Automobile + IT, Korean cars drive smart

Summary

Global automobile manufacturers are aiming at developing an accident-free smart car by 2020. Smart cars are expected to drastically increase road safety. However, this is just part of what a smart car offers us. They will also improve driver convenience. To improve safety and convenience, competition is getting intense in mechanics, IT, electricity and electronics industry as well.

The Korean automobile industry is the fifth largest in the world. At the same time, the IT industry is one of the strengths of Korea. Collaboration between these two industries can create a new growth engine.

Korean car manufacturers such as Hyundai-KIA, Renault Samsung and GM-Daewoo developed their own systems to provide drivers convenience and safety. In the coming years, various services will be applied to a wide range of models.

Academia and knowledge institutes are working on two kinds of self-driving vehicles that will bring accident-free driving one step closer. The Autonomous Vehicle collects information from in-vehicle sensors. The other type of self-driving vehicle is the Automatic Vehicle Guidance System (AVGS), which receives information from both in-vehicle sensors and roadside infrastructure.

A conference on smart mobility brings a lively discussion on the business prospect of smart vehicles. The Korean government sees it as the next generation growth engine and supports it to boost industry.
Details

1. Korean smart car systems

Hyundai-KIA: UVO

During the Customer Electronics Show (CES) in 2010, KIA's infotainment system ‘UVO’, co-developed with Microsoft, was first released. UVO is a system which is operated by Microsoft's voice recognition control engine.

In February 2011, Hyundai’s next generation infotainment/telematics system ‘Blue Link’ was released. It provides a real-time weather conditions report, conversion of voice to text messages and connection between smart phone, navigation and UVO center. Locking/unlocking a car, starting the engine and calling an ambulance automatically when accident occurred are possible applications (see figure 1). Not only did the alliance work with Samsung Electronics and LG Electronics, it also worked with Korean mobile-network operators KT and SKT. The result will enable new vehicles to enjoy smart phone content from 2013 onwards.

![Figure 1. Infotainment/telematics 'Blue Link' by Hyundai](image1)

Renault-Samsung: Driving care

‘Driving care’ is a free smart phone application provided by Renault-Samsung to inform the driver about operational aspects such as fuel efficiency, maintenance records and life cycles of car consumables. Non Renault-Samsung customers can also use this application (see figure 2).
<table>
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<tr>
<th>Company</th>
<th>Technology</th>
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<tr>
<td><strong>Hyundai</strong></td>
<td>Infotainment &amp; Telematics (Blue Link)</td>
<td>Remote control by application: lock/unlock, starting engine and calling ambulance when an accident occurred</td>
</tr>
<tr>
<td></td>
<td>Smart Connectivity System</td>
<td>Easy connection to Smart phone and Tablet PC - Provide weather, news, stock and surrounding information using embedded Wi-Fi</td>
</tr>
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<td></td>
<td>Driver Information System (DIS)</td>
<td>Multi-media, navigation, telematics and information on heating/cooling are shown on 8 inch monitor in Genesis</td>
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<tr>
<td><strong>KIA</strong></td>
<td>Infotainment system (UVO)</td>
<td>Co-developed with Microsoft - Received Industry Newcomer Award at Telematics Update Award 2010 - Easy addition or update of new functions in SW form</td>
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<td><strong>Renault Samsung</strong></td>
<td>Mobile In-Vehicle (MIV)</td>
<td>Renault Samsung and SKT announce in May 2011 that they will co-develop mobile telematics (MIV). It is expected to be released in September 2013. - MIV enables remote control, anti-theft, emergency call and remote reading of mileage</td>
</tr>
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<td></td>
<td>Mobile Smart Entry System</td>
<td>Lock/unlock, turning on/off lights, adjusting the seats by smart phone. Co-developed with SKT</td>
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<td><strong>GM Daewoo</strong></td>
<td>GM Daewoo Mobile</td>
<td>GM Daewoo Talk blog - Text or photo memo on the location of parked car - ‘Where is your car?’ service in case of emergency</td>
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Figure 2. Overview of smart car systems in Korea

2. Evolution of unmanned vehicle

Current systems that recognize driving conditions, make decisions and control the car, leave the vehicle still completely in the hands of driver. An unmanned vehicle has no role for the driver whatsoever. Research on unmanned vehicles started with autonomous vehicles, but is now evolving towards Automatic Vehicle Guidance Systems, in which infrastructure and vehicles communicate with each other.

2-1. Autonomous Vehicle

An autonomous vehicle is a vehicle that makes its own decisions, based on road condition information gathered by on-board sensors. It drives without the help of a driver. Four core technologies are essential to the autonomous vehicle. These are location recognition, recognition of surrounding conditions by
camera or laser scanner, route planning based on the recognized information and giving orders and execution of these commands. Malfunction of one technology will affect the entire system and will have serious consequences.

Hyundai-Kia Motors started a biennial competition on the autonomous vehicle in Korea in 2010. The race is driven on a 3.4 km-long course with mixed paved and unpaved roads. The autonomous cars have nine missions to accomplish, such as recognizing crosswalk traffic lights, parking, avoiding on-road obstacles, and passing slow driving cars. The ‘A1’ from Hanyang University won the first and second competitions (see figure 3).

![Figure 3. ‘A1’ from Hanyang University, the winner of Autonomous Vehicle Competition in 2010 and 2012](image)

Commercialization is expected to take longer than ten years in Korea.

2-2. Automatic Vehicle Guidance System (AVGS)

The research on unmanned vehicles by research institutes was based on autonomous driving technology as described before. It shows unparalleled reliability, but often the price of sensors still exceeds the price of the vehicle. Therefore, research and development has been limited to the military domain. The range and number of in-vehicle sensors was limited.

The current weaknesses led the Electronics & Telecommunications Research Institute (ETRI), one of the leading research institutes in Korea, to start research on the next generation unmanned vehicles. Based on its vehicle-IT convergence technology, ETRI is now concentrating on Automatic Vehicle Guidance System (AVGS).

In a broad sense, AVGS refers to a system that provides safety, efficiency, eco-friendliness and convenience to the driver. The driver receives assistance from devices installed in the car. These
communicate also with neighboring vehicles or roadside infrastructure. In a narrow sense, an Automatic Vehicle Guidance System is delivering information from infrastructure to an in-vehicle device to guide the vehicle autonomously to its destination.

The sensors installed in the infrastructure recognize the location and direction of a car. They inform the car, so that the in-vehicle control device guides it to the right destination. Installed sensors and the communication infrastructure acquire global-level information with high reliability (see figure 4).

Figure 4. Components of Automatic Vehicle Guidance Technology by ETRI

Currently a number of research institutes and universities are concentrating on developing self-driving vehicle. Leading research labs on unmanned vehicle in Korea are:

Automotive Control and Electronics Laboratory (ACE Lab), Hanyang University

Kookmin Unmanned Vehicle Laboratory (KUL), Kookmin University

Intelligent Vehicle IT Research Center (IVIT), Seoul National University

Vehicle & Defense-IT Convergence Research Department, IT Convergence Technology Research Laboratory, Electronics and Telecommunications Research Institute (ETRI)
3. ConTech 2012: Smart Mobility

On November first 2012, an International Symposium on Convergence Technologies was held in Suwon, Korea, organized by the Advanced Institute of Convergence Technology (AICT). The theme of the symposium was ‘Smart Mobility’, meaning a synergetic combination of future smart cars with various IT infrastructures such as cloud computing.

The speakers and panels of the symposium consisted of car manufacturers (Hyundai-KIA, GM Korea), mobile and network companies (LG U+, KT, SK Planet), Universities (Kyonggi University, Kyunghee University, Sungkunkwan University, Hanyang University, Graduate School of Convergence Science and Technology) and LG Electronics.

The business prospect of smart cars was the topic of the panel discussion. The panel had mixed views on that. Looking back at the past years, there has not been any remarkable success in business perspective. Only the benefit of a server company, parts and memory chip manufacturers is foreseen for the near future. On the other hand, some companies are already making profit from B2B services such as the Smart Taxi. KT, one of the major mobile and network service providers in Korea, provides real-time taxi allocation service on the basis of GPS and mobile communication through the KT’s Space Mobility Communication Technology (SMCT) (see figure 5).

![Figure 5. Real-time taxi allocation service by KT](image)

KT pointed out that the existing services in the market are often supplier-oriented. The key to success is changing this supplier’s approach to a customer-oriented approach.

Lastly, the panel agreed that the next ‘killer service’ will not be the visual oriented services via a screen, but an audio oriented service, due to the strengthened safety regulation.
4. Government Support

The Ministry of Land, Transportation and Maritime Affairs (MLTM) released ‘The seventh National Transportation Safety Basic Plan (2012–2016)’ in September 2011. Under the vision of becoming one of the global top ten countries in transportation safety, one of Korea’s goals is to reduce the traffic mortality from 5,200 in 2011 to 3,000 in 2016. To accomplish this goal, the government will support penetration of cutting-edge safety devices on smart cars, such as devices for the improvement of the drivers’ visual orientation and active accident prevention. Devices such as blind spot detection, an obstacle warning system, an alarm for detecting approaching vehicle, lane departure warning system and an emergency break device will be developed. About 600,000 Euros will be invested in the development.

To conclude

Both the automobile and the IT industries are moving fast towards the smart car. Car manufacturers consider this combination as an opportunity to enhance the value of cars. Mobile and network companies see a new market with great potential. The time that a mechanic is hardly needed at a garage, but IT engineers are vital, lies in a not too distant future.

Sources and more information

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