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AUTONOMOUS VEHICLE CONTROL SYSTEM

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Abstract-
An efficient automotive system is implemented for Adaptive Cruise Control system (ACC) and security using an embedded system occupied with a Global Positioning System (GPS) and a Global System of Mobile (GSM). This paper proposes more accurate methods of detecting the preceding vehicle by radar while cornering, with consideration for the vehicle sideslip angle, and also of controlling the distance between vehicles. It ensures the security system of the vehicle. The client interacts through this system with vehicles and determines their current locations and status using Google Earth. The user can track the position of targeted vehicles on Google Earth. Using GPS locator, the target current location is determined and sent, along with various parameters received by vehicle's data port, via Short Message Service (SMS) through GSM networks to a GSM modem that is connected to PC or laptop. To secure the vehicle, the user of a group of users can turn off any vehicle of the fleet if any intruders try to run it by blocking the gas feeding line. This system is very safe and efficient to report emergency situations as crash reporting or engine failure. By making full use of the proposed identification logic for preceding vehicles and path estimation logic, an improvement in driving stability was achieved.

Keywords*—Vehicle tracker, Embedded system, Adaptive Cruise Control system (ACC), Global System of Mobile (GSM), Global Positioning System (GPS).*

l. Introduction

The automotive industry is associated with innovations progress by adopting new technologies and capability of response to constantly emerging challenges. Innovations are key differentiating features in the marketplace of automotive marks. This paper analyses the driving forces for R&D in the area of cars networking and conceptual aspects of automotive connectivity applications. Advances in Information Communication Technologies,a low implementing this idea in the near future. The number of traffic accidents and injuries continues to increase year by year. Under these conditions, there is an urgent need for technologies which can mitigate the serious damage caused by car accidents, as well as prevent the accidents themselves. Some members of this study have played active roles in a study group for the Advanced Safety Vehicle (ASV), a project conducted by the Japanese Ministry of Land, Infrastructure, Transport and Tourism, and are involved with ASV research and development. This study group has proposed and studied safety technologies such as Adaptive Cruise Control (ACC) and Pre-crash Safety Systems. Some of these technologies have already been put into practical use. Several security and tracking systems are designed to assist corporations with large number of vehicles and several usage purposes. A fleet management system can minimize the cost and effort of employees to finish road assignments within a minimal time. Besides, assignments can be scheduled in advanced based on current vehicles location. Therefore, central fleet management is essential to large enterprises to meet the varying requirements of customers and to improve the productivity.

II. SYSTEM MODEL AND ASSUMPTIONS

Cruise control system is system to maintain accurately the driver's desired speed by actuating the throttle-accelerator pedal linkage without any intervention from driver's side. Cruise control system takes over the control the speed of the car by maintaining the constant speed set by the driver. Therefore, this system can help in reducing driver's fatigue in driving a long road trip. This technique of controlling the speed was used in automobile industries since 1910. The driver can set the cruise control with cruise switches, ON, OFF, RESUME, Set/Accel that are located in the steering wheel spokes or on the edge of the hub or on turn signal stalk(GM cars)The on/off button actually has no crucial role. But the Off button turns the cruise control off even if it is engaged .The Set/accel button tells the car to maintain the current speed. Holding down the Set/Accel but

will accelerate the car. The brake pedal and the clutch pedal each have a switch that disengages the cruise control as soon as the pedal is pressed. The cruise control system controls the speed of the car the same way by adjusting the throttle position. Actually cruise control actuates the throttle valve by a cable connected to an actuator instead of pressing the pedal.

The ACC system supports four control modes, which are described below and shown in Figure 1.

(1) ***Constant velocity control*****:** when there are no vehicles straight ahead, or when there is a large distance

between the driver's vehicle and the preceding vehicle, the system maintains a constant vehicle velocity.

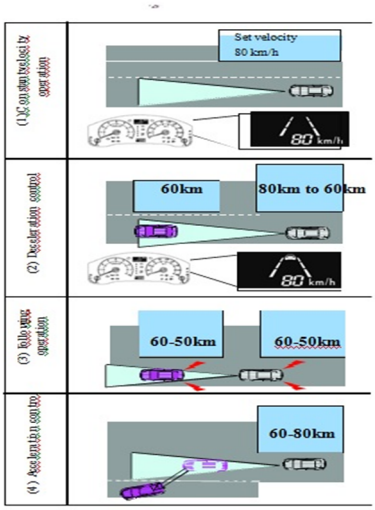
(2) ***Deceleration control***: when a vehicle travelling ahead at a slower speed is detected, the system uses the throttle to decelerate the driver's vehicle. If this deceleration is insufficient, the system uses the brake to decelerate the vehicle.

(3) ***Following control***: when the driver's vehicle is following behind the preceding vehicle, the system

controls the throttle and brake so that the time interval between the vehicles (which corresponds to a distance between the vehicles that is proportional to the velocity of the driver's vehicle) is the time which was set by the driver.

(4) ***Acceleration control***: when, due to a lane change, there is no longer a vehicle ahead of the driver's vehicle, the system accelerates the vehicle up to the velocity set by the driver, and then maintains a constant velocity. When the driver's vehicle approaches a vehicle ahead of it without slowing down enough, an alert buzzer and display prompt the driver to apply the brakes or take other appropriate action.

Figure 1: Four modes of the ACC system.



III STRUCTURE OF ANTI-THEFT TRACKING SYSTEM

The system has two main units; the first is security unit which is embedded in the vehicle. This unit consists of: a GSM modem, GPS receiver, control relay, current sensor and Microcontroller. The current sensor will send an analog signal to the microcontroller when the car isrunning. The microcontroller will send SMS directly to the owner to confirm that. NC control relay contacts are connected with the hot line that powers the fuel pump and ECM. The microcontroller can send a signal to the relay to cut off the power, when received SMS contains code from owner mobile to stop it. The GPS Receiver retrieves the location information from satellites in the form of latitude and longitude readings in real-time. The Microcontroller processes the GPS information and transmits it to the user using GSM modem by SMS every 10 minutes when the user asked that from the system by sending SMS contains code. The Microcontroller also reads engine parameters from vehicle data port (OBD-II) and sends them to the second module in the same SMS. The second module is a recipient GSM modem that is connected to a PC or a laptop. The modem receives the SMS that includes GPS coordinates and engine parameters.

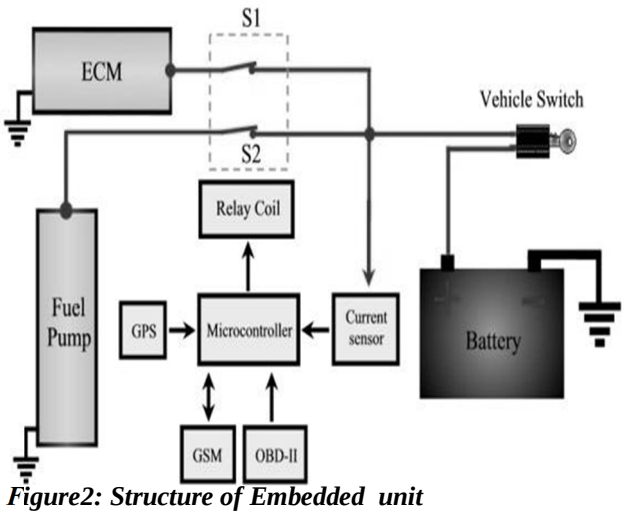


Figure2: Structure of Embedded unit

IV MODEL OF CARS NETWORKING

The vehicles of the near future will be "intelligent" and new technologies will provide for greater assistance in navigation, enhanced driver information about the vehicle, its environment and vehicle connectivity. Connectivity and lifestyle trends will change the way cars are used. This experience will be a key differentiator in attracting consumers, especially in the areas of driver assistance, safety and service.
Key systems integrated (Sierra Wireless, 2010):

- Dynamic route guidance and navigation;
- Motorist information on incidents, special events, weather and work zones;
- Data downloads (entertainment, media, home network, personal preferences);
- Recovery of stolen vehicles;
- Electronic payments including toll , drive-through, parking, road pricing service;
- Remote vehicle diagnostics; Remote vehicle prognostics and self healing;
- Transfer of vehicle data based on warranty;
- Customer relations management including vehicle use profiles and dealer use data.
- Driving-based behaviour service / scheduling / alerts / notification.

Solutions of wireless connectivity by intelligent embedded modules are presented at fig. 3. The collected data is put together as a unified environment model that is then interpreted by the computer.

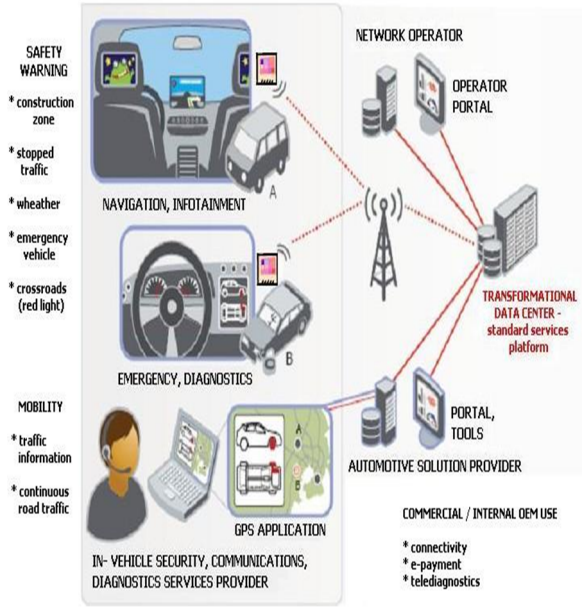


Fig. 3: Model of automotive application

V CONNECTION POSSIBILITIES OF VEHICLE INTERFACES

Automobile manufacturers are incorporating wireless communications into both economy and luxury vehicle models as safety regulations and consumer expectations of anytime anywhere connectivity increase demand for vehicle assistance services, location-aware applications, and infotainment. To compete successfully, manufacturers not only need reliable wireless connectivity to cellular networks but also wireless technology that minimizes total cost of ownership, from production to customer service. Car manufacturers need a quality driven technology partners they can count on from concept to end-of-life.

Standard wireless automotive applications in car outfit are :

- eCall
- Driver / Roadside assistance
- Stolen vehicle tracking and recovery Navigation
- Remote vehicle immobilization / Door lock controls
- Remote diagnostics
- In-vehicle Internet and entertainment.

VI CONCLUSION:

Cars are getting highly computerized and connected. But together with new features new risks come along. The importance of the security aspect increases as new features (see section II. Modern Cars) will get access to the incar infotainment systems in the years to come. With the obtained entrance of the Internet in modern cars, they could be vulnerable to hackers just as normal computers are today. [14] Most of the presented security issues do only exist due to a lack of properly implemented security features. Therefore, the referenced papers for each issue provide recommendations for security mechanisms that can alleviate most security and privacy concerns described in this paper. Thus the car manufacturers are encouraged to watch conscientiously on their interfaces to the internal systems. s. The CAESS researchers say, that the modern car industry put extensive effort in designing safely tolerant components, but did not take intentionally attacks of hackers into account who want to take over the system.

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