enforcement System

ITS Product & Technologies

Mobile Speed Camera is mobile type speed detection camera based on laser sensor. This mobile camera can automatically detect and recognize the vehicle number plate at the designated point.

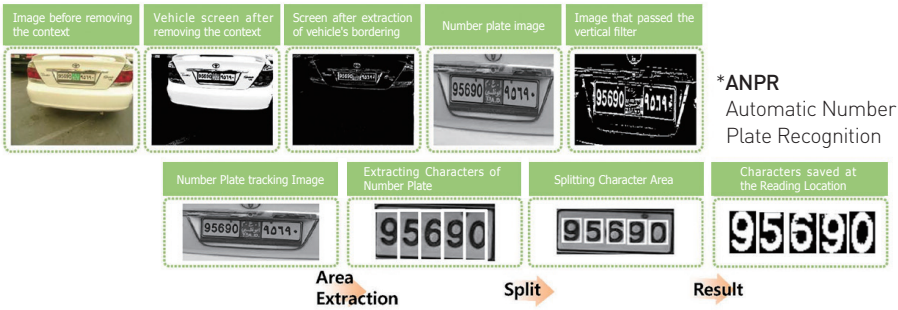
Specifications and Features

Camera	1.3M Pixel CCD Camera
Lens	Motorized 100mm to 120mm (include x2 Extender) Target Range : 80 to 120meters
Illuminator	Wire or Wireless Xenon Lamp 700nm IR Filter Life Time mort than 100,000 times
Sensor	Laser Sensor Measurement Speed : 10~300km/h Speed Error Rate : Less than ±1% 905nm, Class (Eye Safety)
Controller	Intel Embedded Atom 1.6GHz 5.7inch color TFT LCD monitor with touch screen Operating Temperature : -30˚C to 70˚C All-in-One compact module for easy maintenance USB Menory Device : Over 100,000 image storage ANPR(Automatic Number Plate Recognition) (Option)
Housing	Size : 507(L) × 175(W) × 165mm(H) Weight : 6kg
Battery	Sealed Lead Acid Battery, 12V

Keon-A Information Technology Co.,Ltd.

Technologies

ANPR(Automatic Number Plate Recognition) System



General Information

Company Name : Keon-A Information Technology Co., Ltd
Website : www.keona.co.kr
Address : Keon-A Bldg, 401-2, Poongnap-dong, Songpa-gu, Seoul, Korea

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Korea Consultants International Co., Ltd

KCI KOREA CONSULTANTS INTERNATIONAL

Business Area

1st category

■ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

■ Public Transportation
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☐ Others ( )

2nd category

☐ Hardware ☐ Software ☐ SI ■ Consulting ☐ Others ( )

Ongoing ITS project or R&D

Trung Luong – My Thuan Expressway Construction Investment Project (Vietnam) – Technical Design of Traffic Management Systems and Toll Collection Systems, 2010~2011

Others

Ubiquitous Intelligent Disaster Prevention System, 2010, 1020080066210

ITS Product & Technologies

Feasibility Study, Master Plan, Basic and Technical Design, Supervision

General Information

Company Name : Korea Consultants International Co., ltd.
Website : www.kcieng.com
Address : 7F, Daerung Techotown 15, 224-5, Gwanyang-2dong, Dongan-gu, Anyang-si, Gyeonggi-do, Republic Of Korea

Contacts

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Korea Electric Traffic Co., Ltd.

KETC

Company Overview

Korea Electric traffic Co., Ltd. is a leading provider of traffic signals and provider of comprehensive solutions.

Business Area

1st category

■ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
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☐ Others ( )

2nd category

■ Hardware ■ Software ■ SI ■ Consulting ☐ Others ( )

Ongoing ITS project or R&D

ITS
- Implementation and maintenance of ITS, Smart-City solutions.

Product development and Manufacture
- Traffic signal light, Traffic signal controller, Traffic signal center software development, Floor type pedestrian traffic signal light

Possession of new transportation technology
- FDWS (Fog Detect & Warning System) (New Traffic Technology No. 12).

National project
- Participation in national project 'Research on Safety and Infrastructure of Connected Automated Driving at the Urban Road'.

Others

Export

- Since 1999, Traffic signal light, Controller, etc. export in 17 countries.

(Performing business - Road traffic safety facilities (such as traffic signals outside), ITS-related products and solutions, advisory, consulting, sales and maintenance services in general)

Certification

- ISO 9001:2015

ITS Product & Technologies

Traffic signal light and Traffic signal controller

- Traffic Signal Lights: LED Traffic signal lights are designed to consume only 10% of energy compared to incandescent signal lights and to maximize safety through high visibility.

- Traffic signal controller: Real-time signal control and vehicle volume information and Conforms to the Korea National Police Agency standard.

FDWS(Fog Detect & Warning System)

- It is a safe light, which promotes safe driving and prevents traffic accidents in advance by having drivers know the situation on the road clearly, in case of occurrence of heavy fog, day/night and bad weather.

Floor type pedestrian traffic signal light

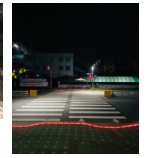
- A floor-type pedestrian traffic signal light auxiliary device that aims to contribute to pedestrian convenience and prevention of traffic accidents by providing additional signal information to pedestrians in conjunction with ground traffic signal lights.

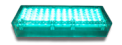
Traffic signal light / Traffic signal controller / FDWS(Fog Detect & Warning System)

Floor type pedestrian traffic signal light








General Information

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Korea Expressway Corporation

Korea Expressway Corporation

Company Overview

The Korea Expressway Corporation ("KEC") was established in 1969 and is responsible for the construction and operation of the nation's expressways. It plays a pivotal role in national transportation policy. As a leading company in the nation's road construction industry, the KEC has been involved in constructing main expressways, which increase the nation's transportation cost efficiency by connecting key points, thus playing an instrumental role in the Korean economic growth.

The KEC has thus far laid 4,196km of domestic expressways. By 2025, the total length of the expressways nationwide will be 5,461km. The KEC has also established the Intelligent Transport System ("ITS"), which employs road construction and management technologies together with state-of-the-art information technology. It continues to make every effort to prepare the nation for a bright future of intelligent roads that are both faster and safer.

Business Area

1st category

■ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

☐ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
- Multi Modal Information/Management - Bus Rapid Transit System/Solution
- Pedestrian/Disabled Support System

■ Electronic Payment
- Electronic Toll Collection - Electronic Parking Payment - Electronic Fare Payment

■ Traffic Information Integration/Management
- Traffic Information Integration - Traffic Information Center Traffic Data Management

☐ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

■ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

☐ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

☐ Others ( )

2nd category

☐ Hardware ☐ Software ☐ SI ☐ Consulting ☐ Others ( )

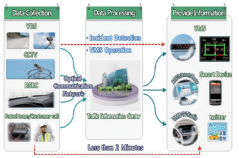
Ongoing ITS project or R&D

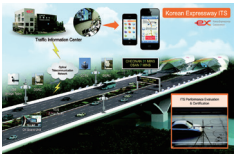
- Nationwide Establishment of the Comprehensive Traffic Information System
- Automatic Tunnel Accident Detection System
- High-Speed Weigh-In-Motion(HS-WIM)
- Smart Overloaded Vehicle Enforcement System

- Smart Toll Collection System
- Standard Slim Hi-Pass System
- Hi-Pass(NTCS, Nonstop Toll Collection System) Only Interchange(Smart IC)
- ITS Performance Evaluation & Certification

Others

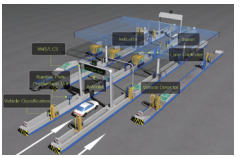
- Apparatus for sensing number of axles in vehicle(1999)
- Apparatus for determining tire width and wheel track of vehicle and method thereof(1999)
- Pass ticket withdrawal control device in ticket issuing unit(1999)
- Ticket issuing unit enabling continuous pass ticket issuing(1999)
- Ticket issuer for preventing double issuing(2000)
- Passport issuing device equipped with plural printing units(2000)
- Device for controlling printer head position of pass checking machine(2000)
- Driving control method of fixed amount pass confirming device(2000)
- Passage receiving apparatus for passage publisher(2000)
- Smart card for toll collection system installed at toll gate(2005)
- Hi-Pass(NTCS, Nonstop Toll Collection System) becomes available nationwide (2007)
- Implementing C-ITS pilot project of government(2014)

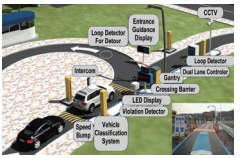




ITS Product & Technologies

Traffic information is provided through (1) collection of traffic data, (2) data processing, and (3) provision of traffic information. Traffic data including that on traffic flow or accidents are collected through such traffic management facilities as VDS, CCTV, AVC, and DSRC, as well as patrol teams and customers. The Traffic Information Center then combines and processes the data to provide traffic information to customers through the Internet, Traffic Broadcasting Services, Smart phones, VMS, and other devices.





Hi-pass is the KEC's proprietary brand for the unmanned electronic toll collection system (ETCS). If an electronic card is loaded into the Hi-pass device (On-Board Unit) in a vehicle, the vehicle is not required to stop at a tollgate to pay the toll as the toll is automatically paid through wireless communication between the device and the antenna installed on the lane. In short, it is an unmanned, no-stop, and non-cash toll payment system.

General Information

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KoROAD

Company Overview

Road Traffic Authority (KoRoad) has been doing its best to reduce traffic accidents by providing traffic safety education, checking safety facilities, developing traffic technologies , broadcasting traffic information and so on.
Especially from this year, 26 of driver's license test courses around the nation take charges of license work and it became the road traffic safety total service provider.
KoRoad will maximize organization's competence to save more citizens from traffic accidents, and through 'Serving Management', 'Science Management', 'Moral management' KoRoad will grow as a organization that is representing Korea on road traffic safety, and will take full response as a life saver and road guide.

Business Area

1st category

■ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

☐ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
- Multi Modal Information/Management - Bus Rapid Transit System/Solution
- Pedestrian/Disabled Support System

☐ Electronic Payment
- Electronic Toll Collection - Electronic Parking Payment - Electronic Fare Payment

■ Traffic Information Integration/Management
- Traffic Information Integration - Traffic Information Center Traffic Data Management

☐ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

■ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

☐ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

☐ Others ( )

2nd category

☐ Hardware ☐ Software ☐ SI ■ Consulting ☐ Others ( )

Ongoing ITS project or R&D

Research of Traffic Science
- The operation of international certified test agency (KOLAS)
- R&D of testing and specifications for safety facilities
- R&D of traffic equipment and traffic information management systems using (ITS)

Traffic Broadcasting Network (TBN)
- Provides fast and accurate traffic information to prevent traffic congestion and accidents

Public Relations for Traffic Safety
- National public relations campaigns aimed at enhancing the national understanding of traffic order principles and preventing traffic accidents
- Pan-national campaign, 'Reduce Traffic Accidents'
- Children's Traffic Safety Public Relations Center

Technical Support for Traffic Safety
- Improving traffic safety in frequent accident areas and providing statistical analysis
- Technical support for traffic accident investigations
- Suggestions for the design, supervision, inspection, and improvement of traffic safety facilities
- Improvement of the 'Safety Zone'
- Technical support, design, and supervision for traffic signal systems
- Management and inspection of automated traffic enforcement systems on consignment

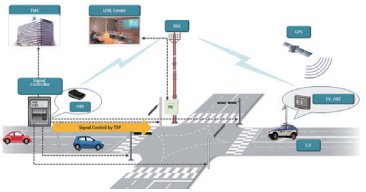
Others

International exchange
- PRI (La Prevention Routiere Internationale) regular member
- TR B (Transportation Research Board) regular member

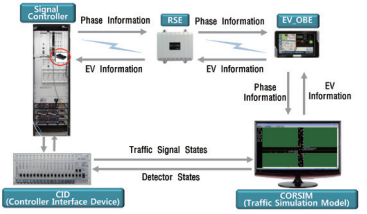
Patent
- total : 213 - a patent application : 27 - registration of patent : 186

ITS Product & Technologies

System(Based on UTIS)



Test and Evaluation



- Evaluation System based on HILS using existing devices (L/C, RSE, EV_OBE, LC_OBE etc.)
- Using CORSIM traffic simulation model
- Debugging the algorithm of TSP
- Evaluating the effectiveness of TSP

General Information

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KR industry Company

Company Overview

KR industry Company has emerged as a comprehensive construction company based on the technology and know-how accumulated in the maintenance of expressway(facilities) and the operation of expressway service area.
KR industry Company was founded in 1987 as a subsidiary company of Korea Expressway Corporation for operation and maintenance work of Expressway under the company name Sae-gil, it changed to Korea Expressway Management Corporation in 1995 and was incorporated into Kyeryong Group through privatization in 2002. In 2009, the company changed its name to "KR industry Company" to promote construction industry and break fixed image of Only O&M Company.
KR industry Company which has been recognized by the government for its excellent technical skills and sincere construction capabilities as a result it has been awarded commendations from the Minister of Land, Infrastructure and Presidential citation of Transport industry. After KR industry Company emerged from KEC(Korea Expressway Corporation), we operated Incheon international airport civil facilities and private financed expressways successfully.
KR industry will become a "super-high-capacity construction company" through a strategy to strengthen internal stability, including the establishment of diverse profit models through business diversification, stable financial structure, and continuous management innovation.

Business Area

1st category

☐ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

☐ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
- Multi Modal Information/Management - Bus Rapid Transit System/Solution
- Pedestrian/Disabled Support System

☐ Electronic Payment
- Electronic Toll Collection - Electronic Parking Payment - Electronic Fare Payment

☐ Traffic Information Integration/Management
- Traffic Information Integration - Traffic Information Center Traffic Data Management

☐ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

☐ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

☐ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

■ Others (The Operation & maintenance of facilities)

2nd category

☐ Hardware ☐ Software ☐ SI ☐ Consulting ■ Others (The Operation & maintenance of facilities)

Ongoing ITS project or R&D

The operation & maintenance of private financed expressway with ITS (Intelligent Transport System)

- The operation & maintenance of 「Sangju-Yeongcheon expressway」
  - The first Introduction of one-tolling system in Korea
  - The longest private financed expressway in Korea
- The operation & maintenance with ITS of 「Deoksong-Naegak expressway」, 「Changwon-Busan expressway」, 「Daegu beltway」, 「Oksan-Ochang expressway」 etc.

Others

Business performance

- The operation & maintenance of 「2nd Yeongdong Expressway」, 「Capital Region First Ring Expressway」
- The operation & maintenance of 「Incheon international airport civil facilities」
  - Airport facilities inspection & maintenance, Winter snow removal operation, Emergency response, Technical review etc.
  - Contribution to the record of the best airport service for 12 consecutive years.
- The operation & maintenance of 「Incheon international airport expressway」
  - Logistics expressway in Seoul metropolitan area.
  - Connecting Yeongjongdo and Incheon(4.4km)
- Future performance
- The operation & maintenance of 「Sheikh Jaber Al-Ahmad Al-Sabah Causeway」 in Kuwait
  - The Main Link is the 4th longest road bridge in the world. The overall causeway consists of two bridges. Both brides have a combined length of 48.53 kilometers.
  - Implementation of a high-tech SCADA system
  - O&M of 6 traffic control surveillance centers
  - O&M of the surveillance cameras

ITS Product & Technologies

Product Offerings

Technologies

- ITS facilities maintenance
- Software management
- Server·Network management
- Emergency response to failure

General Information

Company Name : KR industry company
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KT

Company Overview

KT is the major telecommunications company in South Korea, leads the ICT industries especially in 5G and gigabit-Internet and has various business portfolio in media, finance, security, energy and convergence fields. Among those services, smart city and smart transportation including C-ITS and autonomous vehicles based on 5G network are one of the fast growing business fields which are to expand overseas.

Business Area

1st category

☐ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

☐ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
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- Traffic Information Integration - Traffic Information Center Traffic Data Management

☐ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

■ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

☐ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

☐ Others ( )

2nd category

☐ Hardware ■ Software ■ SI ■ Consulting ☐ Others ( )

Ongoing ITS project or R&D

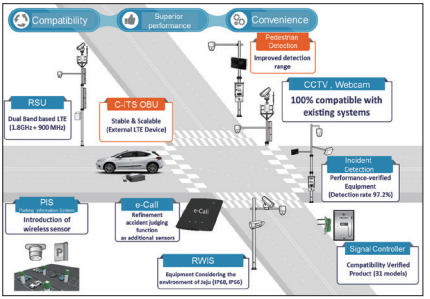
- **Jeju C-ITS empirical Project(2018~2020):** 15units C-ITS services through building center system and site support device
- **Giga Korea Project(2018~2020)**: Development 5G based Autonomous driving solutions
- **2nd Techno Valley, Pangyo**: building the world's first autonomous vehicle cluster
- **Sangam Digital Media City PoC**: Pilot operation of KT 5G self-driving bus in the Sangam-dong area, accelerating a verification of self-driving mobility.

ITS Product & Technologies

Product Offerings

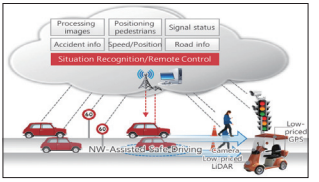
C-ITS Solutions

- C-ITS refers to Cooperative Intelligent Transport Systems using geo messaging technology to allow vehicles, traffic signals and roadside infrastructure to communicate with each other over the mobile network. The objective of C-ITS is to make road traffic safer and more efficient. KT provide 15 units of C-ITS services in Jeju province.



C-ITS Platform

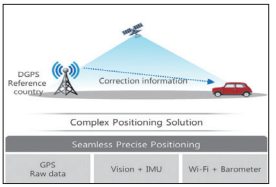
- KT's C-ITS Platform enables drivers to receive personalized traffic information instantaneously and to anticipate traffic conditions. This is a revolutionary opportunity to optimize travel times for drivers, improve safety on the road network and make it possible for road authorities to reach the road users.



Technologies

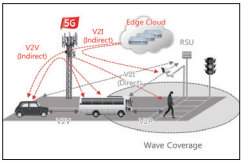
KT precision positioning

- KT have own position correction technology. This technology can make centimeter-precision positioning accuracy using cheap GPS. Such centimeter precision system could let autonomous vehicles navigate safely.



5G C-V2X

- The C-V2X technology uses mobile cellular communication networks to share vast amounts of data in real time between vehicles, infrastructure, pedestrians, traffic management centers and other connected systems, enhancing the safety of automated driving. Using a 5G network that is 100 times faster than existing 4G cellular systems, it becomes possible to reflect traffic information in real time.



General Information

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LAON ROAD

LAON ROAD

Company Overview

LAON ROAD provides an AI-based technological solution to traffic. We are currently in the ongoing process of building advanced mobility systems and infrastructure based on AI imaging technology with traffic analysis capabilities. Using LAON TAS (Traffic vision Analysis System), LAON ROAD successfully ran smart intersection at 133 different intersections in Hwaseong-Si and provided AI solutions for traffic issues which was an exceptional case in Korea. Based on this data, we are continuing to work with other cities to develop more smart intersection projects. With such imaging, we were able to develop the first AI-equipped traffic video camera in Korea, supply AI smart intersections, smart crosswalks, AI VDS, AI emergency risk detection system, and traffic analysis platforms.

Business Area

1st category

■ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

☐ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
- Multi Modal Information/Management - Bus Rapid Transit System/Solution
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- Electronic Toll Collection - Electronic Parking Payment - Electronic Fare Payment

■ Traffic Information Integration/Management
- Traffic Information Integration - Traffic Information Center Traffic Data Management

☐ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

■ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

☐ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

☐ Others ( )

2nd category

■ Hardware ■ Software ■ SI ☐ Consulting ☐ Others (The Operation & maintenance of facilities)

Ongoing ITS project or R&D

Korean Government Projects

- Gyeonggi, Hwaseong - Smart intersection (2021)
- Gyeonggi, Anyang - Smart intersection (2022)
- Gyeonggi, Seongnam - Smart intersection (2022)
- Jeolla, Gwangyang - Smart intersection (2022)

Others

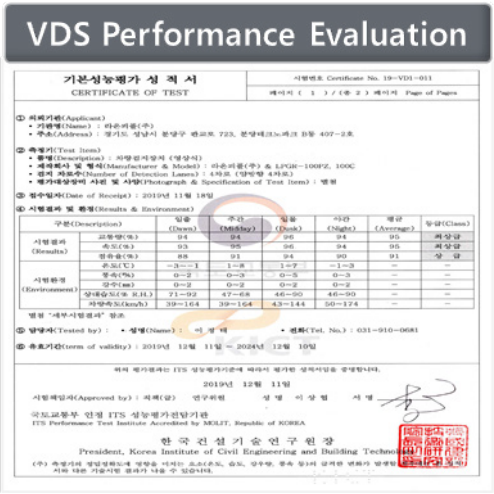
Business performance

- LAON ROAD is the first company in Korea to participate in a real-time traffic control demonstration project in Anyang-Si..
- LAON ROAD has successfully run real-time traffic sign control system using our own AI video analyzing system (TAS) with certified efficiency. (19.10~'20.12)
- LAON ROAD has reached over 95% accuracy in detecting vehicles and has demonstrated improvements of up to 15% to traffic speed compared to conventional traffic systems.

ITS Product & Technologies

Product Offerings

LAON ROAD



- Capability to detect two-way four-lane roads during sunrise, sunset, daytime, nighttime, snow, rain and in foggy environments.
- High-yielding accuracy in traffic volume calculations(top, 95%), vehicle speed (top, 95%), and vehicle occupancy in ROI (Region Of Interest) (top, 91%).
- Develop machine learning data and algorithm model for AI video analysis and identification.

Technologies

Smart Intersection

- Smart intersection is a cutting-edge system that collects and analyzes various Smart intersection is a cutting-edge system that collects and analyzes information such as intersection traffic and potential risk factors using AI in order to improve city traffic flow through a variety of solutions such as TOD improvement, real-time signal control, and traffic policy establishments based on the information received through the system.

LAON TAS (Traffic vision Analysis System)

- Detects vehicles and pedestrians through AI video screening to analyze the real-time traffic situation at intersection locations.
- Detects the location of the pedestrian and identifies vehicle characteristics (vehicle model, size) etc.
- Tracks the identified object's location, direction, and speed to analyze pedestrian volume, traffic volume, and the proportion of cars making turns.
- Analyzes vehicle traffic violations, stop line violation, tailgating, and traffic accident using location and tracking data.

LAON ROAD

LAON TMS (Traffic Management System)

- TMS indicates data collected from TAS deep learning algorithm on a map, allowing users to monitor traffic information in a more convenient manner. Intuitive GIS (Geographic Information System) view, interactive charts, and dashboard are offered for users as well as Web-based AI traffic information management.
- TMS is serviceable for traffic information analysis and policy establishments with a hierarchical structure optimized for spatiotemporal analysis, ranging from all intersections to individual intersections or roads through compositions of comparative analyses.

LAON DTN (Digital Twin Network)

- LAON ROAD DTN models the dynamic flow of real-world transportation networks. Based on real-time traffic data obtained from TAS, it implements real-time synchronized smart intersection digital twins, and uses AI reinforcement learning and simulations to visualize intermediate road traffic flows that cannot be obtained directly from road infrastructure with accurate predictions.
- In connection with LaonRoad TMS, we provide intuitive GIS-based traffic statistics, carbon emission prediction, and comparative service with before/after signal optimization.

General Information

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LG CNS

Company Overview

LG CNS shapes the future of our life. We are dedicated to reinventing the way we live by applying innovative IT solutions to all that exists. LG CNS provides comprehensive consulting, system construction and operation services in Korea and around the world with expertise earned from years of large-scale IT project successes. We are leading the Fourth Industrial Revolution with Cloud, AI, Big Data, IoT, Blockchain, and other new information technologies.

Business Area

1st category

■ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

■ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
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- Pedestrian/Disabled Support System

■ Electronic Payment
- Electronic Toll Collection - Electronic Parking Payment - Electronic Fare Payment

■ Traffic Information Integration/Management
- Traffic Information Integration - Traffic Information Center Traffic Data Management

■ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

■ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

■ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

■ Others (Platform Screen Door, Air Traffic Control)

2nd category

■ Hardware ■ Software ■ SI ■ Consulting ■ Others (Operation and Maintenance, PSD)

Ongoing ITS project or R&D

-Hellas Smart Ticket Project in Athens, Greece
- AFC & FMS project in Bogota, Colombia
- MRT Feeder bus project in Kuala Lumpur, Malaysia
- T-money
- Smart Tolling project in Korea
- Lusail LRT platform screen door project in Qatar

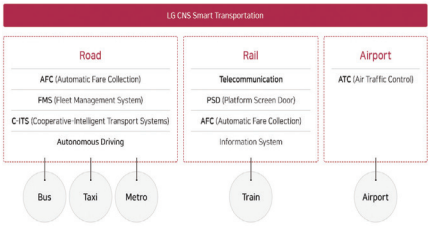
Others

- SIL4 : the highest level of safety in PSD (first in Korea)

ITS Product & Technologies

Product Offerings

LG CNS is creating Smart Transportation success stories with IT. Safe and and effective transportation services that on their own are evolving rapidly to become more convenient, time efficient, and cost effective. Smart Transportation is a service implemented and operated with IT to enable more convenient, safer transportation encompassing all means of transportation from bicycles, passenger cars, buses and subways, to railways, and airplanes.



Technologies

1. AFC Solution

LG CNS's AFC solution enables convenient electronic fare payment for all transportation systems. The solution mainly consists of electronic payment solutions for both passengers and vehicles, and it has evolved into the ABT and Open Payment platform beyond the existing closed-loop method, ultimately seeking to develop into Mobility as a Service (MaaS).

With the expertise and technologies acquired through experiences in many cities around the world, LG CNS provides end-to-end smart fare collection solutions and services by integrating transportation fare information, transportation vehicle information, and transportation route information.

LG CNS's AFC solution provides transport operators with higher efficiency, profitability, and convenience by delivering unified fare management technology. LG CNS is an integrated solution provider that can supply everything from all types of AFC equipment, to solutions and application services for success in the public transit business sector.

2. FMS Solution

LG CNS's FMS provides scientific planning & allocation services from the planning stage and operation schedule, to optimal vehicle and driver allocation. During transit it provides real-time bus position tracking and management services so that drivers and center operators can maintain optimum intervals between vehicles and optimize vehicle/driver allocation more efficiently. Multiple information services including expected arrival time and bus route information through PIPs (Passenger Information Panels) installed in bus stops and buses, and accessible through mobile phones and sites on the Internet. By automating and organizing the entire process of bus operation from service schedules to statistics and reports, it enables flexible, effective responses to the changing needs of drivers, operators, bus companies, and government. LG CNS provides a Total IT Solution with AFC and monitoring for General and Rapid Transit Buses.

3. ITS/C-ITS Solution

As LG CNS's traffic control solution, it provides integrated, systematic solutions in all areas of traffic management including traffic information analysis, real-time monitoring and accident management, and traffic signal control.

The increase in urban populations and automobiles is increasing traffic congestion as well as the risk of accidents, with energy waste and air pollution emerging as social issues. In addition, the importance of the metropolitan area traffic management system is emphasized to meet the increased demand for metropolitan area transportation due to the expansion of the city and road networks.

LG CNS's traffic control solution provides integrated, systematic solutions in all areas of traffic management, including traffic information analysis, real-time monitoring and accident management, and traffic signal control. It also provides the latest traffic control system based on the V2X solution, a key technology of C-ITS.

4. PSD

A PSD system with SIL-4 (Safety Integrity Level-4), this glass and steel structure is installed between subway platforms and train tracks to protect passengers and create a more comfortable environment. Platform screen doors synchronize to open and close automatically with train doors.

The PSD system ensures safety by physically separates railway tracks from platform where passengers wait. When trains enter the station, the PSD also transfer if dust and dirty air, and reduce heating and cooling expenses for stations, providing a more comfortable and pleasant transit experience. Interfaced with the train signaling system so when trains arrive and depart, the Motorized Sliding Doors (MSD) operate and control passenger movement. Emergency Exit Doors (EED) are installed along with MSD so in emergencies, passengers can go reach platforms after opening the doors from the rail tracks. All MSDs and EEDs can be opened and closed manually from the tracks, ensuring the safe evacuation of passengers in emergencies. All opening and closing of PSDs are monitored and adjusted with multi-layered sensors as well as a control unit. SIL (Safety Integrity Level) 4, a high-level safety standard, has been applied to the PSD system, providing the driver with a driver indicator to check the operating status of PSD and DCP (Driver Control Panel) for controlling MSDs in case of an emergency.

General Information

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LG U+

Company Overview

LG U+ leverages LG Group's network and capabilities to provide life-changing services for our customers. Experiences next-level mobile, home and Enterprise services with our superlative network quality. 5G enterprise services with enhanced mobility, city, factory and security features. Specially, LG U+ have focused on smart mobility for future mobility business such as ITS, C-ITS and autonomous vehicle. LG U+ tried providing innovative technical service using 5G NW and autonomous driving.

Business Area

1st category

■ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

☐ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
- Multi Modal Information/Management - Bus Rapid Transit System/Solution
- Pedestrian/Disabled Support System

☐ Electronic Payment
- Electronic Toll Collection - Electronic Parking Payment - Electronic Fare Payment

■ Traffic Information Integration/Management
- Traffic Information Integration - Traffic Information Center Traffic Data Management

☐ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

■ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

☐ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

☐ Others ( )

2nd category

☐ Hardware ☐ Software ■ SI ■ Consulting ☐ Others ( )

Ongoing ITS project or R&D

-Gangneung City, ITS Project.
· Sejong City, Autonomous driving Big Data Platform and Center.
· Gwangju City, Remote Control Center for Autonomous Special vehicle.
· Siheung City, Autonomous driving Mobility Service project.
· R&D, Autonomous driving Technology Development for Handicapped person.
· R&D, Autonomous driving Technology Development of On-demand Public Transport.
· R&D, Recognizing Road Conditions Technology Development based on Infrastructure Sensors.
· Seoul, Traffic Signal Control System based on LTE.

ITS Product & Technologies

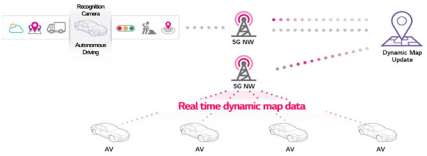
Technologies

- technology related to system integration of Auto Fare Collection System
- technology related to system integration of Electronic Toll Collection System
- technology related to system integration of Bus Information System and Bus Management System (Fleet Management System)

(1) World's first 5G NW based Autonomous driving test

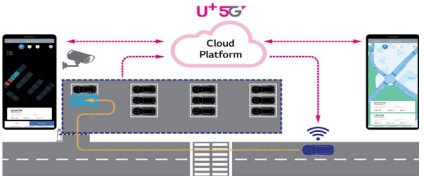
LG U+ has been verified autonomous driving technology for driving test.

- World's first 5G NW based autonomous driving test (8km urban expressway in Seoul) ('19.03)
- Coordinated autonomous driving based on 5G-V2X communication ('19.10)



(2) 5G Autonomous Parking System

LG U+ Autonomous Parking System enables real-time parking lots monitoring based on intelligent CCTV. Driver can check parking lots and controlling autonomous parking using mobile APP. After the driver's request, self-driving and parking from the drop-off point to the parking space.



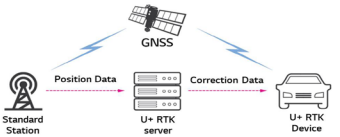
(3) Big Data analysis platform for Autonomous driving

LG U+'s big data platform enables the center operator to control real-time vehicle status, dangerous situations and big data analysis function. Also, platform provides road information and accident information for safety autonomous driving environment.

- Real-time processing with AV Platform: utilized for remote debugging and calibration.
- Big Data Collection/Analysis: Collection/management of logging files, data retrieval and extraction by driving situation.
- AV monitoring: vehicle location, Displaying the raw data of sensor, Indicates whether the sensor and controller fail or not.
- Statistics: autonomous driving time/distance per driver intervention.

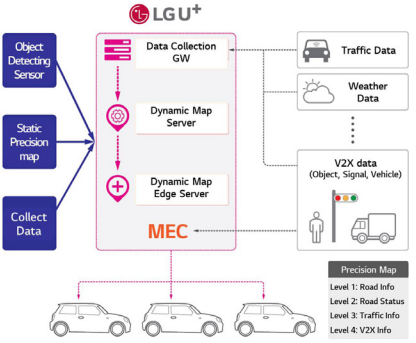
(4) Real Time Kinematic(RTK) solution

LG U+'s development RTK solution for Autonomous vehicle's precision positioning. U+RTK integrated solution to provide precision positioning in cm level. Provides single RTK and network RTK calibration services for national coverage.



(5) Dynamic high-density map platform

LG U+'s Dynamic high-density map platform can be easily linked with autonomous vehicles by applying 5G MEC with domestic and international standard specifications. This platform supports optimal route search and efficient autonomous driving with Dynamic high-density map transferred to real roads. It is a help to autonomous vehicles can drive with confidence.



General Information

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LOTTE Data Communications Company

LOTTE DATA COMMUNICATION

Company Overview

LOTTE DATA COMMUNICATION COMPANY (LDCC) is a subsidiary of LOTTE group which identifies hidden customer needs and establishes a business model for them. LDCC offers Total IT Service, covers the entire process of Digital Transformation based on next-generation core technologies and practices ESG management. Also, LDCC is expanding Mobility business such as Smart Transportation Solution, Smart Tolling System, ITS/C-ITS, Autonomous Shuttle and charging infrastructure for electric vehicles.

Business Area

1st category

■ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

■ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
- Multi Modal Information/Management - Bus Rapid Transit System/Solution
- Pedestrian/Disabled Support System

■ Electronic Payment
- Electronic Toll Collection - Electronic Parking Payment - Electronic Fare Payment

■ Traffic Information Integration/Management
- Traffic Information Integration - Traffic Information Center Traffic Data Management

■ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

■ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

■ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

■ Others (Smart Tolling, Charging infrastructure for electric vehicles)

2nd category

■ Hardware ■ Software ■ SI ■ Consulting ■ Others (Operation and Maintenance)

Ongoing ITS project or R&D

- Sejong City Autonomous Driving Demonstration Regulation Free Zone R&D
- 2021 Central Region Multi-lane Hi-pass Manufacturing Purchase (including installation)
- Fast Charging Facility Auxiliary Business of Electric Vehicles conducted by the Ministry of Environment and the Korea Environment Corporation
- Expressway ITS operation facility of Icheon-Osan

Others

Certification

- KC Certification of multi-lane hi-pass video recording device (AI vehicle number recognition solution) (2020)
- Certification of non-stop and multi-lane electronic payment system (2018)
- ISO9001, CMMI Level 3, ISO20000, ISO27001, ISO50001, ISMS, GS

Prize

- Excellent company in win-win growth index evaluation (2019)
- The 17th Korea SW Enterprise Competitiveness Comprehensive Grand Prize - Minister of Science, Technology and Information Communication Award (2018)

ITS Product & Technologies

Product Offerings

Multi-lane hi-pass

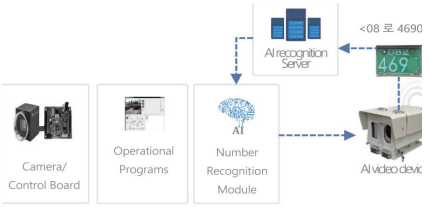
- Non-stop toll collection in high-speed driving
- Non-disruptive operating system

Automated Fare Collection

Automated Billing Infrastructure	Fare collection system	Development of payment method

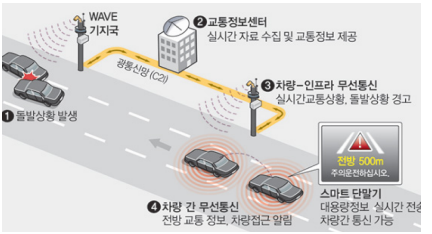
- Toll processing and transaction data collection through electric money when using public transportation

AI video recognition Solution



- AI Deep learning and central control services using Cloud
- 24-hour unattended operating system on over 99% recognition rate

ITS/C-ITS



- Intelligent transportation that communicate with vehicles, roads, and infrastructure to provide to drivers with real-time information

LOTTE Data Communications Company

Technologies

Autonomous driving System

- SAE J3016 level 4 Autonomous driving shuttle
- Intelligently reacts and interacts with road unexpected situations and traffic signals through C-ITS linkage
- Precise obstacle detection and collision prevention through 3D Lidar and Ultra-sound sensors

Charging infrastructure for electric vehicles

- Providing electric vehicle user service; electric vehicle charging station, personalized data service, payment and etc.
- Providing Battery Management System and parking linkage system and etc.
- 24-hour unattended operating system on over 99% recognition rate

General Information

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L&D Tech Co., Ltd

(주)엘앤디테크 LED&DISPLAY

Company Overview

L&D Tech Co., Ltd. is a company specializing in "energy-saving LED fusion products."

Under the slogan of customer satisfaction, customer emotion, and customer trust, L&D Tech Co., Ltd. wants to become a company that always thinks, judges, and practices customers.

With the advent of the 21st century's knowledge society, we will demonstrate our commitment to being at the top of the LED fusion system for environmental and energy-saving issues required across all industries

Business Area

1st category

■ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

☐ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
- Multi Modal Information/Management - Bus Rapid Transit System/Solution
- Pedestrian/Disabled Support System

☐ Electronic Payment
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☐ Traffic Information Integration/Management
- Traffic Information Integration - Traffic Information Center Traffic Data Management

☐ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

☐ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

☐ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

☐ Others ( )

2nd category

■ Hardware ☐ Software ☐ SI ☐ Consulting ☐ Others ( )

Ongoing ITS project or R&D

- A Study on the Development of High-Luminance LED Package with Adjusted Radiance Angle in Jeollabuk-do Technopark

Others

- Certification ISO9001:2015
- Patent No. 10-1970938 (2020)

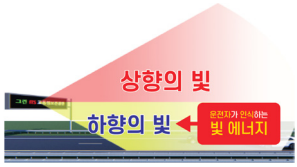
L&D Tech Co., Ltd

DIRECTIONAL ANGLE ADJUSTMENT LIGHT EMITTING ELEMENT PACKAGE AND LIGHT (PCT/KR2019/009549)
- Chinese patent application (2019.12)
- U.S. patent application (2021.04)

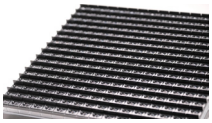
• Patent No. 10-2105793 (2020)
DIRECTIONAL ANGLE ADJUSTMENT LIGHT EMITTING ELEMENT PACKAGE AND LIGHT
• Patent No. 10-2305219 (2021)
LIGHT EMITTING ELEMENT PACKAGE HAVING HALF DOME-SHAPED LENS MEMBER AND LIGHT EMITTING (PCT/KR2021/015761)
• Patent No. 10-2774013 (2021)
Modules for LED display with improved waterproof properties

ITS Product & Technologies

Product Offerings



VMS controlling down by controlling the light emitted from conventional upwards



- LED module (25W/module)

- Installation

Technologies

LED modules have the greatest impact on LED display performance and energy consumption, with LED devices emitting light at the same orientation angle in all directions, and upward light is unnecessary light that is not passed to the user, causing energy waste and light pollution to be controlled. To solve this problem, we invented an LED package and a light-emitting device using a lens to control the upward light downward that is shown to the user by an internal reflective structure.
This can control directional angle, significantly reduce manufacturing costs, significantly reduce light pollution, and significantly reduce power consumption by about 50% compared to before, and greatly increase brightness with light loss suppression. In addition, it is a new technology that responds to carbon neutral trends caused by the global climate crisis by reducing carbon emissions as well as economic efficiency due to reduced power consumption.

General Information

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METABUILD Co., Ltd.

METABUILD CO., LTD.

Company Overview

METABUILD Co., Ltd. is a professional middleware solution company which has researched, designed and developed EAI and BPM product for business industries with plenty of experiences over 23 years since 1998. We are as one of the leading software development companies in South Korea, successfully deployed ITS solutions over 3000 organizations including government administrations such as the Ministry of Information and Communications (currently, the Ministry of Science, ICT and Future Planning), the Ministry of Defense and etc. We are expanding fast, firmly based on proven technologies and customer satisfaction, maintaining reputation of being the most recognized products and use of highly advanced technology. Our dedicated teams share a vision of creating truly superior technology.

Business Area

1st category

■ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

☐ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
- Multi Modal Information/Management - Bus Rapid Transit System/Solution
- Pedestrian/Disabled Support System

☐ Electronic Payment
- Electronic Toll Collection - Electronic Parking Payment - Electronic Fare Payment

■ Traffic Information Integration/Management
- Traffic Information Integration - Traffic Information Center Traffic Data Management

☐ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

☐ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

☐ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

☐ Others ( )

2nd category

■ Hardware ■ Software ☐ SI ☐ Consulting ☐ Others ( )

Ongoing ITS project or R&D

- Development of Cooperative Automated Driving Highway Systems.
- Cooperative ITS Project.
- Development and Verification of Signal Operation Algorithms in Local Intersection Network utilizing V2X Communication Infrastructure.

METABUILD Co., Ltd.

Others

Certification
- "A radar sensor based Realtime Incident Detection System" New Technology Certification
- ISO 9001
- INNO-BIZ (reword for Technological Innovation)
- Qualified as Software Development Leading Company of Venture Industry in Korea

Prize
- Steel Tower Industrial Medal was awarded by government in recognition of contribution to IT industry in 2016
- The leader of Software Development Industry in 2010
- The reward for Smart Highway Research in 2010
- The reward for Korean Intellectual Property Office System

Patent
- Road monitoring method using RADAR and apparatus thereof. And so on.

ITS Product & Technologies

Product Offerings

1. Smart-IDS(Incident Detection System)

Smart-IDS (Incident Detection System) is a radar based real-time incident detecting and monitoring system for preventing accidents and congestion on the road. It detects incidents such as stopped vehicle, wrong way driving, accident, fallen object and pedestrian on the road in all weather condition. Also, it provides the current traffic information to administrator using GUI based S/W and notifies this information to drivers in advance to avoid accident.

<Functions>
- ALL weather operation
- Remote control function
- Detecting fixed/moving object on the road
- Automatic checking risk factors and providing the information
- Providing all statistical analysis information
- Sending detecting information to center

<Technical Specifications>
- Frequency Ka-band 34GHz
- Detection Range Max. 1km
- Range accuracy : ± 2m
- Speed accuracy : ± 2kph
- Refresh Time 100ms
- Size(mm) : 350(W)×350(L)×350(H)
- Weight 10kg

2. Smart-VDS(Vehicle Detection System)

METABUILD CO., LTD.

SMART-VDS (Vehicle Detection System) is a radar sensor installed on road facilities or roadside that collects traffic information by detecting in real time the location, speed, traffic volume, and reverse running of individual vehicles traveling on the road within 200m (4-lane round trip) detection area.
The SMART-VDS radar sensor has no effect on the detection performance of weather conditions such as day/night, fog, heavy rain, and heavy snow, and can detect various types of road obstacles such as vehicles, motorcycles, and general objects.
It is widely used in advanced ITS, next-generation transportation (C-ITS), and autonomous driving.

<Features>
· It can be installed near road entrances and intersections to detect lane changes that the existing VDS cannot detect.
· Maintain performance even in adverse conditions such as closed tunnels and bridges with frequent fog
· No restrictions on installation location due to variable collection area setting
· As a lightweight product, it can be installed on existing traffic lights and signs, thereby significantly reducing installation costs and construction period.
· Easy installation, operation, and maintenance regardless of weather conditions and road pavement as it is a non-buried equipment
· Application of speed compensation function according to the installation height

3. Smart-City

Smart-City is an integrated control platform for smart city construction & operation. It is a system that enables intelligent urban situation control and various services to be created / operated by utilizing technologies of IoT, Cloud, Bigdata, AI and Mobile.

<Features>
- Integrated operating environment support
  - Integrated service operating environment
  - Situation-specific situation response
- Apply function integration structure
  - Including common features
  - Module
- New technology platform
  - IoT/ESB/Cloud/Edge
  - Drone/AI/Bigdata
- S-Service extendability
  - Embedded Service Module
  - Additional link flexibility
  - Citizen-led / problem-solving

General Information

Company Name : Metabuild Co.,Ltd.
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MORU Industrial Systems Co., LTD.

Company Overview

MORU Industrial Systems is a typical ITS (Intelligent Transportation System) base solution provider in Korea.
MORU Industrial Systems developed a new Vehicle Detect Technology and provides related products ; Wireless Loop Detector etc.

Business Area

1st category

■ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

☐ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
- Multi Modal Information/Management - Bus Rapid Transit System/Solution
- Pedestrian/Disabled Support System

☐ Electronic Payment
- Electronic Toll Collection - Electronic Parking Payment - Electronic Fare Payment

☐ Traffic Information Integration/Management
- Traffic Information Integration - Traffic Information Center Traffic Data Management

☐ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

☐ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

☐ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

■ Others (Parking Information System)

2nd category

■ Hardware ☐ Software ☐ SI ☐ Consulting ☐ Others ( )

Ongoing ITS project or R&D

Wired Loop Detector (K-LOOP Series for Barrier Interlock&LPR Trigger) : Compact, Strong, Reliable

Others

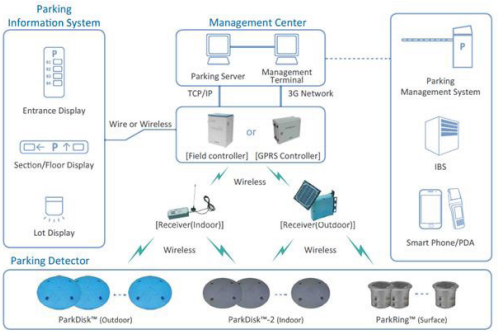
Certification
- ISO 9001:2008

Prize
- THE COMBINED LOOP TYPE AUTO-MOBILE SENSOR USING LOOP COIL AND PARKING INFORMATION SYSTEM THE SAME
- TRAFFIC INFORMATION DETECTION SYSTEM AND METHOD THEREOF

ITS Product & Technologies

Wireless Loop Detector (ParkDisk, ParkRing) for Parking Lot

- All-In-One type Wireless Loop Detector
- Micro Power Consumption Technology Based Wireless Parking Detector
- Wireless Data Communication (ISM Band, Sub 1GHz)
- Very Long Battery Life (10 Years)
- Easy Installation
- Automatic Compensation Algorithm for Temperature
- Waterproof & Heavy Duty Design for Outdoor Parking Lot



Wireless Inductive Loop Vehicle Detector for Intersection Traffic Signal

- Traffic Signal Control Purpose Optimized
- World First Wireless Inductive Loop Vehicle Detector
- 1st NexLoop Series Product

General Information

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MQNIC Co,.Ltd.

Company Overview

MQNIC is the company which provides optimized IT solutions. It consists of a staff with experience in the successful implementation of various projects. Based on recognized technology, reliability and know-how in addition to the private / public sector and expand into overseas.

Business Area

1st category

■ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

■ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
- Multi Modal Information/Management - Bus Rapid Transit System/Solution
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■ Traffic Information Integration/Management
- Traffic Information Integration - Traffic Information Center Traffic Data Management

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- Pre/On-Trip Traveler Information Service - Telematics Service

■ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

■ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

☐ Others ( )

2nd category

■ Hardware ■ Software ■ SI ■ Consulting ☐ Others ( )

Ongoing ITS project or R&D

Project

2022 National Transportation Information Center SW Functional improvements
- 2022 National Highway Traffic Information Integration System Expansion Construction Implementation Design (ISMP) Service
- 2022 Emergency Medical Mobile Integrated Operation and Maintenance Business
- LGensol BSS Establishing an Integrated Control System - Mobile Application Development
- 2022 TMAP Public Transportation Open API Development

R&D

- [ITS Innovation Competition Project] ITS Innovation Service Based on High-Precision Communication Data Positioning Technology
- [Autonomous Driving Technology Development Innovation Project] Crowdsourcing-based Digital Road Traffic Infrastructure Convergence Platform Technology Development
- [Autonomous Driving Technology Development Innovation Project] Development of Road Traffic Digital Twin Using Autonomous Driving Lv4/4+ Big Data
- [Smart City National Demonstration City Innovation Service Model Verification Diffusion Project] Development of real-time mobile location data-based signal intersection optimization service

Others

Patent

- Map quality assessment score generation and distribution system with precision
- Map management system and method with location-based precision, 5 other cases

Prize

-2 016 Software Industry Competitiveness Award Business Capability Strengthening Grand Award
- 2017 Software Industry Competitiveness Award Mobile Embedded Division Grand Award
- 2017 A Ministerial Award by Ministry of Land, Infrastructure and Transport 2017
- A Appreciation Plaque by PyeongChang Organizing Committee for the 2018 Olympic & Paralympic Games

-SK telecom Pride Award 2020

Certification

- Maturity Level 2, CMMI – Development Issued to MQNIC
- 2019 ISO 9001 'Quality Management System'
- 2020 GS Level 1 'Automotive traffic management inter platform 1'
- 2021 Inno-Biz

ITS Product & Technologies

Technologies

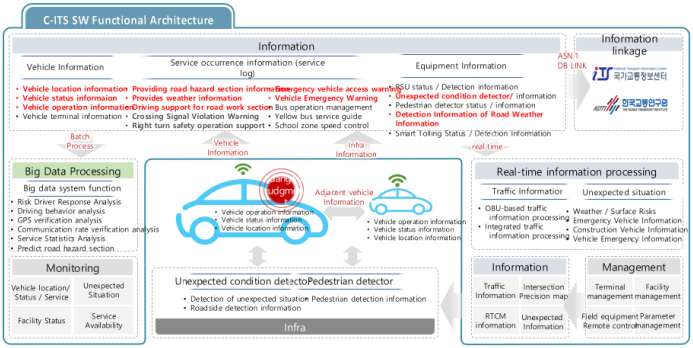
1. Mobility Platform

Real-time traffic information, route navigation, maps, geocoding, POI information, search functions, etc. are collected in conjunction with various mobility elements, processed in an optimal form that reflects the customer's requirements, and then the RestFul API and Mobile (Android, iOS) SDK are deployed.

MQNIC Co,.Ltd.

2. C-ITS

By applying communication technology to components of traffic such as road vehicle cargo, we collect and manage traffic information, maximize the efficiency of use of traffic facilities, and provide useful information to passers-by to enhance traffic use convenience and traffic safety.



3. LBS

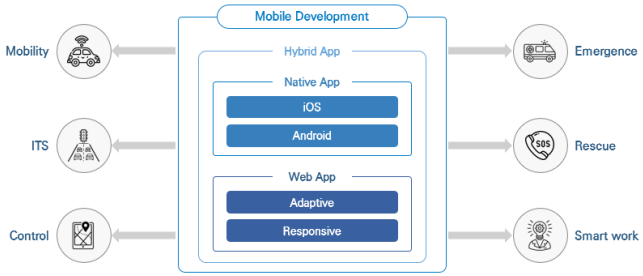
Based on location information obtained from various kinds of devices, we implement various systems such as control, public safety, location-based service and marketing. In addition, we can develop various services such as logistics, transportation and route plan

4. ISP

Conduct a comprehensive analysis and evaluation of all the components that make up an organization, from the strategy of the enterprise or institution to the business processes, organizations, applications, information technology and infrastructure, and derive the informatization challenges needed for the present and the future.

5. Mobile Service

Mobile web standards and systems tailored to a variety of mobile environments provide optimized screens and functions for any model, and provide a UI/UX that users can use comfortably and usefully with the input of professional designers

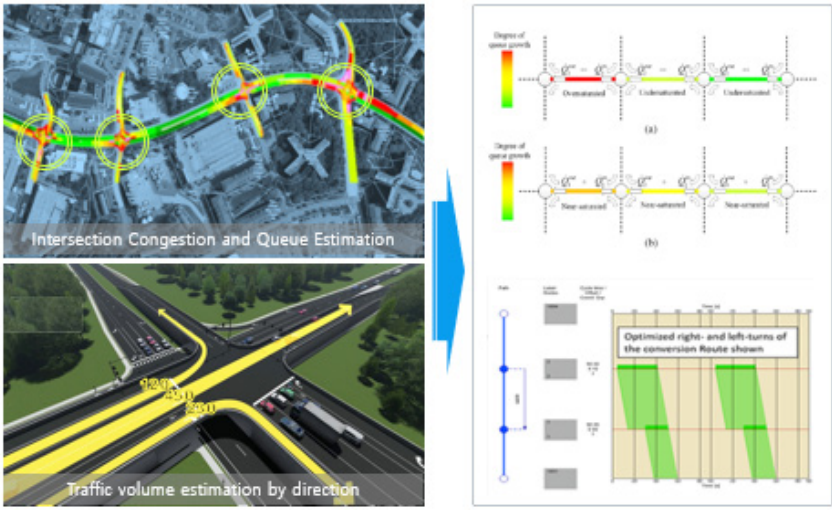


6. R&D

Conduct national/public R&D related to autonomous driving, from basic research at the level of Technology Readiness Level (TRL) Level 1 to research on the development of empirical areas at the Level 7 level.

7. LID

We have developed LID (location intelligence data) for transportation operation and forecasting. This technology converts mobile communication data into HD location data. This technology, which utilizes data from the largest telecommunication company in Korea, does not require any application. In addition, it is possible to collect data about 40% of all domestic travels in real time.

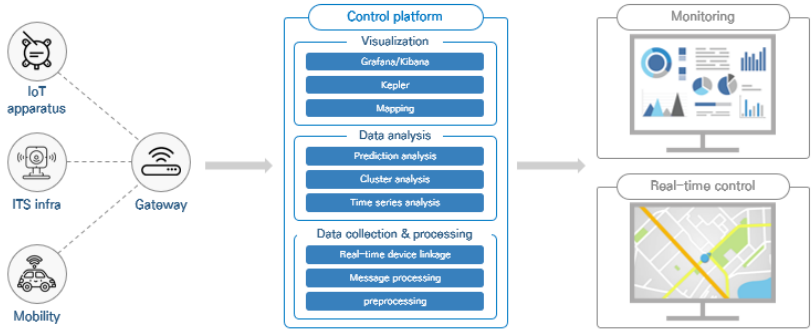


[Traffic volume anaiysis] [Road network signal optimization]

8. Control

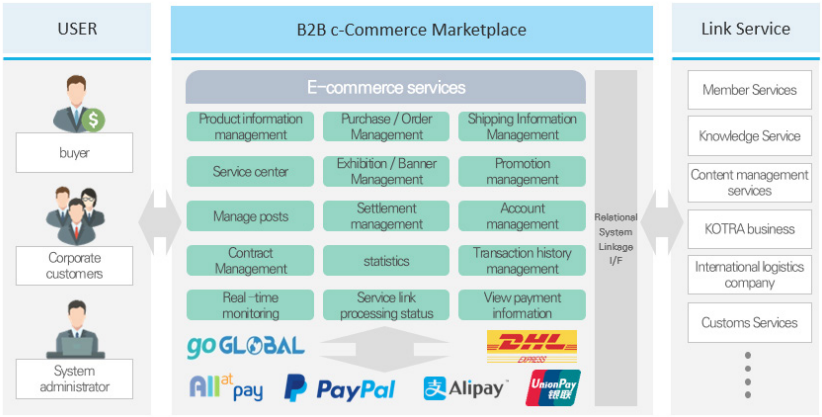
By processing various location and status information collected through IoT devices and road infrastructure, we visualize the on-site information desired by customers in real time to provide monitoring and control services.

MQNIC Co,.Ltd.



9. E-Commerce

We have built a variety of e-commerce platforms from public B2C e-commerce platforms to global B2B e-MarketPlace platforms, and linked PG Corporation, VAN Corporation, and Easy Payment Services to provide a user-centric online payment environment.



MQNIC
Maximum Quality-Based Electronic

10. IoT

Control IoT devices in real time and process information collected from IoT devices to analyze data through a variety of analytical methods. We provide monitoring services based on visualization tools such as Grafana, Kibana, and Kelper to verify real-time data processing.

11. Bigdata

Generate a variety of data with knowledge to support your customers' accurate decisions. Extract the source data in the optimal form according to customer requirements · After machining and performing analysis using machine learning techniques, we offer various data visualization services such as Kibana, Grafana and more.

General Information

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NDS Corporation

Company Overview

NDS is IT service provider which has led informatization in various industrial fields including public works, manufacturing, distribution/logistics and development and operation of information system of Nongshim Group for last 30 years. NDS has a capability of global standard information service which provide customers with the best solution based on rich experience accumulated so far.
NDS is planning to be realized as 'Next Generation IT Service Provider' by enhancing capability of cloud service and ICT construction in preparation for the future, best to secure world class IT skills through continuous investment in R&D.

Business Area

1st category

■ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

■ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
- Multi Modal Information/Management - Bus Rapid Transit System/Solution
- Pedestrian/Disabled Support System

☐ Electronic Payment
- Electronic Toll Collection - Electronic Parking Payment - Electronic Fare Payment

■ Traffic Information Integration/Management
- Traffic Information Integration - Traffic Information Center Traffic Data Management

☐ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

■ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

☐ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

☐ Others ( )

2nd category

■ Hardware ■ Software ■ SI ■ Consulting ☐ Others ( )

Ongoing ITS project or R&D

- Song-Do U-City Construction Project
- Project for a Construction of BIS(Bus Information System) and BMS Link System
- C-ITS Project for a Korea Expressway Corporation
- CUPPS Project for a Incheon Internatinal Airport including a BRS(Baggage Reconciliation System)
- ATFMS(Air Traffic Flow Management System) Project
- GangNam Circuit Highway ITS Project for Seoul
- C-ITS Project for Pyeong-Chang

Others

Certification

- ISO 9001(quality management) - ISO 14001(eco-management) - ISO 20000(IT service management)
- ISO 27001(information security) - K-ISMS(protect information) - CMMI (international quality certificate)

Prize

- Patent related water quality estimating device : 2 application
- NFC-related patent : 1 application - Digital door-lock patent : 1 application

ITS Product & Technologies

WAVE OBU(NDS-EW001)

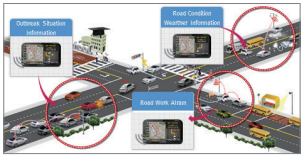
OBU	Main Board	RF Board
		

WAVE RSE(NDS-EWR01)

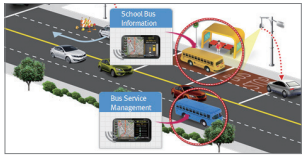
Antena		Main Control Unit			Support Unit
GPS Ant	Wave Ant	Closure	Control Unit	Comm Unit	
					

C-ITS

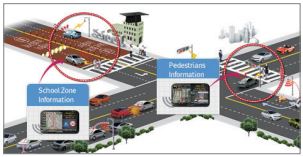
Support for a Safe Drive



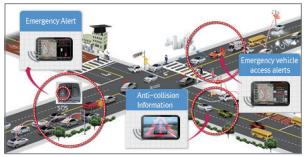
Support for Safe Public Transportation



Pedestrians Care



Inter-vehicle Accident Prevention



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NEIGHBOR SYSTEM

Company Overview

Neighbor System has had top class competitiveness in the IT industry by performing lots of various projects related to Intelligent Transport System (ITS). Neighbor System has an abundance of excellent employees who have a wide range of background and experiences on developing software, and has accumulated a variety of professional technologies of Multimedia / Mobile /LBS such as a technology to construct many kinds of Information Center connected with LBS /Telematics / Visualization System and develop solutions of its terminals, a technology of Visual Communications, applied technologies of GIS / GPS, and so on. Neighbor System has supplied quality technologies and services combined with ITS and has satisfied our clients very highly. Especially, Neighbor System has been providing self-developed softwares and construct systems for cutting-edge traffic infra construction business of Korean local governments and has been leading ITS business by cooperating with Korean major companies and developing technologies together. Neighbor System promises to provide hi-quality products and services based on its corporate culture: trust and responsibility.

Business Area

1st category

■ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

■ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
- Multi Modal Information/Management - Bus Rapid Transit System/Solution
- Pedestrian/Disabled Support System

■ Electronic Payment
- Electronic Toll Collection - Electronic Parking Payment - Electronic Fare Payment

■ Traffic Information Integration/Management
- Traffic Information Integration - Traffic Information Center Traffic Data Management

☐ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

☐ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

☐ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

☐ Others ( )

2nd category

☐ Hardware ■ Software ■ SI ■ Consulting ☐ Others ( )

Ongoing ITS project or R&D

- Ulsan-metropolitan city' 2013 Bus Information System (BIS) expanding and advanced constructing
- Korea Expressway Corporation' 2013 National Traffic Information Center service improvements
- Korea Expressway Corporation' ITS operating software advanced services
- Busan-metropolitan city' Bus Digital Tachograph Management System (DTMS) construct services
- Gumi-city' 2013 Maintenance of Bus Information System (BIS) services
- High-Pass of Sujung-san Tunnel and Kwang-an main road S/W development
- Ulsan-metropolitan city' Maintenance of Intelligent Traffic System(ITS) and Bus Information System (BIS) services
- Electronic Toll Collection System (ETCS) of Ma-Chang bridge additional development

Others

Prize

- 2007 Prime Minister's Commendation (National Records Management)
- 2012 KICTEP (Korea Institute of Construction & Transportation Technology Evaluation and Planning) Chairman Commendation (Construction and transportation industry development)

Patent

- Method of providing Traffic information pursuant to accident data on drive way
- Video transfer system
- Camera Select System and method of selecting camera using dual multi frequency
- Camera Select System and method of Selecting Camera using telephone numbers

ITS Product & Technologies

Product Offerings

EasyMapX

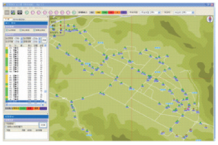
- As consisting of ActiveX component and Map server that help to develop GIS application, EasyMapX can apply to various fields including BIS, Traffic conditions control system, and so on.
- EasyMapX can provide the easy-to-use, effective map caches on the web as well as the basic functions requested by GIS application program such as display control, edit and thematic map.
- EasyMapX, easily possible to edit the user object through the API, can provide development environments appropriate to web application programs.
- Especially, EasyMapX can provide the optimized components for the bus stations and routes of BIS system.

NEIGHBOR SYSTEM

Application fields

- BIS/BMS, ITS (Facility Management, etc) Map Application Terminal
- Vehicle position control (Taxi, rental cars, vans, company cars, etc.)
- For communicating information expressed Traffic Display
- Control of the center of the display throughout the project

Bus Information System(BIS)



Bus route editing

Vehicle control

Traffic Display

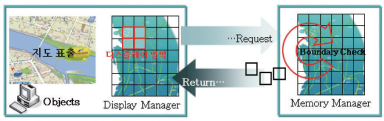
Product Configuration

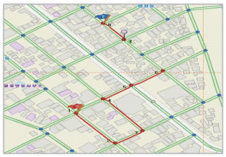
- EasyMapX Objects : Gis Viewer Client Engine of a C/S environment
- EasyMapX BrtEditor : Route and Bus stop editing Client Engine of a C/S environment
- EasyMapX Web : Gis Viewer Client Engine of a Web environment
- EasyMapX Manager : Gis Server Engine of a Web environment
- EasyMapX Editor : Spatial and Nominal Data editing

Product Description

- Client/Server, Supporting WEB-based environment and integration management
- Providing ActiveX component form in order to support development environments of various applied programs such as web, Visual Basic, Visual C++ and Delphi
- Providing theme changing service through the management of layer component

Key Features



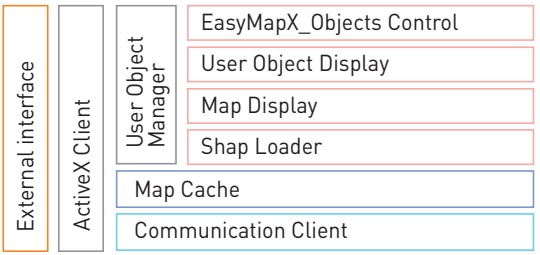


- Upgrade speed of display through management of memory.
- Point continuous selection function, Automatic search function selectable link.
- Function through caching, version control and Off-Line Operation.
- Registered users of the object / Edit Bitmap express / Mouse Support.

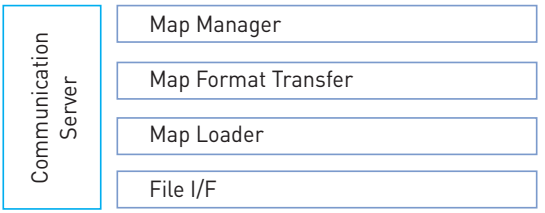
NEIGHBOR SYSTEM

System Configuration

Active Client Moodle Configuration



Map Server Moodle Configuration



General Information

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NOVACOS Co., Ltd.

Company Overview

June 2010 NOVACOS co., Ltd. was established in specialize in the field of road traffic and environmental technology, which is based on AVC(Automatic Vehicle Classification) and Radar, Loop VDS(Vehicle Detection System) and WIM(Weight In Motion) management system development, production and business sectors.

Business Area

1st category

■ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

☐ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
- Multi Modal Information/Management - Bus Rapid Transit System/Solution
- Pedestrian/Disabled Support System

☐ Electronic Payment
- Electronic Toll Collection - Electronic Parking Payment - Electronic Fare Payment

■ Traffic Information Integration/Management
- Traffic Information Integration - Traffic Information Center Traffic Data Management

☐ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

☐ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

☐ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

☐ Others ( )

2nd category

■ Hardware ■ Software ■ SI ■ Consulting ☐ Others ( )

Ongoing ITS project or R&D

KICT & Korea Expressway Corporation AVC Business, Radar VDS and an unexpected VDS project
Ansan-si Flitted CCTV design, Private Freeways VDS & AVC project, Dae-gu UTIS / ATMS VDS System

Others

Certification
- ISO 9001:2008
- ISO 14001:2004

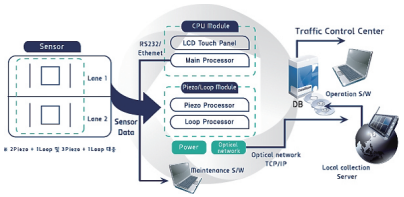
Patent

- Vehicle classification method
- Load sensor and the manufacturing method
- Driving vehicle automatic weight measurement system
- Piezo sensor manufacturing method

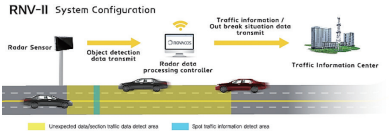
ITS Product & Technologies

Product Offerings

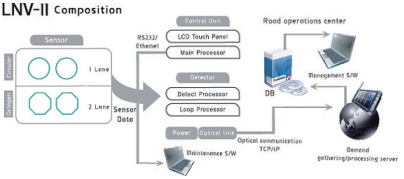
1. AVC(Automatic Vehicle Classification)



2. Radar VDS(Vehicle Detection System)



3. Loop VDS(Vehicle Detection System)



Technologies

An analysis for the traffic situation makes **AVC**, traffic volume, rate, share, such as the width of the vehicle, vehicle information, real-time leap detection and processing by the road system is sent to the operations center.

Radar VDS based on the Doppler-based motion detection technology, reliable traffic information(car selector speed, traffic volume, location, vehicle length, etc.)and the data surprises(sprinting, pedestrian stops, Accident State information, side street)to collect and transmit the data collected for traffic information center.

Loop VDS is a road traffic transportation vehicle sensor systems to provide the Center upon entry of the vehicle by vehicle — one of conductor inductance loop of interaction information for each car traffic(Volume), share(Occupancy), speed(Speed), and the collected data, such as classification schedule cycle makes much of the transport system.

General Information

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Penta Security Systems Inc.

Penta SECURITY
enterprise · iot · blockchain

Company Overview

Penta Security Systems Inc. is a leader in web, IoT, and data security solutions. Penta Security has overseen the implementation of its AutoCrypt®solution in numerous ITS projects across South Korea, including smart highway/roadway projects in the major cities of Daejeon, Sejong, and Yeoju, and K-City, one of the world's largest self-driving car test beds. Launched in 2007, AutoCrypt® is the world's first total security solution for all entities involved in smart transportation: drivers, pedestrians, devices, and infrastructure. The company's experience and extensive testing allows for AutoCrypt®to be adapted to other vehicular fields including EVs, EVSEs, smart ships, trains, and other applications.

Business Area

1st category

☐ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

☐ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
- Multi Modal Information/Management - Bus Rapid Transit System/Solution
- Pedestrian/Disabled Support System

☐ Electronic Payment
- Electronic Toll Collection - Electronic Parking Payment - Electronic Fare Payment

☐ Traffic Information Integration/Management
- Traffic Information Integration - Traffic Information Center Traffic Data Management

☐ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

☐ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

☐ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

■ Others (Cyber Security for C-ITS and Connected car)

2nd category

☐ Hardware ■ Software ☐ SI ■ Consulting ☐ Others ( )

Ongoing ITS project or R&D

Designed the security and authentication system for C-ITS
Security solution for C-ITS Implementation Project – Korean Highway/Seoul city/Jeju Island

ITS Product & Technologies

Product Offerings

For Intelligent Transport Systems (C-ITS)

80% of cars will be connected by 2020. To help create a more convenient tomorrow, connected cars and IoT devices on the road will be engaging in constant communication with a wide range of entities, including unknown ones. This raises the issue of how to prevent untrustworthy communication from entering the traffic infrastructure.

Secure communication can be achieved with mutual authentication, which prevents the introduction of fraudulent or malicious traffic information that could endanger lives on the road. In the case of intelligent transport systems (ITS), trusted communication can be established via the implementation of a security credential management system (SCMS).

AutoCrypt V2X and **AutoCrypt PKI** provide the core security components required to protect communications in ITS.

For Connected car (In-Vehicle Security)

Unlike smart phones, connected vehicles are smart devices that people travel in, rather than with. This means cyber mishaps can instantly become life-threatening. Upon gaining access to a vehicle's internal network, malicious actors may install new firmware for executing custom commands and take over controls remotely.

From the OBD-II port to the vehicle's wireless connection, the attack vectors for hackers are plenty and aren't easy to secure. Cars are not just becoming connected, but also autonomous and therefore architecturally extremely complex. All this data being exchanged within the vehicle needs to be monitored for signs of abnormal activity that could indicate network intrusions or attacks.

AutoCrypt AFW and **AutoCrypt KMS** protect the internal systems of vehicles by detecting malicious or abnormal traffic and securely managing encryption keys used within internal networks.

Technologies

AutoCrypt PKI

AutoCrypt PKI is a public key infrastructure (PKI) system that complements AutoCrypt V2X by providing certificate management used to authenticate end entities such as cars and traffic lights in an ITS.

- Enrolls new end entities into the system, provisions identification and pseudonym certificates, and revokes certificates based on reported misbehavior.
- Designed to comply with the CAMP Security Credential Management System (SCMS), with solutions also available for the European Cooperative (C-ITS) Credential Management System (CCMS).

AutoCrypt V2X

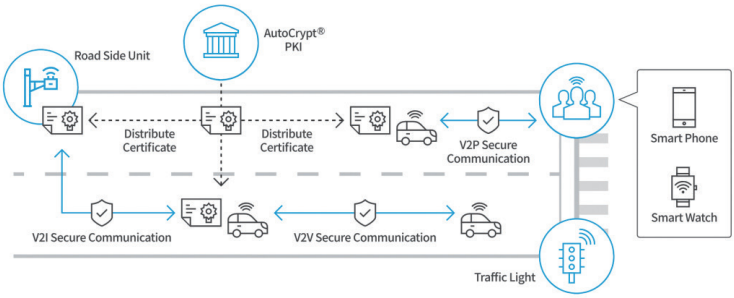
AutoCrypt V2X is an authentication/encryption system for vehicle-to-everything (V2X) communications, including vehicle-to-vehicle (V2V), vehicle-to-infrastructure (V2I), vehicle-to-pedestrian (V2P).

- Secures broadcast and receipt of basic safety messages (BSM) and other data between surrounding vehicle on-board units (OBU) and roadside units (RSU).
- Designed according to the IEEE 1609.2 communication standard for Wireless Access in Vehicular Environments (WAVE).

Penta Security Systems Inc.

- AutoCrypt LCM is a local certificate manager (LCM) that is installed in the OBU to manage certificates from AutoCrypt PKI.

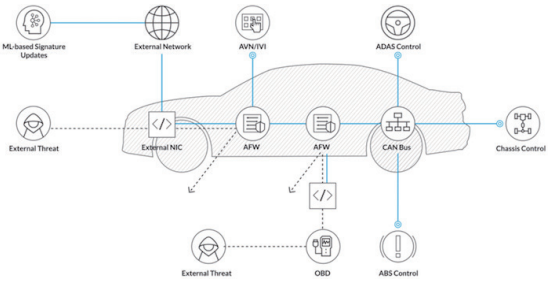
IEEE1609.2: Wireless Access in Vehicular Environments--Security Services for Applications and Management Messages
CAMP SCMS: Crash Avoidance Metrics Partnership –Security Credential Management System



AutoCrypt AFW

AutoCrypt AFW offers both a firewall (F/W) and an intrusion detection system (IDS) for in-vehicle networks. It controls and analyzes the network packets in the CAN or Ethernet to protect the network from malicious packets or other abnormal activities.

- Implements both positive and negative security models to manage access to in-vehicle systems.
- Uses an internal AFW and an external AFW with different security policies.
- Uses machine learning (ML) to analyze malicious traffic and provide signature updates to AutoCrypt AFW.

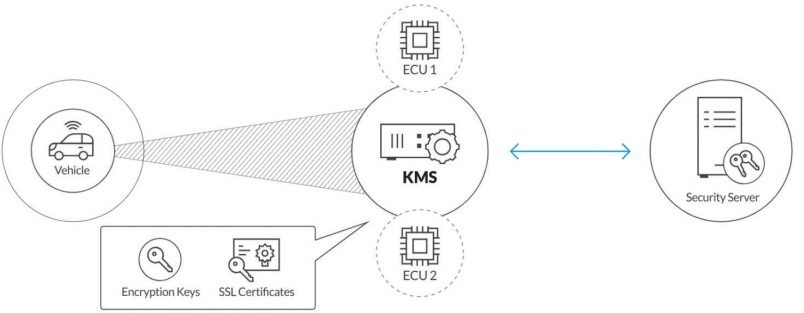


Penta SECURITY
enterprise · iot · blockchain

AutoCrypt KMS

AutoCrypt KMS is an in-vehicle key management system (KMS) that manages keys used for encrypting data transmitted between the vehicle and external entities, or between electronic control units (ECU), as well as keys used for authenticating users and entities.

- Manages the encryption key life cycle process which includes generation, storage, and revocation.
- Integrates with external key management systems and hardware security modules (HSM).



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POSCO ICT

Company Overview

POSCO ICT delivers a comprehensive ICT service, from diagnosis and design of government or enterprise info systems, development of software applications and establishment of hardware and network solutions to operation and maintenance of info systems. Our service scope includes national defense, transportation and manufacture, and se offer systems, top of the line. We build the right system optimized for the business environment and needs; existing systems are integrated into the new one.

Business Area

1st category

■ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

■ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
- Multi Modal Information/Management - Bus Rapid Transit System/Solution
- Pedestrian/Disabled Support System

■ Electronic Payment
- Electronic Toll Collection - Electronic Parking Payment - Electronic Fare Payment

■ Traffic Information Integration/Management
- Traffic Information Integration - Traffic Information Center Traffic Data Management

☐ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

■ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

■ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

☐ Others ( )

2nd category

■ Hardware ■ Software ■ SI ■ Consulting ☐ Others ( )

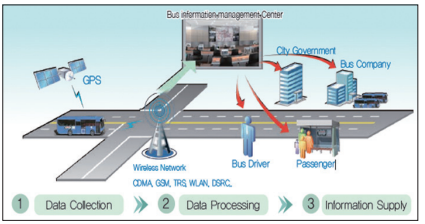
Ongoing ITS project or R&D

- ETCS,TCS / Construction project of Changwon ~ Busan private freeways.
- U-traffic System / Construction project of Chung-ju city.
- Tunnel ITS / Facility management project of San-sung private freeways Tunnel in Busan
- ETCS / Korea Expressway Corporation : hi-pass system maintenance
- Survey of DSRC traffic information on the ITS section
- F.S. / Project of Russia ITS feasibility Study
- Proposal of India Hyderabad city ITS Project.
- Proposal of Brunei ITS project.

ITS Product & Technologies

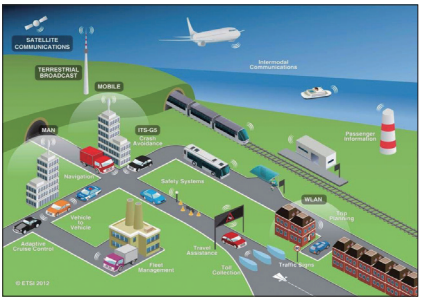
ETCS (Electronic Toll Collection System) & (Multi-Lane Free Flow)
TCS (Toll Collection System)
C-ITS (Cooperative-ITS)
ATMS (Advanced Transportation Management System)
BIS (Bus Information System for BRT)
FMS (Fleet Management System)

1. BIS (Bus Information System for BRT)



2. ETCS & Multi-Lane Free Flow

3. C –ITS (Cooperative – ITS)



General Information

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RANIX

Company Overview

RANIX is a company that is perpetually challenging in research and development to provide the best system semiconductors and solutions, confronted with the convergence and integration era between industries changing rapidly.
We are committed to developing core technologies of autonomous vehicles and Internet of Things(IoT), which are national strategy projects to lead the future of a nation.
Particularly, we are the only company in Korea that has V2X total solutions, essential solution for completing the autonomous vehicle.
On the other hand, we are initiatively developing the security and authentication chip solutions to protect various hacking attacks that must be solved for the growth of the IoT industry.

Business Area

1st category

☐ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

☐ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
- Multi Modal Information/Management - Bus Rapid Transit System/Solution
- Pedestrian/Disabled Support System

■ Electronic Payment
- Electronic Toll Collection - Electronic Parking Payment - Electronic Fare Payment

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- Traffic Information Integration - Traffic Information Center Traffic Data Management

☐ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

■ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

■ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

☐ Others ( )

2nd category

■ Hardware ■ Software ■ SI ☐ Consulting ☐ Others ( )

Ongoing ITS project or R&D

WAVE
- Total Solutions and Modem ASIC
- Software Stack and Application Development / Support include video transfer

Security
- IEEE1609.2,3,4 for WAVE
- Dedicated Chips for Automotive and IoT

Others
- AEC-Q100
- INNO-BIZ
- Awarded the Grand Prize at the 'IoT Innovation Award(Smart Traffic Sector)'

ITS Product & Technologies
Product Offerings & Technologies

1. G-WAVE

G-WAVE is baseband ASIC optimized for vehicle-to-vehicle and vehicle-to-infrastructure communication and has developed for safety, convenience, and commercial applications in vehicular environment.
G-WAVE will serve cooperative road safety and traffic efficiency with low latency and fast data rate under harsh automotive mobile condition.
RANiX's V2X technology will integrate crypto engine for advanced security, RF transceiver, high speed application processor as well as modem device to provide the lowest cost for new ITS solution worldwide.

Feature
- US/EU ITS
- Integrated Anti-fast fading
  [Enhance fading performance]
- Support Dual Channel
- Support Diversity
- 10MHz Ch. Bandwidth

Security
- IEEE1609.2 H/W Engine (2016v)(~1.2K signature processing/1s)
- ECDSA-224/256
- ECIES, SHA 224/256
- AES CCM

S/W
- US/EU ITS
- OS : Linux
- Tx/Rx Driver, Security Driver
- 1609.x Stack

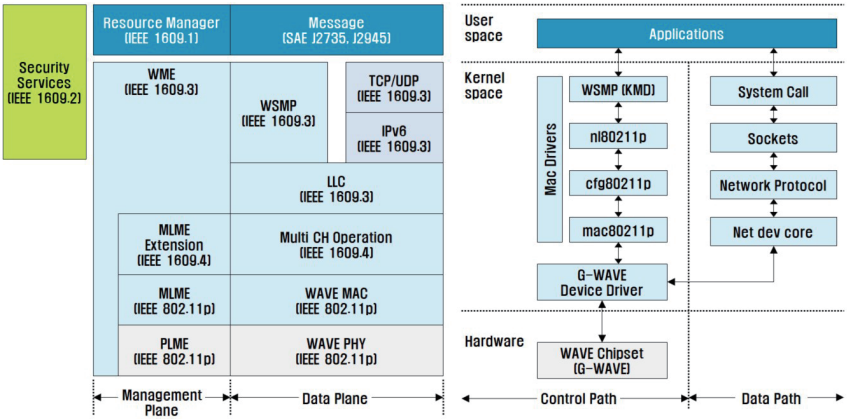
SDK Available

Transceiver
- AD9364

CPU (External)
- Freescale I.MX6 Dual Lite Cortex-A9 (800MHz)

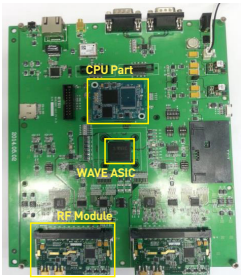
RANIX

S/W Implementation



SDK, EVM & OBU

Software Development Kit	
Platform	[V.1] Linux 2.6 / [V.2] Linux 3.14
Cross Compiler	ARM Tool Chain
Software	U-BOOT, Linux Kernel Source, Root File System, 802.11p MAC, IEEE 1609.3 (IPV6, WSMP), IEEE 1609.4(Multi-Ch Operation) IEEE 1609.2 Driver Source



Evaluation Module	
Processor	[V.1] ARM926EJ (Samsung S3C2450 533Mhz) [V.2] Cortex-A9 (Freescale I.MX6 Dual Lite 800Mhz)
Operating Memory	[V.1] Mobile DDR RAM(64MB) SLC NAND Flash(256MB) [V.2] DDR3 RAM(2GB), SLC NAND Flash(16GB)
SD	SD/MMC Port (SD Boot)
UART	UART1 (Debug) UART3 (GPS)
Ethernet	SMSC LAN9220 10/100Mbps
Expansion Connector	EBI (G-WAVE Register Interface)
Radio Modes	IEEE 802.11p PHY
Wireless Modes	WAVE
Transceiver	[V.1] MAX2829 / [V.2] AD9364

OBU		
Shape	 <Out Side>	 <Inner Board>
Interface	SD/MMC Port (SD Boot) UART Ethernet : SMSC LAN9220 10/100Mbps Transceiver : 2CH Communication : Between OBU and OBUs or EVMs Radio Modes : IEEE 802.11p PHY	

2. MaaT Ⅳ

MaaT-Ⅳ is the best optimized DSRC baseband SoC for various ITS services, such as ETCS, BIS and ATMS.Through ARM Cortex-M3, system peripherals and H/W DSRC transceiver, it provides the most cost-effective solution for DSRC based applications.
The proprietary DSRC transceiver makes robust communication possible due to outstanding TX/RX performance and auto frequency scan function.
MaaT-Ⅳ can be easily certified by Korea Expressway ETCS, TTA DSRC and automotive AEC-Q100 with its features.
Built-in smart card buffer, regulator and serial flash controller are versatile for a small and low price product.

Feature

CPU
- Embedded ARM Cortex-M3 Core, 80 MHz
- Non-maskable Interrupt (NMI) + 1 to 240 Physical

Interrupts
- SDRAM (Main Memory, 8MB)

Modem
- TTAS.KO-06.0025/R1
- DSRC RX Data FIFO
- Frequency Scan Function
- Support SPI RF Interface

Peripherals
- ISO 7816-3 Compliant Smart Card Interface (SCI)for ETCS
- USB Full-speed
- Serial Flash Interface
- I2S (with WAVPACK)
- UART/Timer/SPI/I2C/WDT
- 32 General Purpose I/O Ports

IPs
- Main/SC LDO, PLL

Process
- 0.18㎛ CMOS Standard Cell Library
- 100pin LGA (14mmx14mm, 0.5mm Pitch)

RANIX

3. MaaT-V

MaaT-V is developed for system optimization including memory, peripheral devices and circuits of Maat-IV. Ultimately, user can be best of design circuit and cost effectively.
Of course, MaaT-V is including all functions of MaaT-IV.

Feature

Enhanced
- ESD/EMI
- GPIO : Design POC(Power On Control)/Open Drain Output(3EA)
- Audio Codec : SDRAM Bypass Mode for Fast Boot

Include Internal from MaaT-IV
- Serial Flash : 8MB
- Reset IC : POR(Power On Reset)
- Oscillator : Can use Crystal direct
- USB Oscillator : 48MHz

CPU
- Embedded ARM Cortex-M3 Core, 80 MHz
- Non-maskable Interrupt (NMI) + 1 to 240 Physical

RAM
- SDRAM (Main Memory, 8MB)

Modem
- TTAS.KO-06.0025/R1
- DSRC RX Data FIFO
- Frequency Scan Function
- Support SPI RF Interface

Peripherals
- ISO 7816-3 Compliant Smart Card Interface (SCI)for ETCS
- USB Full-speed
- Serial Flash Interface
- I2S (with WAVPACK)
- UART/Timer/SPI/I2C/WDT
- 32 General Purpose I/O Ports

IPs
- Main/SC LDO, PLL

Process
- 0.18㎛ CMOS Standard Cell Library
- 100pin LGA (14mmx14mm, 0.5mm Pitch)

4. THoTH

速龙(THoTH) integrates a number of key components in one package to support various features and application required by the car.
速龙(THoTH) are composed with CPU, Peripherals, DSRC modem, SDRAM, LDO, Smart Card Interface, CAN and USB etc., and provides the most cost-effective solution for DSRC based applications.
速龙(THoTH) supports China Standard GB/T 20851.

RANiX

Feature

CPU
- Embedded ARM Cortex-M3, 80MHz
- Non-maskable Interrupt (NMI) + 1 to 240 Physical

Interrupts
- SDRAM (Main Memory, 8MB)

Modem
- GB/T-20851.x
- DSRC RX Data FIFO
- Multi RF Interface (SPI & Dedicated Control)

Process
- 0.18㎛ CMOS Standard Cell Library
- 100pin LGA (14mmx14mm, 0.5mm Pitch)

Peripherals
- ISO 7816-3 Compliant Smart Card Interface(SCI) for ETCS
- USB Full-speed
- CAN 2.0B (with FD)
- Serial Flash Interface (with Fast Boot Mode)
- I2S (with WAVPACK, SDRAM Bypass Mode)
- UART/Timer/SPI/I2C/WDT
- Detecting the Forced Detachment, Using Secondary

Battery [Patent]
- 65 General Purpose I/O Ports

IPs
- Main/SC LDO, PLL, PoR, XTAL
- ADC (6bit, 1KSPS, 2ch)

Developpment of Core Technologies of Autonous Driving

Expertise	Product Portfolio	Technical Overview
Automotive Communication	DSRC Modem SoC for Korean ETC	• TTA Standard • 5.8GHz RF ASK • ETC(Hi-pass) Communication Protocol
	DSRC Modem SoC for Chinese ETC	• Chinese Standard(GB/T 20851.X) • 5.8GHz RF ASK • ETC Communication Protocol
	V2X(WAVE) Modem Chip	• IEEE STD 802.11P, 1609 • 5.9GHz RF OFDM • Core Tech. of Safety & Autonomous Driving

General Information

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RexGen Co.,Ltd

Company Overview

RexGen creates new values in images with image data generated in all fields such as transportation, national defense, safety, sanitation and the environment. With Deep Learning technology, RexGen analyzes and processes big data with the application of Image Processing Technology, IoT and ICT, prevents and solves unprecedented social issues.

Business Area

1st category

■ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

☐ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
- Multi Modal Information/Management - Bus Rapid Transit System/Solution
- Pedestrian/Disabled Support System

☐ Electronic Payment
- Electronic Toll Collection - Electronic Parking Payment - Electronic Fare Payment

■ Traffic Information Integration/Management
- Traffic Information Integration - Traffic Information Center Traffic Data Management

☐ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

☐ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

☐ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

☐ Others ( )

2nd category

■ Hardware ■ Software ■ SI ☐ Consulting ☐ Others ( )

Ongoing ITS project or R&D

- Hamburg ITS World Congress 2021

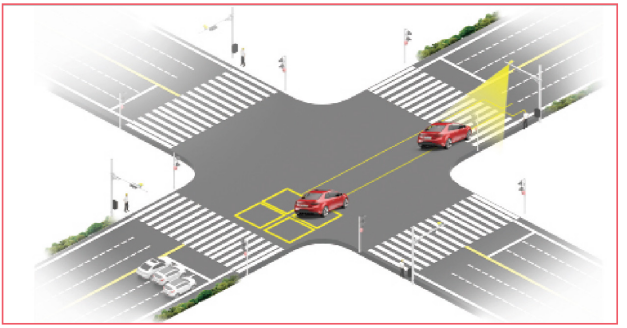
Others

1. 99.9% : Number plate Detecting Accuracy under the high-speed vehicle (260km/h) for Korea number plates
2. 40th : Construction Capacity Among the total 9.2K Government Contractor in Korea, 2021
3. 101 : Number of patent (Most cases are related with Automatic number plate recognition system)
4. 40+ : Engineer engage in the A.I and its Hardware development

ITS Product & Technologies

Product Offerings

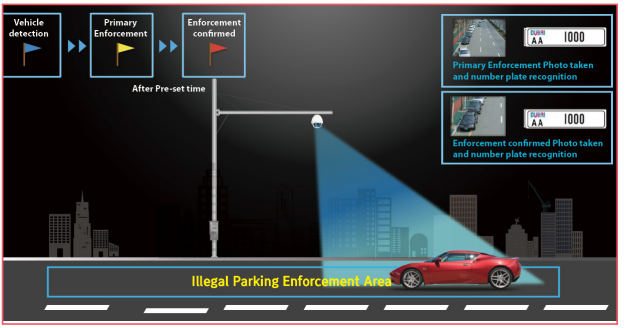
Smart Traffic Enforcement System



Smart Traffic Enforcement system monitoring, detecting, managing 24/7 for over-speed, point to point, traffic signal violations on the road. Provide images of vehicles committing a violation such as auto-recognized vehicle's number.

1) Over-speeding / Red light violation/ Seatbelts / Point to point / Bus lane / Cell-phone enforcement
2) Multi lanes detections(Max 3 lanes)
3) Frontal, Rear camera(Motorbike)

Intelligent Parking Enforcement System



Efficient Parking Enforcement Solution that enables operators to "Assess in real-time" the condition of multiple enforcement cameras operation, quickly intervene in the enforcement process.

RexGen Co.,Ltd

1) Real-time monitoring up to 64 channels with one operation PC
2) Detection mode(Automatic, Manual) / Enforcement / Statistics
3) Customization(e.g. Using Flags detection type in Korea)

Smart Traffic System

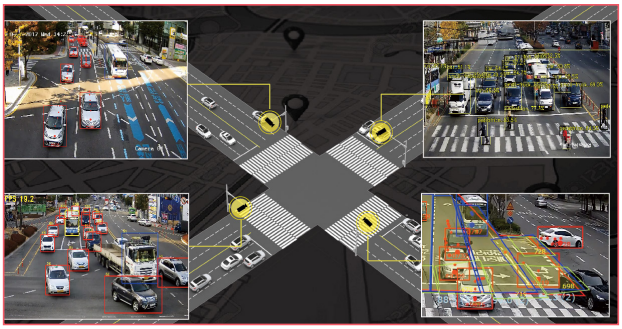
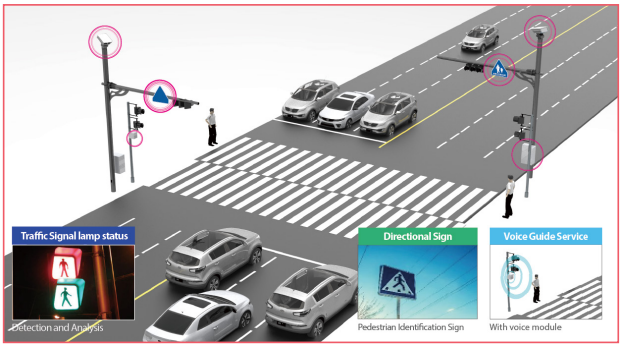


Image processing system based on deep learning, creating traffic big data, for an effective traffic system (Design of road lines, Calculation of the numbers of lane by direction, and design of signal reality) by extracting traffic information by direction of intersection and vehicle type through traffic object detection and tracking algorithms

1) Deep learning-based vehicle detection
2) Calculation of traffic volume in all conditions(day/night, sun/rain, dry/snow/wet)
3) Vehicle type classification and pedestrian detection
4) Accurate traffic count in public or variable lanes and ability to detect U-turns
5) Smart traffic control program
6) Deep learning-based vehicle detection
7) Traffic statistics function

Smart Pedestrian System



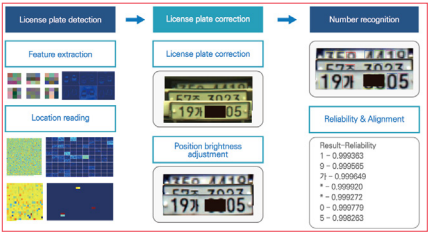
Rex Gen

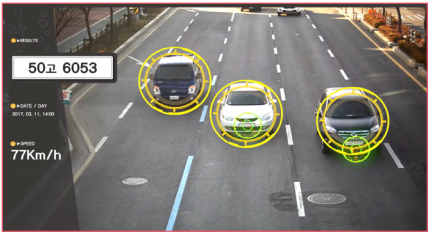
Smart safety management system to "secure pedestrian safety at crosswalks" with pedestrian detection based deep learning and tracking algorithms.

1) Providing pedestrian safety information based on image analysis
2) Deep learning-based image processing technology applied
3) Detection rate of illegal pedestrians: 99%
4) Calculation of the number of waiting pedestrians
5) Calculation of pedestrian movement direction and number of pedestrian

Technologies

Deep Learning Algorithm





The network-based algorithm that calculates scores referring to fixed-size bounding boxes and the existence of object class instances in each box establishes a stable and convenient digital crime prevention system with the innovative search system and license plate recognition technology.

General Information

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ROADKOREA Inc.

RK RoadKorea Inc.

Business Area

1st category

■ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

■ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
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☐ Commercial Vehicle Operation
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☐ Others ( )

2nd category

☐ Hardware ■ Software ☐ SI ■ Consulting ☐ Others ( )

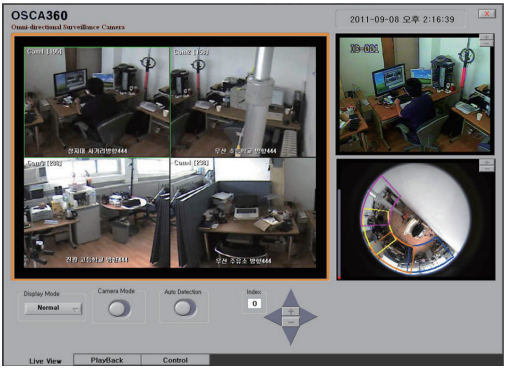
Ongoing ITS project or R&D

National Project
- SMART-I -> Automatic Tracking CCTV System Research and Development
- KICTEP (Korea Institute of Construction & Transportation technology Evaluation and Planning. -> SMART Highway Project

ITS Product & Technologies

OSCA : Omnidirectional Surveillance Camera

- 360 degree Surveillance with one lens (about 100~140M)
- Automatic Object Tracking
- Divided Screens (up to 4 Screens)



General Information

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Saesol Tech Inc.

SAESOL TECH

Company Overview

Saesol Tech Inc. is a V2X cybersecurity company for autonomous vehicle. Since autonomous automobility field is growing day by day, Saesol Tech has been developing V2X Cyber Security solution suites which contains V2X SCMS server and V2X security client for OBU and RSU to secure V2X communication from malicious attacks. Saesol Tech is a technology cooperation partner with LG Electronics by signing an MOU with LG Electronics on technical cooperation of V2X security solution for the next generation. Along with the fact that LG Electronics has invested in Saesol Tech, the technology that Saesol Tech has is highly assessed by the market.

Business Area

1st category

☐ Traffic Management
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- Traffic Enforcement - Parking Management

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☐ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

☐ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

■ Others (V2X Cybersecurity for Autonomous Vehicle)

2nd category

☐ Hardware ■ Software ☐ SI ☐ Consulting ☐ Others ( )

Ongoing ITS project or R&D

- V2X Security Conformance Testing System (Test Station, SCMS Emulator, Test Proxy)
- V2X Security Conformance Testing Agent (receives and performs TCI, supports IEEE 1609.2 Stack, SCMS 1.0, 2.0 LCM, MBD and MBR, and inspects privacy protection)

Saesol Tech is currently developing V2X security conformance testing system and which tests communication between SCMS server and clients. Testing system is necessary for any technology to deploy and commercialize, and testing system for V2X security has not been developed yet in the world, Saesol Tech is going to be the first company who develops the testing system for V2X security.

Others

Patent

- Anonymous saving and tracing system based on implicit communication utilizing ECC Butterfly method

Working Group

- Saesol Tech is leading a sub-working group for Cyber Security Working Group of OmniAir Consortium, the leading association promoting interoperability and certification for connected vehicles and ITS

Teams

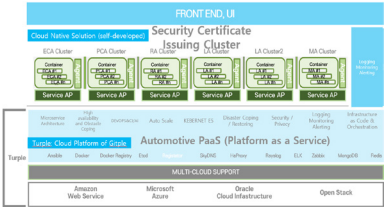
- Saesol Tech has developed the first SCMS server in Korea, has the former CTO of automobile security company, a member of standard and certification committee of C-ITS and ITS-Korea, and a former board members of successful IT venture company for 15 years.

ITS Product & Technologies

Saesol V2X Cyber Security Solution Suites

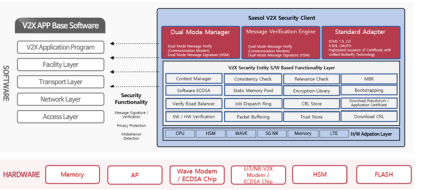
Saesol V2X SCMS

- Issuing both IEEE 1609.2 and X.509 certificates
- Cloud native design
- User-friendly interface



V2X Security Client for OBU and RSU

- Provides secured communication to V2X End-Etities
- Verified compatibility between various V2X modems and HSM
- Advanced stability and certification speed that are suitable for autonomous vehicles



Functionality

- Protects BSM, basic safety message, by issuing certificates

Supporting Standards

- SCMS: IEEE 1609.2, IEEE 1609.2.1, SCMS CAMP WIKI, SAE J2945/1
- Client: IEEE 1609.2, SAE J2945/1

General Information

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SAMWON FA Co., Ltd.

SAMWON FA

Company Overview

Founded in 1979 in southern port city of Busan, Korea, SAMWON FA has become a leading player to serve customer needs across diverse industries with its state-of-the-art ITS solutions and technologies. SAMWON FA developed RFID-based Electronic Toll Collection System in 1998 for the first time in the world. The firm has since solidified its presence in the smart transportation market developing and supplying cutting-edge automatic fare collection systems for buses and urban rail transit.

Business Area

1st category

■ Traffic Management
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- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

☐ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

☐ Others ( )

2nd category

■ Hardware ■ Software ■ SI ■ Consulting ☐ Others ( )

Ongoing ITS project or R&D

- Implementing Bus Information Management System in Busan city
- Implementing Bus Rapid Transit project in Busan city
- Implementing Intelligent Transportation System in Busan city
- Implementing ITS & BIS Maintenance in Busan city

Others

Patent

1. Charging a transportation card using a bus validator
2. Updating bus arrival information through BIT camera system link
3. BIT Low Power Dimming Control Using Solar Power
4. RFID Tag embedded inlay, Card comprising the inlay and method for fabricating the inlay thereof
5. Method for fabricating RF-ID tags

Certification

1. KCC(Korea Communications Commission)

1) Wireless device for wireless data communication
2) Ticket Gate
3) Wide Ticket Gate
4) Portable Ticket Gate
5) Bus card reader
6) Self Service Charger
7) Automatic Ticket Vending Machine
8) Automatic fare adjustment machine
9) Central Ticket Issuing Machine
10) Toll road unmanned card reader
11) Wireless device for RFID/USN

2. FCC(Federal Communications Commission)

1) US Taxi[Electronic Payment System]

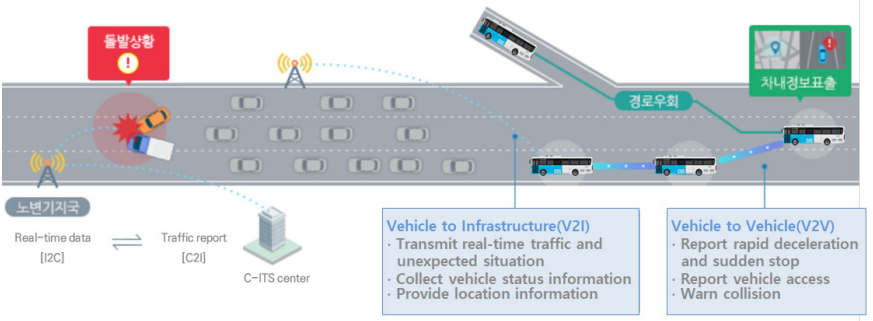
3. ISO 9001

ITS Product & Technologies

Product Offerings

1. Cooperative-Intelligent Transport Systems

A state-of-the-art transportation system that develops and verifies safety services suitable for the state-of-the-art road traffic environment and shares traffic conditions and danger information in real time.



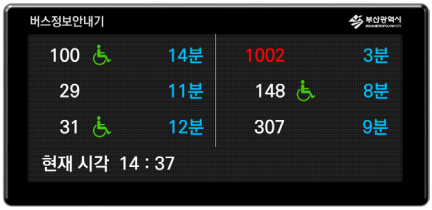
SAMWON FA Co., Ltd.

2. All-in-One Bus Fare Collection & Management System

A state-of-the-art on-bus system that collects fares from passengers, manages bus operation for drivers and provides bus-related data to operators, transport information centers, bus card issuers and drivers enabled by location-based services such as GPS, LTE and WLAN to expand convenience for every user.

3. Bus Information Terminal(BIT)

It is installed at bus stops to provide passengers with bus location and estimated arrival time



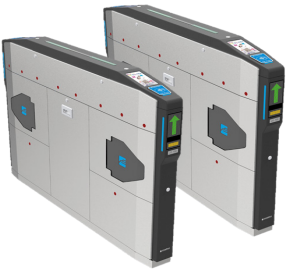
4. Ticket Vending and Card Reload Machine

It allows passengers to purchase tickets or recharge their pre-paid transportation cards.

SAMWON FA

5. Automatic Gate Machine(AGM)

It is designed to perform access control between unpaid area and paid area by allowing passengers to enter or exit through the gate after checking the validity of their tickets or transportation cards



Technologies

Intelligent Transportation system

An intelligent transportation system (ITS) is an advanced application which aims to provide innovative services relating to different modes of transport and traffic management and enable users to be better informed and make safer, more coordinated, and 'smarter' use of transport networks. Some of these technologies include calling for emergency services when an accident occurs, using cameras to enforce traffic laws or signs that mark speed limit changes depending on conditions.

General Information

Company Name : SAMWON FA Co., Ltd.
Website : www.samwonfa.com
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SAT (System and Application Technology) Co., Ltd.

Company Overview

SAT (System and Application Technology) Co.,Ltd. is a manufacturer and supplier of Low Speed WIM System, High Speed WIM System, Automatic Traffic Classification System, Static Weighbridge System, Software relevant to traffic system and Maintenance & Calibration Service for traffic control and management systems. SAT has the biggest market share for LS-WIM System in Korea more than 99% and has stepped into worldwide markets.

Business Area

1st category

☐ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

☐ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
- Multi Modal Information/Management - Bus Rapid Transit System/Solution
- Pedestrian/Disabled Support System

■ Electronic Payment
- Electronic Toll Collection - Electronic Parking Payment - Electronic Fare Payment

☐ Traffic Information Integration/Management
- Traffic Information Integration - Traffic Information Center Traffic Data Management

☐ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

■ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

☐ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

☐ Others ( )

2nd category

■ Hardware ■ Software ☐ SI ☐ Consulting ☐ Others ( )

Ongoing ITS project or R&D

- Development of Smart WIM Controller
- Load Condition Surveillance System
- Automatic Overloading Enforcement System with High Speed WIM

Others

Certification
- ISO 9001:2008
- ISO 17025:2005

Patent
26 patents for WIM system

ITS Product & Technologies

Product Offerings

WAVE modem has developed for safety, convenience, and commercial applications in vehicular environment.

LS-WIM : ± 5% accuracy at 0 ~10km/h
HS-WIM : ± 5% accuracy at 30 ~ 250kmkm/h
Automatic Vehicle Classification System : More than 95% accuracy in vehicle classification for Vehicle classification
Weighbridge System : 3 to 7 platforms, ±1% weighing accuracy

Technologies

Multi rows of weighing sensor using Bending Plate, Quartz Sensor, Piezo Sensors, Load cell to increase the accuracy of WIM system.

General Information

Company Name : SAT(System and Application Technologies Co., Ltd.)
Website : www.satech.co.kr
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Contacts

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E-mail : hsshin27@satech.co.kr

SA Tech Co.,Ltd.

Company Overview

SATECH Corp. have an ITS Total Solution of ITS Consulting design, construction, deployment, operation and maintenance.
In addition, SATECH Corp. are continuing to try to go to open the Smart Traffic world.
And SATECH Corp. implementing a sustainable transportation system through excellent technology and best professional and technical personnel

Business Area

1st category

■ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

■ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
- Multi Modal Information/Management - Bus Rapid Transit System/Solution
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☐ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

☐ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

☐ Others ( )

2nd category

■ Hardware ■ Software ■ SI ■ Consulting ☐ Others ( )

Ongoing ITS project or R&D

R&D

Self-driving technology development innovation project
- Development of integrated road traffic control system and operation technology when autonomous driving is mixed

Others

Certification

- SO 9001:2015 / ISO 14001:2015
-INNO-BIZ

Patent

-Walking aid device and its control method
-Error checking system of Bus Information Terminal

ITS Product & Technologies

ITS (Intelligent Transports system) :

- Intelligent Traffic Control System with leading edge technologies of electronics, communications and control supervises traffic participants and elements i.e. road, vehicle, freights etc.
- ITS covers real-time traffic data gathering, data mining and providing optimal traffic condition.
- ITS reduces fuel consumption and achieves eco-friendly traffic environments.

1. Traffic signal controller

- Local Traffic Controller equipped with Microprocessor is installed on road cross to control Traffic Signal Lamps. LTC collects traffic Volume, Speed and Occupancy, controls optimal traffic signal after data analysis.
- Standard LTC monitors traffic volume of each direction via vehicle detector, builds traffic signal plan and controls signal pattern to make optimal traffic flow. Whereas previous LTC runs only predefined signal pattern on the basis of time-of-day, day-of-week and special day plan without considering traffic condition changes.

[Features]

- Real-time traffic signal control using vehicle detectors
- Powerful microprocessor provides numerous functions for best suited traffic signal Control
- Built-in large scale memory for stable operation
- Database synchronization by periodic data exchange
- Endurable structure for harsh environment

2. Loop Detector

- Basic sensor for real-time traffic condition data collection of Vehicle Detection System
- Reliable, maintainable, endurable inductive loop
- Data from inductive loop detector is conveyed to VDS server after processing at Central Processing Unit

[Features]

- Reliable sensor immune to weather and light condition
  - Low installation cost
  - Sensitivity tuning as to pavement condition
  - Erroneous data purging algorithm embedded

3. BIS(Bus Information System)

It's a system that provides to peoples about bus information through Identifying real-time position of the bus from the bus using GPS and analysis and processing

[Features]

- It can predict the destination arrival time and it can make sure peoples can ride the bus a few minutes real-time updates by Internet BIT.

General Information

Company Name : SA Tech Co., Ltd.
Website : www.sa-tech.kr
Address : #A-325, 184, Jungbu-daero, Giheung-gu, Yongin-si, Gyeonggi-do, Republic of Korea

Contacts

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SDsystem

Company Overview

SDsystem is an specialist in transportation systems in Korea as well as contributing to the development of this area

Business Area

1st category

■ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

■ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
- Multi Modal Information/Management - Bus Rapid Transit System/Solution
- Pedestrian/Disabled Support System

■ Electronic Payment
- Electronic Toll Collection - Electronic Parking Payment - Electronic Fare Payment

■ Traffic Information Integration/Management
- Traffic Information Integration - Traffic Information Center Traffic Data Management

■ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

■ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

☐ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

☐ Others ( )

2nd category

■ Hardware ■ Software ■ SI ■ Consulting ☐ Others ( )

Ongoing ITS project or R&D

1. Jeju Island C-ITS (SW platform)
2. Pangyo Zero City Autonomous Driving Demonstration Complex Construction Project
3. Seoul Smart Parking System

Others

Certification

- ISO 14001
- ISO 9001
- CE Certification

Patent

- Toll Collection
- Vehicle classification for toll collection
- Number plate recognition
- Smart Parking system

ITS Product & Technologies

Product Offerings

SDsystem has the core technology and production capacity to perform from research/development to manufacture, installation and maintenance of the equipment

Technologies

ETCS(Electronic Toll Collection System)

The system allows automatic toll payment without the need to stop the car through the on-board device (OBU) that automatically charges the payment with wireless network.

PMS(Parking Management System)

The system integrates equipment for the management of entrance and exit of vehicles as well as detecting the empty spots in the facilities and informing the user for a fast and convenient parking management

BIMS(Bus Information & Management System)

This system collects location/status info from the on-board device and sends it to the center, through the wireless network where it will be analyzed to provide information such as arrival time and bus information to the user through various media (displays in the stop, web server, mobile phone) Bus Information & Management System

General Information

Company Name : SDsystem
Website : www.sdsystem.com
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Contacts

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SeoulTech co., LTD

Company Overview

SeoulTech has dedicated itself in the Electric Machinery and ICT fields for over 22 years specialized in LED electronic board with advanced design along with environment-friendly product manufacturing and also energy saving and low-cost maintenance. SeoulTech has widened this field to all the information display related business. As the value what we pursue most is 'Customer is always right', SeoulTech shall be worth to do its best for their satisfaction both of products and service. A recent step that SeoulTech manufactured a large number of VMS (Variable Message Signboard), VSL (Variable Speed Limit) for national roads & expressways widely spread in Korea gave us an inspiration and a motivation to move forward the further steps which is ITS development involved. On top of the experiences and efforts that Seoultech has put in the LED electronic signage, billboards, CCTV, broadcasting equipment and ITC fields, we are trying to participate in the advanced ITS standardization process and its business such as road CCTV management system, smart street light facility platform C2C information exchange and etc.

Business Area

1st category

■ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

■ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
- Multi Modal Information/Management - Bus Rapid Transit System/Solution
- Pedestrian/Disabled Support System

☐ Electronic Payment
- Electronic Toll Collection - Electronic Parking Payment - Electronic Fare Payment

■ Traffic Information Integration/Management
- Traffic Information Integration - Traffic Information Center Traffic Data Management

☐ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

☐ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

☐ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

■ Others (LED, LCD display solution, ITS(BIS,VMS,CCTV))

2nd category

■ Hardware ■ Software ☐ SI ■ Consulting ☐ Others ( )

Ongoing ITS project or R&D

- Large media façade
- Bus information system solution
- Development of an electronic board controller

Others

- Electronic sign board control system and method using short-distance wireless communication
- An electronic board with inspection and error detection method
- Integrated modular bus information system
- LED Module Dichotomous Dynamic Drive
- the Method and Equipment of LED Color Using Symmetric PWM Pulse Distribution
- High-definition luminance adjustment system

ITS Product & Technologies

Product Offerings

A technique to control the overall PWM was developed to achieve a clean color and a dichotomous drive to increase the color level to achieve detailed images.

Technologies

PWM symmetric signal technology

Extract the signal from the PWM signal. Then reverse the order so that the entire section is distributed symmetrically. By implementing LED colors, color reference between color bands will be prevented, allowing dark areas to be presented in detail

Dichotomy drive

This technology improves the re-presence rate by varying the order of drive rather than the position continuous

General Information

Company Name : SeoulTech co., LTD
Website : www.seouldisplay.com
Address : 77, Geomsan-ro 173beon-gil, Paju-si, Gyeonggi-do, Republic of Korea

Contacts

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E-mail : boatmaxim@gmail.com

Signtelecom Co., Ltd.

SIGNTELECOM CO.,LTD

Company Overview

Since 1989, Signtelecom is a leading solution provider of System Integration of LED Display and Intelligent Transportation System(ITS). We offer cutting-edge technology of System Integration of software and hardware.
Signtelecom is expanding its global market presence and establishing strategic partnership to enhance world-class competitiveness.
We are capable of providing any solution which our end-users need, in the most time-efficient and cost-effective way with the best quality on the basis of 32 years' of technology know-how.

Business Area

1st category

■ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

■ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
- Multi Modal Information/Management - Bus Rapid Transit System/Solution
- Pedestrian/Disabled Support System

☐ Electronic Payment
- Electronic Toll Collection - Electronic Parking Payment - Electronic Fare Payment

■ Traffic Information Integration/Management
- Traffic Information Integration - Traffic Information Center Traffic Data Management

☐ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

☐ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

■ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

☐ Others ( )

2nd category

■ Hardware ■ Software ■ SI ☐ Consulting ☐ Others ( )

Ongoing ITS project or R&D

ITS project or R&D
Hwasung ITS project / Bucheon ITS project / Daegu ATMS project / Ulsan C-ITS project / Anyang BIS project / Seoul BIT project etc. [More than 20 projects/year]

Others

19 kinds of in-house manufacturing certificates,
45 technical patents
Good Software (GS) Certificate
New Excellent Product (NEP) Certificate
Excellent Product Certificate
KS Certificate, R&D Center Authentification, ISO9001/14001

ITS Product & Technologies

Product Offerings

Technologies

General Information

Company Name : Signtelecom Co., Ltd.
Website : www.signtelecom.com/eng/
Address : #1-119, 775 Gyeongin-ro, Yeongdeungpo-gu, Seoul, Republic of Korea (Mulle-dong 3-ga, Acehightech City), ZIP: 07299

Contacts

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Phone (mobile) : 82-10-9509-9878
E-mail : ehp728@signtelecom.com

Songam Syscom Co., Ltd.

SONGAM SYSCOM

Company Overview

Songam Syscom successfully maintained its business in ICT and ITS sector since the company's foundation in 1991. With cutting-edge technology and expertized know-how, we are currently participating in total service of design, construction, operation and maintenance for various ITS integrated centers including Pangyo Zero city Gyeonggi Autonomous Driving Center, Wonju city ITS center and other ITS centers of major domestic cities. As a leading ITS specialist company, we are aiming to deliver high quality, reliable and cost-effective ICT & ITS products by constantly exploring and implementing innovative and intelligent solutions that drive long-term value to customers.

Business Area

1st category

■ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

■ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
- Multi Modal Information/Management - Bus Rapid Transit System/Solution
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- Pre/On-Trip Traveler Information Service - Telematics Service

☐ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

☐ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

☐ Others ( )

2nd category

■ Hardware ■ Software ■ SI ☐ Consulting ☐ Others ( )

Ongoing ITS project or R&D

- 2021 Wonju ITS Construction project (Wonju City)
- 2021 Gyeonggi autonomous driving center integrated maintenance project (Advanced Institutes of Convergence Technology)
- ITS Center and CCTV Integrated center maintenance project in Sungnam, Hanam, Gangwon province and other domestic cities

Others

Certification

- ISO14001, ISO9001 - CERTIFICATE OF SINGLE PPM QUALITY - CE

Patent

- A Bus Information Terminal Having Dual Structure With Automatic Recovery Function
- PACKET PROCESSING METHOD AND APPARATUS IN RING NETWORK
- RING TYPE OPTICAL MODEM DEVICE, AND COMMUNICATION METHOD USING THE SAME

(and other 12 patents, 8 designs and 9 utility models registered)

ITS Product & Technologies

Product Offerings

1. Industrial Optical Switch (L2)
- Line speed : 1.25 Gbps ± 20ppm
- Line symbol : Scrambled NRZ
- Optical source : Single mode LD
- Peak wavelength : 1310nm
- Connection type : SC/PC
- Optical type : 2 Core
- Transmittal distance : 20Km or 40Km
- Specification : Meeting ITU-T G.957, G.958

2. Multi controller for CCTV & VDS
- HD/Full HD, H.264
- Stored for more than 24 hours
- Backup function

24/7 storage and Event video storage function

Technologies

ITS
- Freeway Traffic Management System
- Vehicle Detection System
- Bus Information System
- Smart intersection Solution
- CCTV

RFID
- RFID based logistics management system

Electronic Power Telecommunication and Monitoring System
- Smart-grid Convergence Platform
- Convergence Terminal
- Multi-service Optical Transmission System with LAN Interface for Electrical Power System
- Optical Modem for DAS (Distribution Automation System)
- PITR(Protective Information Transmitter & Receiver)

General Information

Company Name : Songam Syscom Co., Ltd.
Website : www.songam.co.kr
Address : HQ(Factory) : 32, Donghwagongdan-ro, Munmak-eup, Wonju-si, Gangwon-do, Korea
R&D Lab : 8F 1Dong 2Danji, Pangyo Seven Venture Valley 17, Pangyo-ro 228beon-gil, Bundang-gu, Seongnam-si, Gyeonggi-do, Korea

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E-mail : cryu@songam.co.kr

sTraffic

Company Overview

Based on the best professional team with outstanding technological capabilities and many years of experience, s-Traffic provides transportation solutions that considers people and environment beyond the creation of safe transportation infrastructure.

Business Area

1st category

■ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

■ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
- Multi Modal Information/Management - Bus Rapid Transit System/Solution
- Pedestrian/Disabled Support System

■ Electronic Payment
- Electronic Toll Collection - Electronic Parking Payment - Electronic Fare Payment

■ Traffic Information Integration/Management
- Traffic Information Integration - Traffic Information Center Traffic Data Management

■ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

□ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

□ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

□ Others ( )

2nd category

■ Hardware ■ Software ■ SI ■ Consulting □ Others ( )

Ongoing ITS project or R&D

1. Implementation of Toll Collection System for Korea Expressway Corp. in 2013
2. Development and supply of Unmanned Toll Collection System for Korea Expressway Corp.
3. Supply of Vehicle Classification System for Korea Expressway Corp. in 2013
4. Implementation of Electronic Toll System for Sujung tunnel in Busan
5. Implementation of Toll Collection System for Bukhang bridge in Busan
6. Implementation of Electronic Payment System for Gwangan bridge in Busan
7. Implementation of Toll Collection System and Traffic Management System for Guri-Pocheon expressway
8. Improvement of Toll System and Expressway Toll System for Misiryeong Corp. in 2014
9. ETCS Feasibility Study for Mongolia in 2015
10. A study on the improvement of Hipass image recognition and communication quality for Korea Expressway Corp Research Institute in 2015
11. Establishment of New Transportation Card System for Seoul Metro (Line 1-8) in 2016
12. Implementation of Smart Tolling System for Korea Expressway Corp. in 2016
13. Implementation of Vertical Platform Screen Door(VPSD) for pilot business of SNCF in France

14. Implementation of Vertical Platform Screen Door(VPSD) for pilot business of TNB in Spain
15. Implementation of Electronic Toll Collection System for pilot business of CMNP in Indonesia
16. Implementation of Automatic Fare Collection System spare-part for TVM in India
17. Implementation of Smart Tolling System for pilot business of Namhae Expressway
18. Implementation of Electronic Toll Collection System in Azerbaijan
19. Implementation of Electronic Toll Collection System for expressway in Incheon International Airport

Others

Certification

- ISO 9001:2008 - CE

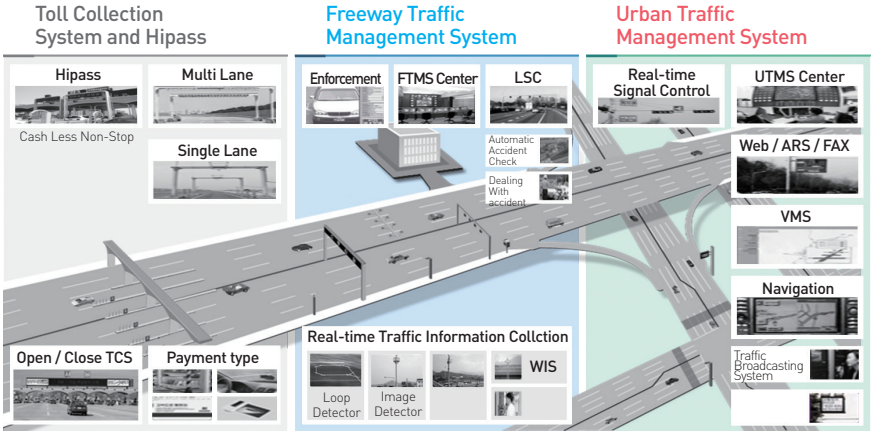
Patent

- Unmanned Vehicle Photographing Equipment
- Automatic Vehicle Number Recognition System
- Vehicle Speed Detection System
- Traffic Law Violation Enforcement System

ITS Product & Technologies

Product Offerings

sTraffic provides Toll Collection System and Hipass, Freeway Traffic Management System, and Urban Traffic Management System for the creation of safe and speedy transportation infrastructure.



sTraffic

Technologies

MLFF(Multi-Lane Free Flow Tolling System)

MLFF is Multi-Lane Free Flow toll collection system using DSRC or RFID technologies. MLFF provides safety of driving and improves the traffic flow because it does not need to change a lane or decrease speed for paying a toll while driving. And it does not have a complicated structure like an old toll gate. Also, MLFF can reduces amount of fuel consumption and carbon oxide emission around a toll gate so that it helps to make comfortable environment for a city. MLFF is the latest toll collection system developed by sTraffic which have been a leading company of tolling market for 20 years in South Korea. MLFF will make safe and environment-friendly expressways for future.

General Information

Company Name : sTraffic
Website : www.straffic.co.kr
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Contacts

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THINKWARE CO., LTD.

THINKWARE

Company Overview

THINKWARE Systems Corporation develops, manufactures, licenses and supports a range of LBS solutions and products, including scalable intelligence map and navigation systems, in-vehicle infotainment systems, mobile applications, road network information data and statistical analyzing engine technologies. THINKWARE is now well positioned to provide total LBS solutions to worldwide markets with having number one spot in the Korea LBS industry.

Business Area

1st category

■ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

☐ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
- Multi Modal Information/Management - Bus Rapid Transit System/Solution
- Pedestrian/Disabled Support System

☐ Electronic Payment
- Electronic Toll Collection - Electronic Parking Payment - Electronic Fare Payment

■ Traffic Information Integration/Management
- Traffic Information Integration - Traffic Information Center Traffic Data Management

■ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

■ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

☐ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

☐ Others ( )

2nd category

■ Hardware ■ Software ■ SI ■ Consulting ■ Others (GIS, GPS, DR, LBS)

Ongoing ITS project or R&D

Automotive AVN system projects - In-vehicle audio video navigation S/W and solutions
- Intelligent Map S/W solution business – Air 3D / real 3D (web, app.)
- Customer Experience Navigation Cloud R&D, projects – Cloud navigation solutions(Web, Mobile) for every stage of the customer journey with Data-driven experiencesExpressway Corp Research institute in 2015

Others

Certification
- ISO 9001:2008 (Q347012) certified

Patent (1000-odd worldwide)

THINKWARE CO., LTD.

- Method and system for providing analysis index associated with drive section based on road and traffic conditions
- APPARATUS AND METHOD FOR PROVIDING REAL-TIME INFORMATION USING ANALYSIS FACTOR BASED ON ROAD AND TRAFFIC CONDITIONS
- APPRATUS AND METHOD FOR CONTROLLING VIDEO RECORDING IN BLOCKBOX FOR VEHICLE
- SERVER, NAVIGATION SYSTEM, VEHICLE NAVIGATION SYTEM, AND METHOD FOR PROVIDING IMAGES OF VEHICLE NAVIGATION SYSTEM
- SAFETY PHOTO SERVICE PROVIDING METHOD AND SYSTEM
- METHOD FOR SENSING COVERING STATE ACCORDING TO VELOCITY AND SYSTEM FOR PROVIDING TRAFFIC INFORMATION USING THE SAME METHOD, etc.,

ITS Product & Technologies

Product Offerings

GPS :
- Map software (European and Asia map solutions, supporting GPS devices and mobiles)
- PND (Navigation devices, No.1 market share)
- iNAVI, ThinkNAVI
- In-Dash

Car DVR(Dash-Cam) : Time, Speed, 2Ch(Full HD), Surveillance, Drive assistance,
Tablet PC : Dual/Quad Core, 10.1"/8.9"/8", Android Jelly bean, PLS LCD, GPS, Wifi
In-Vehicle Infotainment system : Android AVN platform
LBS : LBS system integration and software solution

General Information

Company Name : THINKWARE CO., LTD.
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TmaxTibero Co., Ltd.

Company Overview

DBMS vendor that provides the best database software in Korea. TmaxTibero Co., Ltd. (hereafter TmaxTibero) is a DBMS vendor that researches and develops data-related core technologies and data-based technologies. In 2003, TmaxTibero successfully launched its own DBMS product 'Tibero' to commercialize the large DBMS in Korea, and has become one of the leading companies in the domestic DBMS market. In 2008, TmaxTibero developed 'Tibero Active Cluster (TAC),' which is a shared DB cluster technology. It was the first in Korea, and the second in the world. TAC shows stability and high performance enough to replace DBMS products of other global companies.

In March 2022, TmaxTibero strengthened its product competitiveness by launching a user customized high-performance DBMS 'Tibero 7' which is optimized for Cloud system. The product can be applied to not only a unit business system but also a core business system or an enterprise system. Gradually upgrading technology, TmaxTibero now leads the domestic DBMS market with its competitive products that display outstanding performance, stability and distinctive technical support.

TmaxTibero has made efforts and passion in developing new database technology and products to meet the needs of the market and customers. As the result, TmaxTibero has grown as Korea's leading DB service company with high quality products and original technology which can compete with foreign products.

Business Area

1st category

■ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

■ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
- Multi Modal Information/Management - Bus Rapid Transit System/Solution
- Pedestrian/Disabled Support System

☐ Electronic Payment
- Electronic Toll Collection - Electronic Parking Payment - Electronic Fare Payment

■ Traffic Information Integration/Management
- Traffic Information Integration - Traffic Information Center Traffic Data Management

☐ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

☐ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

☐ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

☐ Others ( )

2nd category

☐ Hardware ■ Software ☐ SI ☐ Consulting ☐ Others ( )

TmaxTibero Co., Ltd.

Ongoing ITS project or R&D

- Seoul Transportation Operation & Information Service - Integrated traffic management and analysis system building
- Cheongju City Hall - Advanced Traffic Management System (ATMS) building
- Namyangju City Hall - Bus Information System (BIS) building for Namyanju-Gapyeong-Chuncheon
- International Airport Corporation - U-Signage replacement and installation business
- Gimhae/Changwon/Yangsan/Uijeongbu/Uiwang/Namyangju/Gunpo/Gyeonggi-do Gwangju City Hall - Urban Traffic Information System (UTIS) building
- Daegu Metropolitan Transit Corporation - System building for the line no. 3
- Gumi City Hall - BIS building
- Busan-Gimhae Light Rail Transit Corporation - Automated Fare Collection (AFC) system building
- Gwangju Metropolitan City Hall - BIS building
- Korea Institute of Construction Technology - 5th Transport Advice on GOing anywhere (TAGO) system building
- Metropolitan Transport Association - Intelligent Transport System (ITS) building for Seoul-Hanam as part of the Bus Rapid Transit (BRT) pilot project
- Ministry of Land, Transport and Maritime Affairs - BIS building for the southeastern part of the capital area
- Yongin/Busan Metropolitan City Hall - ITS building
- Korea Express Corporation - TCS server adoption for business/branch offices
- Tongyeong City Hall - Bus Management System (BMS) building

Others

Certification

Tibero proved its stability and performance by gaining GS certificate from Telecommunication Technology Association (TTA) and gained 'Open GIS' certificate, the international GIS standards, from OGC (Open Geospatial Consortium) for the first time in the domestic DBMS market.

- GS (Good Software) Certificate Statue
  · Tibero 4 Certificate (Code: 09-0208, November of 2009)
  · Tibero 5 Certificate (Code: 13-0029, February of 2013)
  · Tibero 6 Certificate (Code: 15-0437, August of 2020)
- Open Geospatial Consortium Certificate Statue
  · Spec. : OpenGIS® Simple Features Specification for SQL, Revision 1.1, Types and Functions Alternative

Major Awards

Jun. 2022 Korea Innovative product
Nov. 2021 Korea World-class Product Award
Feb. 2018 Korea Software Enterprise Competitiveness Grand Prize for Job Creation Contribution
Nov. 2016 Korea Technology Awards: Minister of Trade, Industry and Energy Award
Nov. 2014 Korea SW Product Quality Award
Oct. 2010 Award of DB Solution Innovator
Dec. 2008 Korea Software Technology Excellence Award
Nov. 2008 New technology·Excellent IT product Presentation selected by public Institutions Won the best product Award

ITS Product & Technologies

Tmax Tibero

Product Offerings

- Maximizes performance of processing increasing multiple users with a multi-process and multi-thread based architecture and the latest methodology for efficient resource management.

TmaxTibero

- Offers a compatible development environment by complying with ANSI SQL standards and supporting data access standard APIs, tbPSM (Tibero's Persistent Stored Modules), and embedded SQL.
- Maximizes business continuity by offering an environment for convenient and stable operation with high availability, database structure modification, and various backup/recovery functions.

Technologies

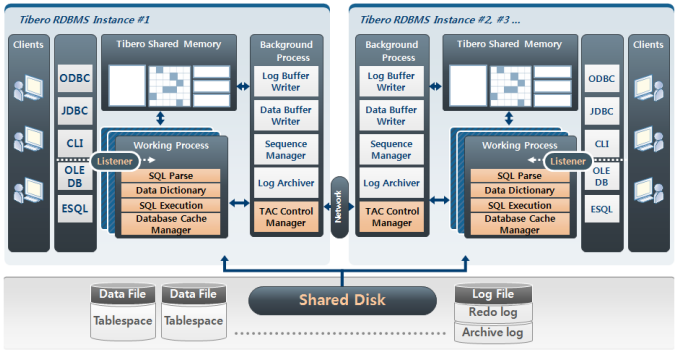
Stability

In order to protect a database against various types of failures, Tibero offers a variety of logical/physical backup methods and provides the RMGR (Recovery Manager) utility that implements flexible recovery depending on each failure situation.

- Backup: Nonstop service through online backup, and rapid backup through offline backup and incremental backup
- Recovery
  - · Crash Recovery: Automatically performed while Tibero is restarted after abnormal termination.
  - · Media Recovery:
    - » Complete recovery: Restores all lost data in the event of data loss.
    - » Incomplete recovery: Restores the database to a particular point of time.

High Availability

Tibero supports Tibero Active Cluster (TAC), which corresponds to Oracle RAC, for its high availability. TAC guarantees stable system operation and convenient scalability with cluster-related functions including the failover function.



Compatibility

Tibero supports standardized SQL and interfaces to integrate with various applications, is fully compatible with almost all components of Oracle, and thus it enables rapid and easy DB migration.

- Compliance with Global Standards
  - Supports the standardized SQL (SQL-92 and SQL-99), a variety of character sets, and XA interface which compiles with X/Open standards.
  - Supports various standard interfaces: JDBC, ODBC, OLE DB, and CLI (Call Level Interface)
  - DB Link (Sybase, Oracle, DB2, MS SQL)
- Compatibility with Oracle
  - Supports non-standardized SQL (Complete support of Oracle-modified SQL).
  - Application compatibility: Compatible with Oracle's stored procedures (PL/SQL) and embedded SQL
  - Data type: Supports CHAR, VARCHAR, NUMBER, DATE, TIMESTAMP, BLOB, CLOB, LONG, RAW, ROWID, NVARCHAR, and NCLOB.

TmaxTibero Co., Ltd.

High Performance

Tibero ensures the best performance in mass transaction system via various mechanisms for high performance processing.

- Multi Process - Multi Thread: Creates required threads beforehand and makes them stand by to respond to user access requests immediately, and uses the minimum system resources.
- Row-level Locking: Minimizes loads by reducing a lockable range and avoiding lock escalation.
- MVCC (Multi Version Concurrency Control): Processes multiple users at once, and offers a structure in which blocking does not occur between read and write processes.
- Parallel DML: Realizes quick response time as multiple threads execute a single query in parallel, and automatically forms operation groups, which can be executed independently, to process them in parallel.
- Parallel Data Loading: Uses the tbLoader utility which loads mass text data to a database, and enhances loading speed as multiple threads within the utility are operating concurrently.
- Partitioning: Supports various partition types such as Range, Hash, List, and Composite partition, and also provides global index and local index.

Function/Convenience

Tibero offers various utilities for developers and administrators in order to develop and manage a database more efficiently.

- tbAdmin
  - Input, modification, and execution of SQL statements, and DML SQL statements' execution plan view
  - Partial Data Fetch for performance improvement, Open File, and Save As... functions
  - Describe Object (table, view, synonym) function, and various monitoring functions
- tbMigrator: Supports tbExport, which is a tool that exports some or all of the data and schema objects in a database to a file, and tbImport, which can import this file back into a database.
  - Migrates data and application from another DBMS to Tibero without modification.
  - Migration target: All schema objects such as table, index, view and synonym, constraints, privileges, and roles
  - Parallel migration processing enables speedy data migration.
- tbLoader: Loads massive data files to a database at high speed.

General Information

Company Name : TmaxTibero Co., Ltd.
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Contacts

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Tmoney Co., Ltd

Company Overview

Tmoney Co., Ltd ("Tmoney") is an internationally recognized and industry leading e-payment service provider based at the heart of Seoul, Korea. Tmoney has been established by Seoul Metropolitan Government and LG Group in 2003 for the purpose of implementing the unified AFC system for the public transit.

Tmoney delivers the best quality e-payment system, data settlement services, and other value added services such as vehicle information systems (BIS, TIS) to both local and international customers. Tmoney helps cities and businesses plan and implement their own unique e-booking and e-payment system for their transit modes or other places where these technologies play a significant role.

Smart technologies continue to reshape ways people plan and pay for their travels and make payments on-line. Tmoney aims to make reality of 'Seamless Travel' come true; a reality where people no longer have to plan their travels in advance regardless of how many modes or how complicated the journey may be, and make this 'reality' a very much real, accessible and enjoyable experience for people all around the world.

Business Area

1st category

☐ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

■ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
- Multi Modal Information/Management - Bus Rapid Transit System/Solution
- Pedestrian/Disabled Support System

■ Electronic Payment
- Electronic Toll Collection - Electronic Parking Payment - Electronic Fare Payment

☐ Traffic Information Integration/Management
- Traffic Information Integration - Traffic Information Center Traffic Data Management

☐ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

☐ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

■ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

☐ Others ( )

2nd category

☐ Hardware ☐ Software ☐ SI ☐ Consulting ☐ Others ( )

Tmoney Co., Ltd

Ongoing ITS project or R&D

- Delivery of E-ticketing system and settlement service for Wellington (New Zealand)
- Operation of Ulaanbaatar City E-Ticketing and Traffic Control System (Mongolia)
- Delivery of C-ITS(Cooperative ITS) pilot project for Seoul city buses (Korea)
- Implementation of BLE & facial recognition-based BIBO(Be-In-Be-Out) ticketing system in UI rail(Korea)
- Operation of Integrated Devices and Bus Arrival Information System for Express Bus (Korea)
- Operation of an Integrated Settlement System for public transportation in Seoul Metropolitan Area(Korea)
- Seoul Taxi AFC and STIS-Seoul Taxi Information System (Korea)

Others

AFC
- Ministry of Trade, Industry and Energy selected as World Best Solution.
- Transit card settlement system : the first ISO9001 certification in the industry.

Card
- Ministry of Land Infrastructure and Transport nationwide compatible transit card certification for the first time in the industry (Transit card : 2010, July 12 / Payment security application module SAM : 2010, November 16)

Mobile
- NFC form & WIMA's NFC Global Competition Awards in 2sectors in 2012 year (Total of 3 sectors, Best Business Viability, Best User Experiences, Best Innovative Solution)

Global
- EACOPS(East Asia Common Payment Scheme) Leader : Multi-National Interoperability

Tmoney

ITS Product & Technologies

Product Offerings

Bus Driver Console
- The world's first all-in-one terminal for both AFC, BMS and C-ITS functions that are applied in Seoul City buese (1,600 fleets)
- C-ITS integrated that copes with various communication methods(V2X, 5G) in an optimized manner
- Intensive and integrated on board computer inclusive of Driver Console, 10.1" Display and GPS
- High Performance suitable for Multi-Fare / Multi-boarding
- Easy user interface and manipulation for bus drivers

Bus Validator
- State-of-the-art Bus Validator with multiple connectivity and high performance - Wide and clear user interfaces with 4.3" LCD
- Compatibility with international RF Card specification(ISO14443 type A/B, Mifare)
- Expandability up to 8 SAM slot as SIM type
- Easy maintenance control functions with Automatic Error Control and Data loss control

Taxi Validator
- Accepts diverse types of cards(IC card, Magnetic Stripe card, RF card)
- Flexible to deploy applications such as mobile call service and navigation (GPS)

Express Bus On Board Device
- Multi-payment method available such as RF type card, Mobile RF chip, Magnetic type card
- Ticket check through Barcode reader(QR code) Payment Media KSCC issues different types of smart cards such as pre-paid, post-paid and also NFC chips for mobile. We provide them in a variety of different styles suited for their functionalities and themes.

Card, Mobile, Other accessory

Tmoney Co., Ltd

Technologies

1. AFC Acquiring

- It is easy deployable system which enables passengers to easily integrate turn-key AFC solution into the bus system; a system designed to provide smart-card and mobile device(NFC) based AFC, real-time BMS, and Remote Device Control Services. OBU's(On-Board Units) transmit transaction and operation data to center system through wireless connection in real time. At center system, passengers are able to monitor fleet and passenger activities and update fare structures of the OBU's.

2. Smart Mobile Ticketing (Intercity Express Bus)

- IT is a total express bus solution that enables optimal Real-Time Monitoring System(RTMS) and innovative ticketing system. With the state of the art OBU, ways passenger can purchase the ticket are diversified; from mobile(Tmoney Express App) to on-board ticketing where you simply issue your ticket on the bus passengers are riding without booking in advance. The OBU's are wirelessly connected to operator's RTMS. Operators can send travel information to the OBU's. They are also able to manage their fleet effectively by obtaining database of operational information of each vehicle. They can monitor each vehicle's booking, ticketing and boarding status on a real time basis and use this information to maximize each vehicle's passenger load.

General Information

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TOPES Co., LTD.

TOPES

Business Area

1st category

■ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

☐ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
- Multi Modal Information/Management - Bus Rapid Transit System/Solution
- Pedestrian/Disabled Support System

☐ Electronic Payment
- Electronic Toll Collection - Electronic Parking Payment - Electronic Fare Payment

■ Traffic Information Integration/Management
- Traffic Information Integration - Traffic Information Center Traffic Data Management

☐ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

☐ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

☐ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

☐ Others ( )

2nd category

■ Hardware ■ Software ☐ SI ■ Consulting ☐ Others ( )

Ongoing ITS project or R&D

Project : ITS project for Angola, Rwanda, Turkmenistan

Others

ISO
- ISO 9001 : 2009 / ISO 9001 : 2008 - ISO 14001 : 2009 / ISO 14001 : 2004

CE
- CR200 (TOPCAM200C) - Vehicle Enforcement System (#K1651/L07)
- CR200 (TOPCAM200C) - Vehicle Enforcement System (#K1652/E07)
- Surge Portection Equipment (#N8 07 04 63165 001)

Prize
- Korea Expressway Corporation.
  : Appreciation Award for ITS Project in 2010. (#10-231)
- Chief of the Ulaanbaatar City / Traffic Control Center
  : Appreciation Award Of Honor for Ulaanbaatar City ITS Project in 2010.

TOPES Co., LTD.

ITS Product & Technologies

Vehicle Enforcement System (TOPCAM 2012)

- Speed Enforcement System (TOPCAM 2000)
- Red-Light Enforcement System (TOPCAM 2001)
- Point to Point Speed Enforcement System(Average Speed Enforcement system) (TOPCAM 2002)

Traffic information system

- Automatic Vehicle Identification System(Image detection) (IMAGEPRO 8000)
- Automatic Vehicle Identification System(Sensor detection) (IMAGEPRO 6100)
- Vehicle Detection System (IMAGEPRO 1000)

Road Security System

- Crime Prevention & Prevalence System (IMAGEPRO 5000)
- Roadway Surveillance System (IMAGEPRO 6000)
- Intelligent CCTV System for Safety Improvement in the Protection Area (IMAGEPRO 7000)

CCTV System

- CCTV for Traffic Monitoring System (IMAGEPRO 4000)
- I-TV (Industrial CCTV)

General Information

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TRACOM Co. Ltd.

TRACOM

Company Overview

TRACOM, established in November 2004 as an ITS service company, leads the revolution of software and hardware solution, integrated ICT and Traffic-Infra Businesses. For 17 years, TRACOM has been working with companies and communities around the world to build ITS and constantly making efforts for creating value through the continuous R&D.
Main business areas include BIS, BMS, and traffic management center. Since its establishment, TRACOM has carried out ITS construction and maintenance projects for more than 30 local governments in Korea, and has conducted ITS construction projects, consulting, and feasibility studies in various countries such as Uzbekistan, Azerbaijan, Paraguay, etc.

Business Area

1st category

■ Traffic Management
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- Fleet Management System - Hazardous Freight Management - Logistics

☐ Others ( )

2nd category

■ Hardware ■ Software ■ SI ■ Consulting ☐ Others ( )

Ongoing ITS project or R&D

Overseas Project
- PMC service of public transportation improvement project for easing urban traffic congestion in Asuncion, Paraguay
- A feasibility study on establishment of urban advanced transportation system and construction of traffic management center in major cities of Uzbekistan

TRACOM Co. Ltd.

Domestic ITS Project
- Construction of Intelligent Transportation System (ITS) in Anseong-city, Korea
- Basic design of autonomous vehicle pilot project and construction of ITS in Anyang-city, Korea
- Construction and operation of big data monitoring center for autonomous vehicles in Sejong-city, Korea

R&D
- Development of priority signal technology and safety management technology of Super BRT
- Development of AI-based Traffic Signal Control System for Autonomous Vehicles

Others

Certification
- ISO 9001:2015

Patent
- Technical patent: Navigation system using RF beacon (2009)
- Technical patent: Navigation system using RFID Tag (2009)
- Technical patent: Methodology and system for calculation of link travel time (2014)
- Technical patent: Traffic signal control system and traffic signal light for blackout-free (2014)
- Technical patent: Low power bus information terminal using sunlight

Certificate of Software Quality
- BIT for ITS/BIS AYBIT 2013

ETC
- S/W registration: more than 10 programs
- Winning a 4th Korea Internet Award 2010 (Special Mention Award)
- Confirmation of Innovation Technology Small Business(INNO_BIZ)

ITS Product & Technologies

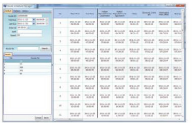
Product Offerings

TRACOM

Product Offerings

T-CENTER®

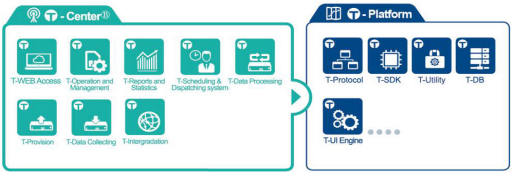
T-Center is solutions created for urban and inter-urban transit operations. T-Center allows optimal Bus Management and Bus Information.



FUNCTIONALITY

- **Data Colleting Module:** receives Bus location data from T-Driver(On Bus) and save the data in its database via network.
- **Processing Module :** converts the collected basic data to bus information including expected bus arrive time.
- **Provision Module :** provides bus information to people through the T-Passenger, Internet and a mobile phone in real time.
- **Scheduling and Dispatching module :** allows daily management of operations, including manual modification of scheduling and creation or suspension of services based upon incidents that may occur during day-to day operations.
- **Reports and Statistics Module:** creates a full set of customizable reports to over all of the company's operational needs, based upon each customer's specific characteristics.
- **Operation and Management Module :** manages/operates bus schedule, local equipment, communication network, center hardware and software etc.
- **Integration Module :** allows interfacing with the company's other operational assistance systems (control and monitoring systems).
- **Web/ Mobile Module :** provides users with internet-based access to the full functionality of the tools from any location.

MODULES



T-DRIVER

T-Driver

Bus location and chronological data collected in seconds using GPS and wireless data network are combined to generate the bus operation data, and the self-diagnosis result and unforeseen situation data of each module are collected and combine with the bus operation data to be saved in T-Driver and sent it to T-Center®.

T-Driver separates the internally processed data and those received from T-Center® depending on the bus line and current situation to deliver the most reliable information to drivers.

Specification

- CPU : ARM11 Core Micro Processor
- Display Panel : 7 inch Digital TFT Color Touch
- External Storage : SD Memory
- Interface : Serial Port : RS-232C 5Port, RS-485 1Port
- Modem(Option) : WCDMA, GSM, TRS Support
- Key button : 5~9 button

Features

- User friendly UI and simple touch display
- Easy installation and maintenance
- Wireless communication (Using domestic communication)
- Licensed software, No monthly fees or recurring costs
- Display the each bus interval in front and back
- Optional S/W : Eco-Driving Indicator
- H/W : CCD Camera, Finger printer Recognize

TRACOM Co. Ltd.

Product Offerings

T - PASSENGER

Contact us

Website : www.tracom.co.kr
E-mail : tracom@tracom.kr
TEL : +82-31-389-8877 **FAX :** +82-31-389-8878

T-Passenger

T-Passenger is a device that provides the expected bus arrival information to users that installed at bus and bus stop requires high level of durability and safety against the harsh environment such as dust, vibration, temperature and humidity.

By applying the high-intensity LCD or LED, passenger is easily able to recognize the bus information. The efficiency of the product has been maximized to enable the visibility of the contents of the screen even under the sunlight.

Specification

- Mainboard : Industrial Controller
- Display: 26 Inches Outline ~ 46 Inches or LED
- Sub Controller : MCU : 8bit Micro

Features

- Water proof/heat proof/dust proof structure to resist external factors (rain, dust, etc.)
- City Activity PR or Advertisement (image, video)
- Current Time, Weather, News etc. information can be displayed
- Bus Routing Search (Key button)
- Self-recovery (watch dog)
- System administration through remote control
- Licensed software, No monthly fees or recurring costs

General Information

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UNISECU INC

UNISECU
www.unisecu.kr

Company Overview

UNISECU is developing AI-based ITS technology. Our flagship product "Smart Crosswalk System" was developed in 2017. It automatically recognizes pedestrians and changes the traffic light without having to wait or press the button signals. This product prevents jaywalking and protects vulnerable users. As for the certificate, it has been selected as 'Excellent Product' by the Korean government for the first time outside Seoul. In 2021, we are aiming to expand the system by adopting signal extension technology.
UNISECU values 'Integrity and Safety' the most. We are making rapid achievements as a pioneer in the 4th industrial revolution and will continue to expand our footprint.

Business Area

1st category

■ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
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- Pre/On-Trip Traveler Information Service - Telematics Service

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- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

☐ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

☐ Others ( )

2nd category

■ Hardware ■ Software ■ SI ☐ Consulting ☐ Others ( )

Ongoing ITS project or R&D

Smart City Solution for traffic volume detection by using high-resolution 4D/UHD (Ultra High Definition) & multi-tracking radar which analyzes moving direction.

Others

Patents

- Intelligent Type of Apparatus for Guarding Crosswalk Pedestrian and Guard System with the same
- Integrated System for Monitoring Vehicles Using Radar Sensor on Spot

UNISECU INC

- A Method for Detecting a Pedestrian Automatically and a Device for Generating a Signal on Detecting a Pedestrian Automatically
- A plurality of transmission method of the video stream for the improvement of the background and object identification capability of the IP camera
- Convergence detector and traffic enforcement system therewith
- A smart overspeeding vehicle oversee apparatus for analyzing vehicle speed, vehicle location and traffic volume using radar, for detecting vehicles that violate the rules, and for storing information on them as videos and images, a smart traffic signal violation vehicle oversee apparatus for the same, and a smart city solution apparatus for the same

Certificate

- ISO 9001 : 2005

ITS Product & Technologies

Products

Smart Crosswalk System (SC)

- UNI-PDS1000CE: Automated Crosswalk, Broadcasting sys, Button Crosswalk

Smart Speed/Red-Light Enforcement (SSRL)

- UNI-SRE1000: Detects speed and red-light signal
- UNI-SSE1001: Detects speed

CCTV System

- UNI-P01-SW: 3 Mega, x40 Zoom IP PTZ Camera + Switching Hub
- UNI-B01-PO: 2 Mega, x4 Zoom IP Bullet Camera + PoE injector
- UNI-D01-PO: 2 Mega, x3 Zoom IP Dome Camera + PoE injector
- UNI-2500R-M01: N.V.R. + LED 22inch Monitor

Technologies

1. Smart Crosswalk System

Consists of 3 functional parts: Automated Crosswalk, Broadcasting sys, Button Crosswalk
All-In-One system

Automated Crosswalk

- Behavior Analysis: Analyzes pedestrians' intention whether to cross or pass-by
- Light Change: Changes lights for pedestrians not for passersby
- Recognition Rate (official test certificate)100%: day/night, under good/bad weather conditions, 750 times per each (1,500 times in total)

Broadcasting System

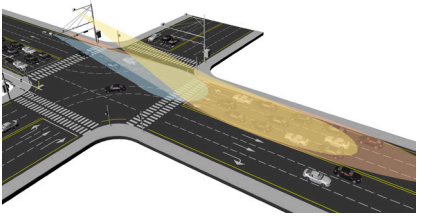
- when people nearing road or attempting J-walking "It is dangerous, please get back to sidewalk"
- when pedestrians come into the scanning zone "Please wait for a moment, it will turn to green light"
- when green lights turn on "Please cross after look left and right"
- when green lights blink "Please cross on the next light"

Button Crosswalk

- lights turn to green when a pedestrian pushes button
- still functional even when under maintenance (no need to J-walk or detour)
- LED backlight makes it easier for pedestrians to use (esp. for hearing impaired, disabled)

UNISECU
www.unisecu.kr

Optional Functions
- Centralized Control
  1. Current light color, broadcasting test, equipment temp. check
  2. Check the no. of nearing road or attempting j-walk
  3. Sound test, Rebooting, Video Surveillance (for security purpose)
- Scheduler: Setting on/off timer
  example
  · school area: deactivate at commuting time
  · populated area: activate 00:00~05:00
  · lowly populated area: activate 24/7

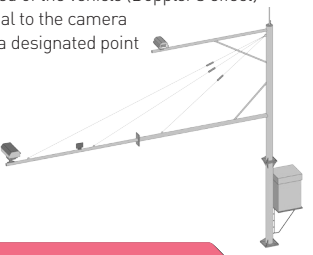


2. Smart Speed/Red-Light Enforcement
A smart city solution for multi-purpose: Traffic measurement, Speed and Signal Violation.
All-In-One system

Radar Technology
- 2M to 340M range
- Detects cars running over speed limit
- Detects cars passing through intersection on red light

Enforcement Scenario
a. When a vehicle passes scanning zone, radar sensor detects the speed of the vehicle (Doppler's effect)
b. When a vehicle exceeds speed limit, the radar sensor outputs a signal to the camera
c. When the camera gets the signal, it takes a picture of the vehicle at a designated point

How it Works
a. Radar sensor detects speeding cars
b. Radar sensor outputs signal to camera
c. Camera takes picture of the car's plate



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WAYS1

Company Overview

WAYS1 specializes in geo-spatial information, developing and providing services for navigation maps, High-definition maps for automated driving, and local dynamic maps based on high-precision maps.

Business Area

1st category

■ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

☐ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
- Multi Modal Information/Management - Bus Rapid Transit System/Solution
- Pedestrian/Disabled Support System

☐ Electronic Payment
- Electronic Toll Collection - Electronic Parking Payment - Electronic Fare Payment

■ Traffic Information Integration/Management
- Traffic Information Integration - Traffic Information Center Traffic Data Management

☐ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

■ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

☐ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

☐ Others ( )

2nd category

■ Hardware ■ Software ■ SI ☐ Consulting ☐ Others ( )

Ongoing ITS project or R&D

- Development of Dynamic Map Server and Dynamic Information Collection Function of PoC 1st and 2nd Phase
- Development of Dynamic Monitoring Function and Pedestrian Traffic Safety Event PoC
- Development and Supply of LDM of Saemangeum Automated Commercial Vehicle Test Bed Construction Project
- Development of Road System Based on LDM and V2X for Automated Driving
- Development of V2X based truck cluster operation technology
- A Study on the Safety Infrastructure for Automated Driving in Urban Roads

Others

Certificate of patent (KOREA)

- METHOD AND APPARATUS FOR PROVIDING INFORMATION OF A BLIND SPOT BASED ON A LANE USING LOCAL DYNAMIC MAP IN AUTONOMOUS VEHICLE
- APPARATUS AND METHOD FOR PROVIDING DRIVING INFORMATION FOR AUTONOMOUS VEHICLE
- APPARATUS AND METHOD PRODUCING MESSAGE FOR TRAFFIC SIGNAL PHASE SERVICE

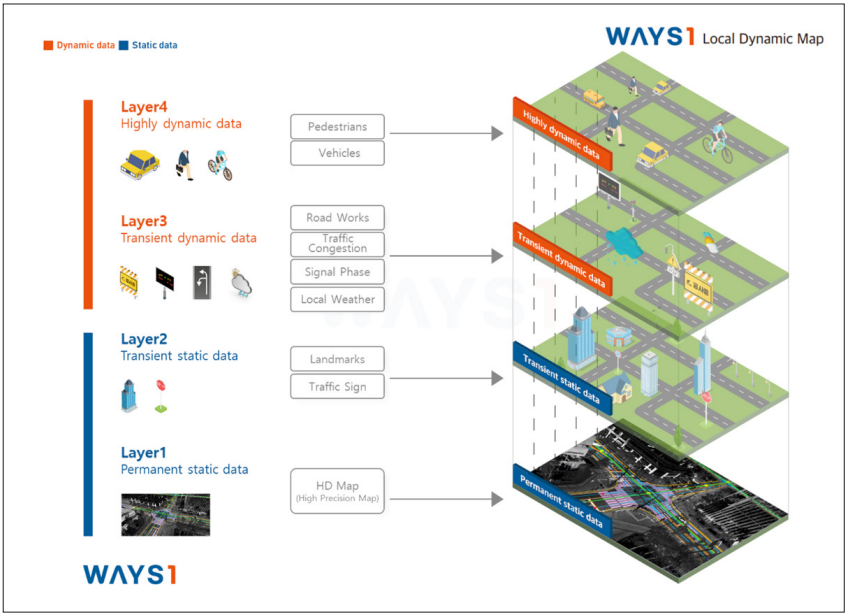
Certificate of Software Quality

- (TTA(Telecommunications Technology Association)) GS-Certified 1st Grade: LDM2X

ITS Product & Technologies

Product Offerings

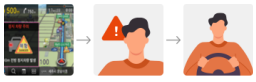
- LDM2X (LDM to Everything) is WAYS1's unique solution for LDM and operating systems. Our product successfully completed multiple automated driving projects, including C-ITS-related testings in various municipalities. It is a GS-certified product with proven technological excellence.
  * Good Software (GS) Certification: Telecommunications Technology Association certification of high-quality products using international standards (SO/IEC9126-2, 25051) to conduct strict testing and comprehensive evaluation of software quality.



WAYS1

C-ITS vs. LDM Cooperative automated Driving System

- LDM cooperative automated Driving system combines and processes road information and transmits it to vehicles as V2X messages without driver involvement.
- LDM cooperative automated Driving system combines the dynamic information of C-ITS and the static information of HD map into LDM standard and generates accurate location information for transmission.

Category	C-ITS Road Infrastructure System	LDM Cooperative Automated Driving Road Infrastructure System
Purpose	Provides information (text/image) to drivers	Provides quantified data to self-driving controller
Dynamic Information Collection Method	Infrastructure sensor, traffic information center, vehicles	
Service Provision Method	SAE J2735 Message set	
Location Information Generation Method	Static information set during development	Real-time generation using HD map, improved accuracy
Capabilities	Simple transmission of collected data	Delivers a combination of collected information and map data
Response to Road Changes	Requires software repair and maintenance	Able to respond with updated/distributed HD maps
Service Flow	 C-ITS HMI → Driver (Perception/Decision) → Driver (Control)	 Data transmission → Automated Driving System → Steering/ Acceleration /Brakes

ITS Product & Technologies

Technologies

- LDM2X developed by WAYS1 is a system that collects, stores, manages, and transmits real-time data (nearby vehicles, traffic signal information, etc.) and information about events on the road (accidents, constructions, etc.). LDM2X manages not only static data such as map data but also dynamic data. The dynamic data collected into LDM2X RSU(Road Side Unit) is delivered to LDM2X OBU(On Board Unit) through the system infrastructure before finally reaching the automated-driving system. A customized profile message (Dynamic Obj Profile) has been added to ADASIS v3 for dynamic data transmission. We also developed and added AHP(ADASIS Horizon Provider; ADASIS generator) to LDM2X OBU in addition to AHR (ADASIS Horizon Reconstructor) that can be used on automated-driving systems.

General Information

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E-mail : sykim@ways1.com

Wayties Inc.

Company Overview

Wayties is a tech startup company that provides V2X devices and test solutions based on years of studies and experiences in V2X and Connected Vehicle technology. We offer V2X driving test and data analysis, and V2X engineering to Car OEM, Tier-1/2, and ITS companies. Since its foundation in 2016, Wayties have been working on commercialization of V2X technology by participating in ITS Korea and OmniAir Consortium and cooperating with various business partners worldwide.

Business Area

1st category

☐ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

☐ Public Transportation
- Bus Information/ Management System - Public Transportation Information/Management
- Multi Modal Information/Management - Bus Rapid Transit System/Solution
- Pedestrian/Disabled Support System

☐ Electronic Payment
- Electronic Toll Collection - Electronic Parking Payment - Electronic Fare Payment

☐ Traffic Information Integration/Management
- Traffic Information Integration - Traffic Information Center Traffic Data Management

☐ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

■ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

☐ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

☐ Others ( )

2nd category

■ Hardware ■ Software ☐ SI ■ Consulting ☐ Others ( )

Ongoing ITS project or R&D

We have been participating in various R&D project related to V2X, C-ITS, Vehicle platooning and Connected Automated Vehicle for several years to develop V2X services, evaluation procedures and systems. For one of our current projects, we are developing V2I (Vehicle-to-Infrastructure) service and safety service evaluation technology for V2X-based commercial vehicle platooning with road operator, Car-OEM, and mobility service providers.

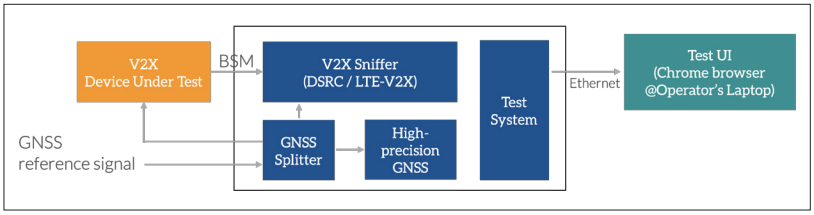
Others

Patents related to V2X, C-ITS and connected and cooperative driving (2 patents registered and 10 pending)

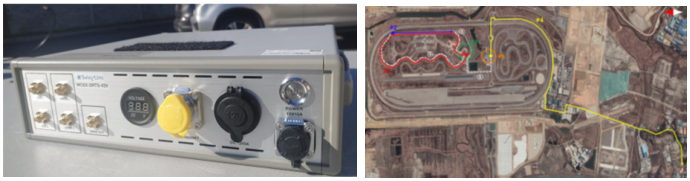
ITS Product & Technologies

V2X Driving Test System (WCEX-DRTS-V2V)

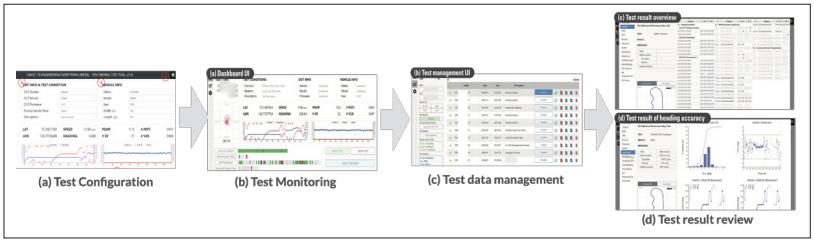
- The vehicle-to-vehicle (V2V) driving test system (WCEX-DRTS-V2V) is a conformance test tool for <SAE J2945/1> requirements (on-board system requirements for V2V safety communications) and <IEEE 1609.3> standard in the real-road driving testing.
- OmniAir Consortium certification test in progress (2021.08)
- Features
  · Real Time Dashboard, Interactive GUI and Automated Report Generation
  · Basic Safety Message (BSM) Analyzer (IEEE802.11p, 3GPP Rel.15 PC5)
  · Conformance Testing for SAE J2945/1A Requirements
- Test coverage:
  · Position, Heading and Speed accuracy using embedded high precision GNSS system
  · Path History Distance, Perpendicular Points
  · Hard Braking Event, Device Power Startup, Certificate Change, etc.



<Fig. Block diagram of V2X Driving Test System>



<Fig. V2X Driving Test System Snapshots and Example of test course>

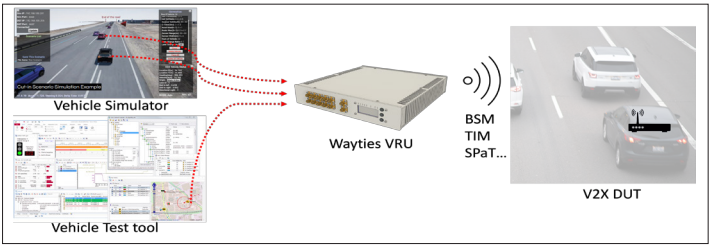


<Fig. UI flow of V2X Driving Test System>

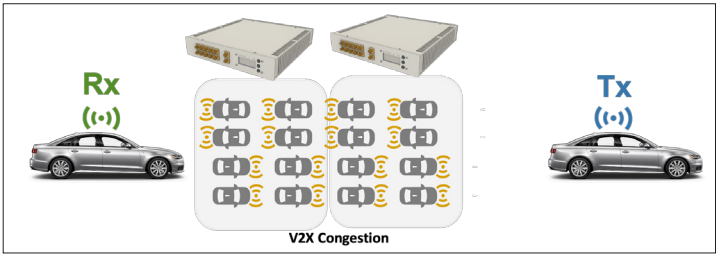
Wayties Inc.

V2X Radio Unit Array (WCEX-VRU)

- VRU is a versatile communication device that can transmit multiple synthesized V2X radio arrays and process V2X standard messages. It has various use cases that require virtual V2X radios such as V2X proxy for autonomous driving simulator and V2X test system, V2X packet sniffer, and V2X congestion packet generator.
- Features
  · Supporting multiple V2X radio array (up to 8 radios)
  · Supporting WAVE/DSRC (IEEE802.11p), C-V2X (3GPP Rel.15 PC5)



<Fig. Use cases of VRU with vehicle simulator and test tool>



<Fig. Use cases of VRU for V2X congestion test>

- Integration of V2X devices and target OBUs to existing systems
- DSRC and C-V2X message packet analysis and field testing
- Applying V2X system into vehicle platooning, CAV and C-ITS systems

General Information

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WIABLE Corp.

Company Overview

- Wiable Corporation was established in 1996 with joint- investment of the Ministry of Information and private telecommunication service providers. (A company dedicated to installing mobile communication systems in specific area such as subway, railway, national park, public area and so on.)
- Early 2000 year, Wiable Corporation is privatized and diversified its business participating various projects such as RSU/OBU of UITS system set up, public safety-LTE pilot project, high-speed LTE-M pilot project and LTE-R project and so on.
- Currently, we are specialized in the supply and installation of RSU and OBU devices for C-ITS systems.

Business Area

1st category

☐ Traffic Management
- Traffic Signal/Control - Incident Management - Traffic Information - Safe-driving Support
- Traffic Enforcement - Parking Management

☐ Public Transportation
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- Electronic Toll Collection - Electronic Parking Payment - Electronic Fare Payment

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- Traffic Information Integration - Traffic Information Center Traffic Data Management

☐ Traveler Information
- Pre/On-Trip Traveler Information Service - Telematics Service

☐ Advanced Vehicle/Road
- Safe-driving Vehicle & Road - Autonomous Driving - Drive Assistant System

☐ Commercial Vehicle Operation
- Fleet Management System - Hazardous Freight Management - Logistics

☐ Others ( )

2nd category

■ Hardware ☐ Software ☐ SI ☐ Consulting ☐ Others ( )

Ongoing ITS project or R&D

Specialized in ITS related project, especially construction parts (V2X RSU, CV2X RSU, vehicle terminal, HMI, etc.).

WIABLE Corp.

Others

- Certified for ISO 9001 (quality management) and 14001 (environmental management)
- Patent for Ground balance sensor and vehicle integrated service device
- Patents for Eco-friendly telecommunication pole installation and tower structure.
- Broadband Integrated Antenna
- Patent for binary code division multiple access-based communication system by using ARAI algorithm

ITS Product & Technologies

Product Offerings

Components

• Power	:	PoE(IEEE 802.3at)
• CPU	:	1.MX8 Quadcore (1.2Ghz, 64bit)
• DRAM	:	1 Gigabyte DDR4 SDRAM
• FLASH	:	Up to 16 Gigabyte eMMC (Default 8 Gigabyte)
• V2X Radio	:	2 radios
• Security	:	IEEE 1609.2 Hardware Security Module
• GNSS	:	GPS, GLONASS, GALILILEO, SBAS
• Sub Memory	:	MicroSD
• Interfaces	:	Ethernet(1Gbps), Wi-Fi, Bluetooth
• LEDs	:	Power, Status, Diag, F/W update, Fault
• Accessories	:	V2X Ant., GPS Ant., PoE switch, Wi-Fi/BT Ant. / LTE Ant.(Optional)
• Cellular (Optional)	:	**LTE(4G)** – Rel9 Cat4 (MIMO 2x2)

Components

• Power	:	12 / 24 V
• CPU	:	1.MX8 Quadcore (1.2Ghz, 64bit)
• DRAM	:	1 Gigabyte DDR4 SDRAM
• FLASH	:	Up to 16 Gigabyte eMMC (Default 8 Gigabyte)
• V2X Radio	:	2 radios
• Security	:	IEEE 1609.2 Hardware Security Module
• Sensors	:	Accelerometer, Gyroscope
• GNSS	:	RTK GPS, GLONASS, GALILILEO, SBAS
• Sub Memory	:	MicroSD
• Interfaces	:	Ethernet(1Gbps), Bluetooth, Wi-Fi
• Accessories	:	V2X Ant., GPS Ant., Wi-Fi/BT Ant(Optional).

Technologies

- National Emergency Safety and Communications Network (Public Safety LTE)
- National wireless network combined from the wireless communication networks of the disaster related organizations such as military, police force, Ministry of public safety and security, and local governments
- Railway Convergence Network (LTE-Rail)
- Establishment and maintenance of public network for underground section such as railway (KTX, General Railway), subways and tunnels
- Establishment and maintenance of public network for base station such as military units, parks, Tourist sights, and new cities
- The Development of public equipment for base station public services (Public base stations, public optical repeater, public RF repeaters, public antenna etc) and environmental friendly base station, and solutions for public use
- Intelligent Transportation System for Next Generation
- Intelligent Transportation System that uses Vehicle to Everything Communications(V2X) to exchange the information through wired and wireless communications such as vehicle to vehicle, vehicle to infrastructure etc.

General Information

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ITS KOREA

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