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Embedded Systems and IoT Implements in Smart Car

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Abstract:

This paper aims to create a prototype for a smart vehicle system that provides real-time location of the vehicle upon detection of a crash and alerts the police station and the user's relatives, as well as a panic button feature for the safety of a passenger. We also show a cabin monitoring system and an interactive interface between a user and a car, in which the user can send a text message to the car's GSM module to inquire about temperature, humidity, and other factors within the vehicle. The GSM module communicates with the Arduino, which retrieves sensor data and sends it to the user via text message. In a good automobile, anyone can simply manage the system and speech recognition, as well as the mechanism to conceal the checkout distance. To tend the square measure victimisation Bluetooth module, the speech should recognise.

Keywords: Smart Car, Embedded system, IoT, GSM Module, Smart Vehicle.

Modern wireless technology.

Introduction:

Because of the growing use of IoT in automotive Embedded Systems, the Smart Car application has received a lot of attention. When the owner is not present, it is extremely difficult to locate lost vehicles in large cities or to track down any thefts that may have occurred. The Internet of Things (IoT) refers to smart gadgets and sensors that are distributed and connected in the environment to gather, share, and integrate data. Many new Internet-of-things (IoT) devices are designed to help people gain a better understanding of how humans interact with their surroundings. [1] Wireless sensing is expected to become a dominant solution for IoT applications due to the expansion of wireless radio equipment, pervasive wireless signals, and the wealth of information brought into wireless signals by human activities.

Embedded systems are found in everything from automobiles and bridges to hospitals and industries. These systems can be found in a variety of devices, including mobile phones and virtual reality headsets, as well as clothing and even our homes. It's only a matter of time before embedded systems become more prevalent in equipment. In the ITS sector, emerging embedded systems technology can be seen. [2] When it comes to ITS, embedded systems play a role in lowering pollution, fuel consumption, and road fatalities in automobiles and public infrastructure. In the background of active safety systems, vehicle-to-vehicle or vehicle-to-road infrastructure communication necessitates interconnection with various devices.

As more people use modern-day cab services, the number of cases of harassment and robbery in cabs is increasing. Some of the features currently implemented in a few high-end luxury-level vehicles include driver fatigue monitoring, accident prevention measures, GPS-based location and nearest hospital alert, smart braking systems, smart airbags, and so on. There hasn't been a cost-effective model developed for low-cost vehicles. It is critical to have easily accessible safety measures in the vehicle to reduce the risk of death. This project aims to create a low-cost smart vehicle system that can help the cause. [3]

A smart car is a comprehensive integration of numerous sensors, control modules, actuators, and other components. A smart car can monitor the driving environment, assess potential hazards, and take appropriate actions to avoid or reduce hazards. Figure 1 depicts the general architecture of a smart car.

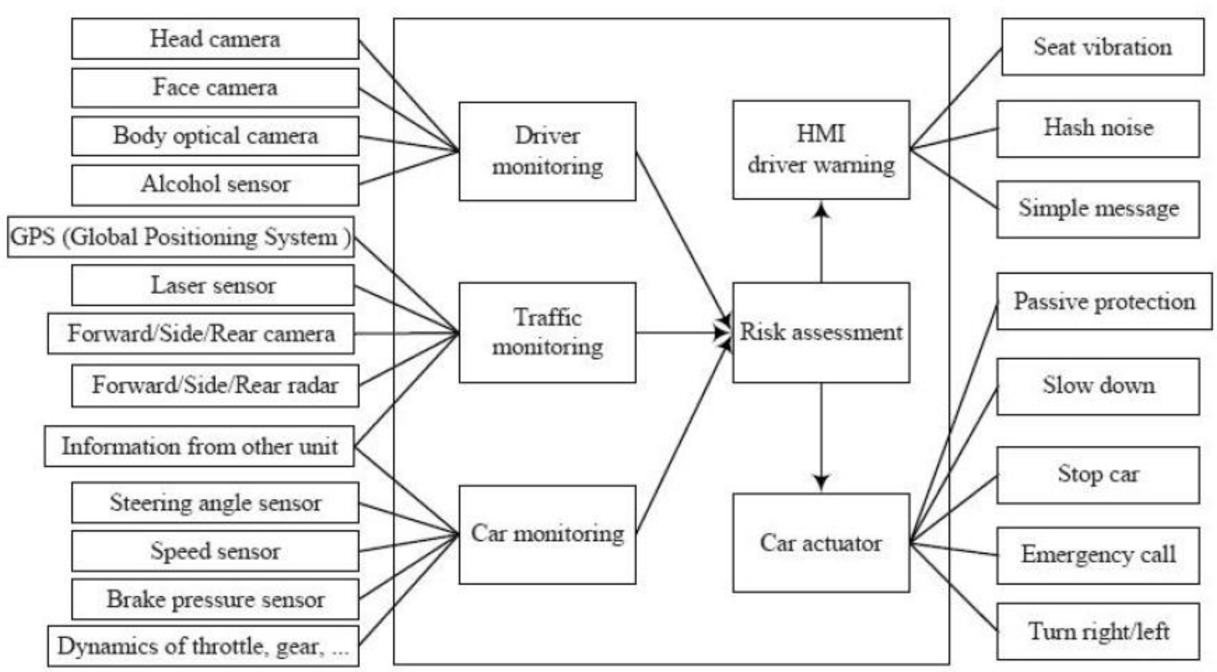


Figure 1: General architecture of a smart car.

The Central Processing Unit in the Smart Vehicle is used to implement applications and communication protocols. A wireless transceiver for data transmission from vehicle to vehicle (V2V); A GPS, or Global Positioning System, for navigational purposes; An input/output interface that allows humans to interact with the system. Finally, and most importantly, sensors installed inside and outside the vehicle for various purposes and measurements.

The braking system, which includes the parking brake and the anti-lock braking system, crash sensors, the engine control unit, electronic steering, the lighting system, seat belt sensors, tyre pressure monitoring systems, the integrated starter generator, power distribution, and connectivity, and so on are some of the most important sensors. The vehicle-mounted cameras, which display images on the console, are another critical component.

Review of Literature:

Borgonovo et al.'s [4] smart parking solutions will benefit a diverse range of urban stakeholders, all of whom bear the burden of poorly managed parking spaces in some way. It is expected, for example, that these systems will reduce the number of traffic accidents caused by a lack of driver attention as they race to find parking spaces or rush to fill existing ones.

Christy, A et al (2019) proposed using sensors, RFID tags, and machine learning techniques to control the vehicle by automatically sensing accident prone zones in order to prevent accidents. The system can be integrated into the vehicle's dashboard. The RFID tags and machine learning techniques provided have been found to be effective in deceleration [5].

Prayla et al. (2019) used Gradient Boosting And Support Classifier to classify apple leaf images into healthy and diseased leaves. They achieved a high rate of accuracy with Gradient Boosting at 87% and Support Vector Classifier at 91% [6].

Research Methodology:

It is the systematic, theoretical examination of the methods used in a specific field of study. A theoretical analysis of the methodologies and principles of a field of knowledge is included. This type of research typically includes parameters such as paradigm, theoretical model, and phases. In order to apply analytical and descriptive methodologies to the research, secondary sources must be thoroughly reviewed and analysed. To broaden the textual analysis and provide additional perspectives, a close reading of a few secondary materials would be required.

Result and Discussion:

Wi-Fi has a significant advantage over dedicated sensors in that it can connect passengers and drivers in the car to the internet while driving, whereas dedicated sensors can only sense. Radio waves can bounce back and forth inside an automobile, according to the diagram in fig. 2[7], because the metal exterior acts as an antenna.

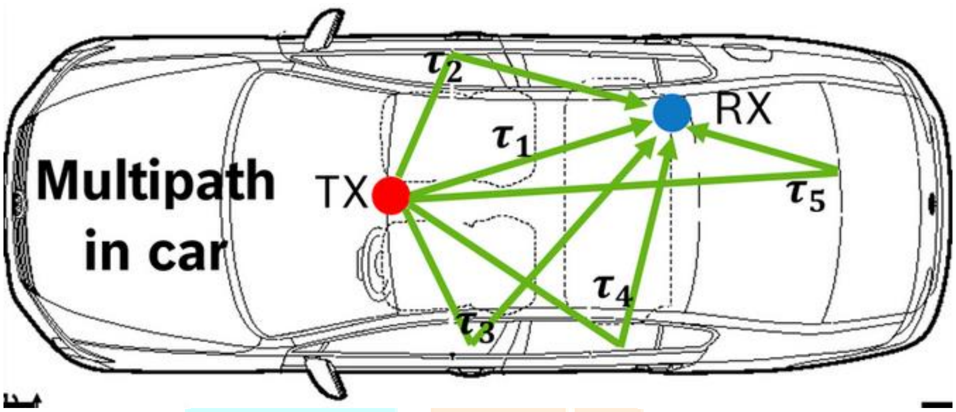


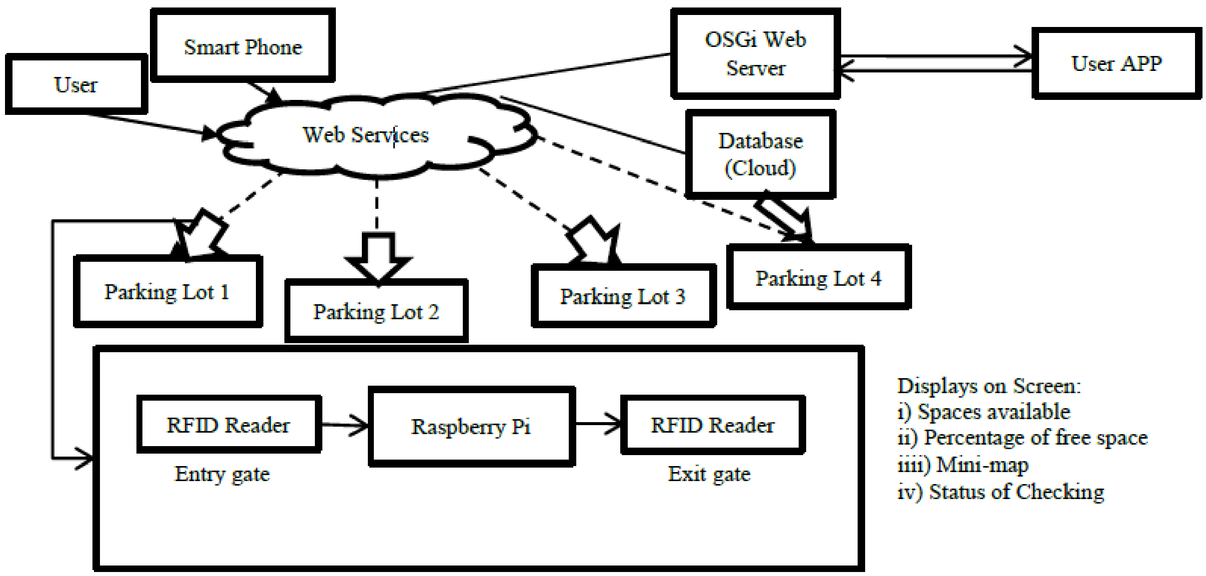
Figure 2: Multipath propagation in automobiles

Because radio waves cannot penetrate metal, they can only travel within the metal box that is the interior of a car. Second, because the gearbox, engine, and wheels are all located outside the primary payload and are concealed by metal, the car's movement has little effect on internal propagation. [8]

The Internet of Things (IoT) is a new paradigm that allows electrical devices and sensors to communicate with one another over the internet to make our lives easier and more enjoyable. IoT has the potential to address a wide range of economic, governmental, and public/private sector issues around the world as a result of the internet and smart devices [9].

Proper IoT protocols can be used with open hardware such as the Raspberry Pi and Arduino. For data reception to a server, an ultrasound sensor would be connected to open hardware and a suitable WiFi module. Data transfer protocols such as CoAP (Constrained Application Protocol) and MQTT (Message Queue Telemetry Transport) can be used, and the collected data is then updated in real time to the Web application. In another scenario, where an RFID reader scans the tag on the car plate, Arduino can be used to gather this information and collectively process it to provide essential information such as the total number of parking spaces, percentage of free spaces, a mini-map, checking status, and so on. The count would be increased when the vehicle entered the parking lot and decreased when it left. [10-11]

Figure 3: Proposed architecture of IoT based smart car parking system.



The Raspberry Pi connections can be seen in Figure 3. It can serve as servers in the Internet of Things smart parking architecture. The proposed device for this system is the Raspberry Pi, a minicomputer that would be more effective than Arduino, which only functions as a subset of the Raspberry Pi.

ADAS or Advanced Driver Assistance Systems:

This is a critical safety feature. It warns the driver of any potential road hazards so that the driver can take control of the vehicle in time. Lane Departure Warning Systems, Adaptive Cruise Control, Blind Spot Detection, Collision Warning Systems, Parking Assistance Systems, and Night Vision Systems are among the features available. ADAS systems are classified into three types: vision-based, RADAR-based, and LIDAR-based. [12]

1. Vision-Based ADAS Systems

are similar to the vehicle's eyes. They are made up of Automotive Cameras that are installed in the front, back, and both sides of the vehicle. Image signal processing algorithms are also used. They aid in parking assistance, object recognition, lane change assistance, and collision warning alerts to the driver.

2. RADAR-Based ADAS Systems

In low visibility conditions, vision-based ADAS systems cannot provide information to the driver. They have a longer range and can detect the velocity and position of objects and other vehicles very effectively.

3. LIDAR-Based ADAS Systems

are far superior to vision and radar-based systems. LIDAR, or Light Detecting Imaging and Ranging, can also distinguish between different on-road objects. They are powerful enough to generate an accurate 3D map of the surroundings, resulting in safer driving.

4. AEB or Autonomous Emergency Braking –

This feature can save lives in congested areas, heavy traffic areas, and accident-prone areas! When it detects a frontal collision, it automatically applies all brakes. The driver is warned about the impending collision before applying the brakes; however, if the driver fails to notice or avoid it, the car does it for you! This has recently been added to MG Gloster.

5. Adaptive Cruise Control –

This feature enhances and simplifies your driving experience. It makes use of cameras, LIDAR, and RADAR technology. This automatically establishes a required distance between your vehicle and any vehicle ahead of it. This can provide you with hands-free driving experience. This may not be very effective in congested areas, but it can detect lanes and automatically return the car to the correct lane. Because this car is already a better driver, the driver can have a very relaxing and comfortable drive without worrying about any casualties!

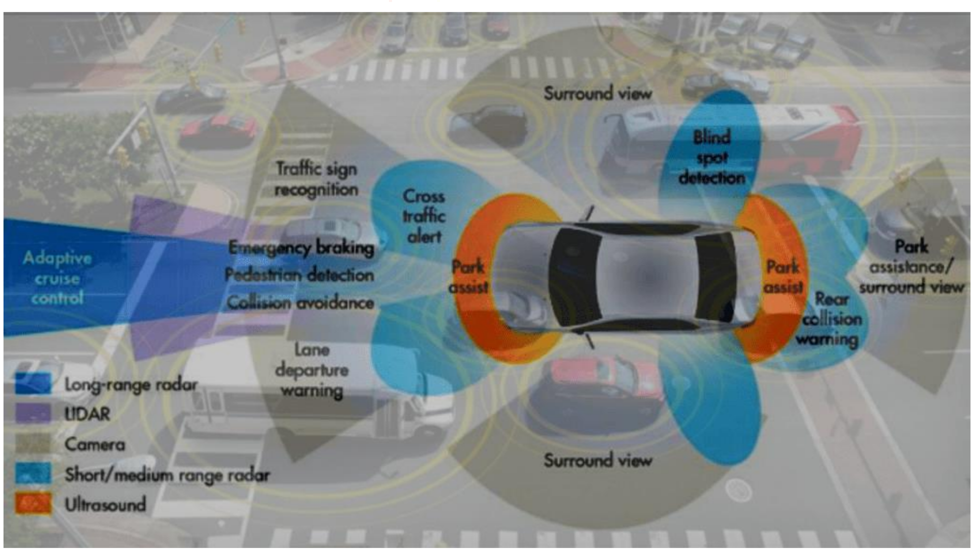


Figure 4: Advanced Driver Assistance Systems (ADAS)

Conclusion:

Modern wireless technology and radio analytics advances enable several cutting-edge Internet of Things (IoT) applications that will fundamentally alter our way of life and help us better understand what, when, where, and how the world around us works. Automobiles are multiplying in number and becoming increasingly automated; therefore, in this age of increased automation, it is critical that they be intelligent and provide driving assistance and safety assurances. Multipath propagation interacts with the driver and passengers inside the vehicle and records their characteristics, which can be thought of as a subset of rich scattering interior environments. A pair of commercial Wi-Fi devices installed in a vehicle to provide a Wi-Fi connection enable automated identification, monitoring, counting, and detection of an unattended/left child.

References:

1. Y. Wang, K. Wu, and L. M. Ni, ‘‘WiFall: Device-free fall detection by wireless networks,’’ in Proc. Int. Conf. Comput. Commun., Apr. 2014, pp. 271–279.
2. Y. Zeng, P. H. Pathak, C. Xu, and P. Mohapatra, ‘‘Your AP knows how you move: Fine-grained device motion recognition through WiFi,’’ in Proc. 1st ACM Workshop Hot Topics in Wireless, 2014, pp. 49–54.
3. Public transport vehicles to get gps, panic buttons from 2018. HindustanTimes, Dec 2016. Article.
4. Borgonovo, E.; Gatti, S.; Peccati, L. What drives value creation in investment projects? An application of sensitivity analysis to project finance transactions. Eur. J. Oper. Res. 2010, 205, 227–236
5. Haro, Luis Fernando D., "Low-cost speaker and language recognition systems running on a Raspberry Pi." IEEE Latin America Transactions 12.4 (2014): 755-763.
6. Aravind, K.R.N.V.V.D., PraylaShyry, S., Felix, Y.," Classification of Healthy and Rot Leaves of Apple Using Gradient Boosting and Support Vector Classifier", International Journal of Innovative Technology and Exploring Engineering (IJITEE) ISSN: 2278-3075, Volume-8 Issue-12, October 2019.
7. Y. Wang, J. Liu, Y. Chen, M. Gruteser, J. Yang, and H. Liu, ‘‘E-eyes: Device-free location-oriented activity identification using fine-grained WiFi signatures,’’ in Proc. 20th ACM Annu. Int. Conf. Mobile Comput. Netw., 2014, pp. 617–628.
8. J. G. Andrews, S. Buzzi, W. Choi, S. V. Hanly, A. Lozano, A. C. K. Soong,and J. C. Zhang, ‘‘What will 5G be?’’ IEEE J. Sel. Areas Commun., vol. 32, no. 6, pp. 1065–1082, Jun. 2014.
9. B. Wang, Y. Wu, F. Han, Y.-H. Yang, and K. J. R. Liu, ‘‘Green wireless communications: A time-reversal paradigm,’’ IEEE J. Sel. Areas Commun., vol. 29, no. 8, pp. 1698–1710, Sep. 2011

10. Jayakshei Dadaji Bachhav, Mechkul M.A, “Smart car parking system,” International research Journal of Engineering and technology, vol. 4, no. 6, pp. 3036-3038, Jun. 2017
11. Prabhu Ramaswamy, “IoT Smart Parking System for Reducing Green House Gas Emission,” 2016 Fifth International Conference On Recent Trends In Information Technology, pp. 1-6, 2016.
12. Evolution of IoT in Smart Vehicles by Monisha MacharlaOct 2, 2020; Applications of IoT- https://iot4beginners.com/evolution-of-iot-in-smart-vehicles/