ETRI

Vehicle ADAS (Advanced Driver Assistance System), AVM(Around View Monitoring) system related field

Obstacle Sensing Technology Around Vehicle

Contact: Heejin Choi
Email: hjchoi2@etri.re.kr
Phone: +82. 42. 860. 4946

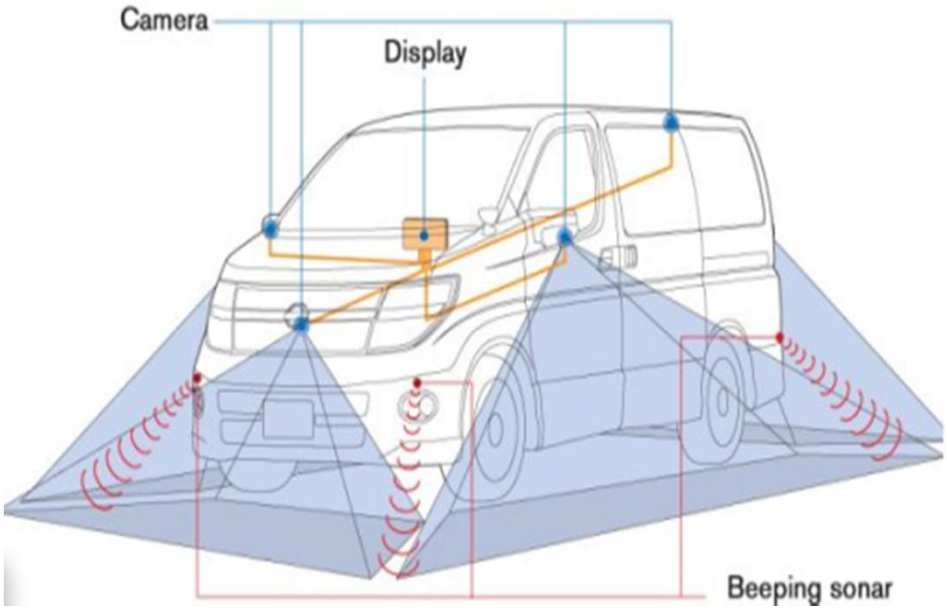
TECHNOLOGY BRIEF

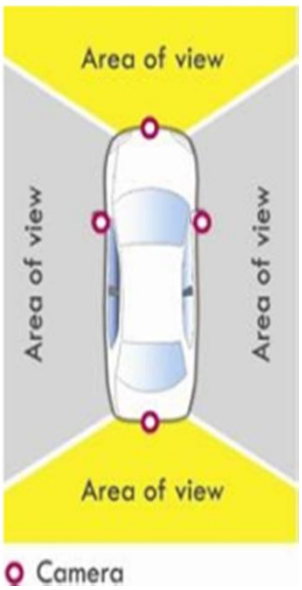
Obstacle Sensing Technology Around Vehicle

▣ Technology Overview

- A technology which is loaded in AVM(Around View Monitoring) system of a vehicle and perceives obstacles(including pedestrians) around the vehicle while the vehicle is parking or stopping.

- Signal conditioning module for obstacle detection is included in AVM system which has 4 fish-eye lens cameras to monitor the vicinity of vehicle. It allows safety support system of school buses for children, obstacle anti-collision system of parking support system and posterior approach object sensing service while the vehicle is stopping.





☐ **Keywords** | **Vehicle ADAS (Advanced Driver Assistance System), AVM(Around View Monitoring) system, MOD (Moving Object Detection)**

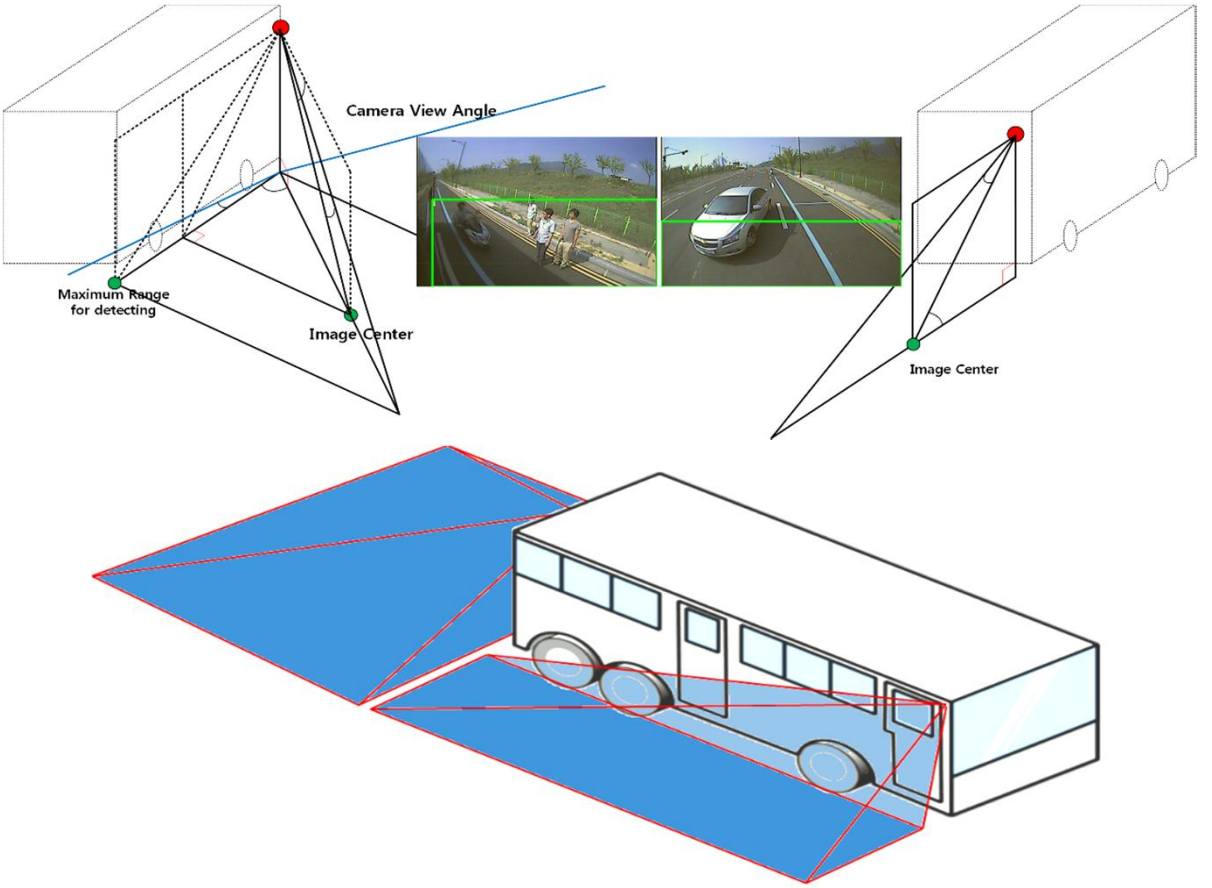
☐ **TRL** 5

Technology Classification Code		
Sector	Sub Sector	Industry
Convergence SW	Application SW	Industry application SW

TECHNOLOGY BRIEF

Obstacle Sensing Technology Around Vehicle

▣ Technology Description



▶ Obstacle sensing technology around vehicle

- **A technology which is loaded in AVM(Around View Monitoring) system of a vehicle and perceives obstacles around the vehicle while the vehicle stops or moves slowly**
  - Technology perceives moving obstruction while the vehicle stops
  - Technology perceives moving obstruction while the vehicle moves

▣ Application Fields

▶ Application to robot industry and safety system of vehicle

- **As a technology that can be applied to safety system of vehicle and robot industry, it is usable for application field warning dangerous situations around the vehicle while moving slowly.**
- **Technology can be applied to school buses for children and general sedan/van.**

▣ Outstanding Features

A technology which is loaded in AVM(Around View Monitoring) system of a vehicle and perceives obstacles(including pedestrians) around the vehicle while the vehicle is parking or stopping.

▶ Features of technology

- **A technology which is loaded in AVM(Around View Monitoring) system of a vehicle and perceives obstacles around the vehicle while the vehicle stops or moves slowly**
- **Obstruction detection related technology is as follows**
  - Technology that perceives moving obstacle while the vehicle stops
  - Technology that perceives moving obstacle while the vehicle moves

▶ Predominance of technology

- **Technical side :**
  - Unlike existing detecting method, detection ability about target is outstanding and detection speed is far better than learning based algorithm.
  - As a code based on MISRA rule, it can be instantly applied to imbedded system for vehicle.
- **Business side :**
  - Written in C language for apply to existing AVM system, so code size is small and technology can be applied to various systems.

▣ IPR Status

Apply 2 cases of domestic patent

No.	Country	Application Number (date)	Status	Title
1	US	15/059651 (2016.03.03.)	Apply	Obstacle Detection Apparatus and Method

▣ Technology Trend

Recently various Advanced Driver Assistance Systems(ADAS) supporting convenient and safety drive are attached to vehicles.

▶ Necessity of alternate technique increase

- In case of existing AVM(Around View Monitoring) system, it shows vehicle vicinity through one image which is attained and compounded from 4 camera's image. Commercialization is focused on expensive cars.
- Existing vehicle rear sensing technology using ultrasound sensor and/ vehicle rear monitoring technology using rear camera cause frequent accidents because it can't monitor lateral dangerous situations.
- Warning to drivers about dangerous situations by detecting vehicle vicinity will prevent accidents in advance.
- Most of the major vendors are currently developing LDWS and BSWS system based on vision sensor, and these vision system development and operation ability are expected to be more important elements in future system supply companies.
- Installation of rear camera will be a requirement in USA from 2018. Also rear camera(ex. wireless rear camera, license plate sticking camera) which was top-selling product in the After market in 2015 is easy to use and install, and market is composed of low-cost products so low-cost obstacle detection technology is expected to need.

☐ Korea

- Since camera sensor based technology is able to apply to future multi-application, almost every companies are researching and developing. Sensor fusion technology based new applications will appear in the next few years.
- Camera sensor is affected by weather condition so it cannot substitute radar completely. So they realize highly reliable and improved system by combining radar.
- AVM system development is progressing a lot in Korea, but obstacle detection technology loaded product is not yet launched.

☐ Global

- Europe, North America, and Japan car makers are already being mass-produced, and this systems are continuously evolving technology.
- Technology is applied to front/back conflict and collision, blind spot obstacle waring and lane change/keep system.
- Core sensor module and signal process part technology are superior.

▣ Market Trend

Europe, North America and Japan are consistently developing this technology, and it is expected to apply to various fields and products in future. Also applying to safety system of vehicle will prevent vehicle accident in advance.

- Focusing on expensive cars, AVM system was commercialized in the domestic since 2012. Especially vehicle vicinity obstacle detection technology finished the safety test by applying to commercial product in 2014 and is expected to be commercialized easily.

▶ Domestic and foreign market size (unit: hundred million dollars)

Classification		First year (2014)	Second year (2015)	Third year (2016)	Fourth year (2017)	Fifth year (2018)
Obstacle sensing technology around vehicle	foreign	50	55	62	69	75
	domestic	300	350	420	490	550

▶ Domestic and foreign market share (unit: %)

Classification		First year (2014)	Second year (2015)	Third year (2016)	Fourth year (2017)	Fifth year (2018)
Obstacle sensing technology around vehicle	foreign	0.05	0.3	0.6	1	1.4
	domestic	3	6	8	10	13

☐ Market Leaders

▶ International Vendors

- GM, FORD, DCX, BMW, Benz, VOLVO, HONDA, NISSAN, TOYOTA

▶ Domestic Vendors

- KIA(K9), Renaultsamsung(SM7), Imagenext, Ajin Industry Inc.

☐ Technology Demand

Application	Vehicle and robot manufacturer, domestic and foreign vehicle safety system developing company (auto parts manufacturer)
Industry	Domestic and foreign vehicle safety system developing company (auto parts manufacturer), robot manufacturer

▣ Scope of Technology Transfer

▪ **Technology transfer contents**

- **Vehicle vicinity obstruction sensing technology**
  - Fish-eye lens camera based obstacle detection technology
  - It provides technology that perceives moving obstruction while the vehicle stops or moves

- **Vehicle vicinity obstruction sensing technology**
  - Fish-eye lens camera based obstacle detection module source code
  - Related technical document and intellectual property(TM/TDP, patent, program)

▣ Applications and Effects

▶ Expected application products and services

- **Get on/off safety system of school buses for children – apply to school buses for children, safety enhancement is possible**
- **General sedan and van's black box function extension – extension of obstacle approach informing function is possible**
- **General sedan and van AVM – extension of obstacle detection function is possible**

▶ Expected effects

- **[user safety assurance]** Applying to safety system of vehicle prevents vehicle accident in advance and allows improvement of national safety.
- According to legislation of school bus get on/off safety system, future business value is expected to increase.