Smart Technologies for Vehicle Monitoring: A Review

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Abstract: - The Internet is an innovative innovation that is continually changing into new technology and software platforms, making it impossible for anyone to avoid. Yet, the Internet of Things (IoT) promises an astonishing future for the internet where the variety of dialogue is machine-to-machine. Today's intelligence is mostly human-to-human and human-to-device. The Internet of Things (IoT) is a paradigm that enables sensors, actuators, and processors to serve important functions on things. This research study looks into the developments and trends in vehicle mechanization that can prevent collisions between vehicles. In the smart vehicle technology different sensors are used like IR sensor, smoke sensor, Eye blinking Sensor, ultrasonic sensor, Vibration sensor, Pressure sensor, GPS and GSM etc. In order to automatically activate the alarm when a vehicle is detected as being close by, both front and back IR sensors are used. The smoke within the car can be found using a smoke sensor. Whether the driver is wearing a seat belt or not is determined by the seat belt sensor. The GPS module may collect latitude and longitude data from satellites, and the Wi-Fi module will upload this data to the internet. To monitor all activity, needs a microcontroller, such as an Arduino, Node MCU, or Raspberry Pi.

Keywords: —*Internet of Things (IOT), sensors, actuators, processors, Arduino, Node MCU, and Raspberry Pi.*

I. INTRODUCTION

According to the Ministry of Statistics and Plan Implementation, 114 million motor vehicles were registered in India in 2009, and 159 million in 2012. And statistics published by the Delhi Statistical Handbook, the number of registered motor vehicles increased from 534,000 to 877,000 between 2014 and 2016, which increased the number of accidents and, consequently, the number of fatalities linked to the uptick [4]. 1214 traffic accidents happen every day in India, and one person dies every four minutes as a result of a road accident [1].

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According to data gathered by the National Crime Bureau and Ministry of Road Transport and Highway, more than 100,000 individuals died as a result of road rage in 2013 [4]. Road accidents cause significant mortality all around the world. Recent surveys claim that these can be decreased by properly implementing IOT systems and relying on alerting systems as well. We can only lessen the number of people who die in collisions, but we are powerless to control how other drivers behave, such as when they drive while intoxicated or drugged, etc. [2].

Modern vehicles are equipped with very sophisticated and intelligent systems to support real-time safety applications. Real-time applications to support public safety and lessen possible risks from these vehicles are in high demand because to the rise in mandate and funding in the Intelligent Transportation Systems (ITS) stream [8].

Tyre Pressure Monitoring System (TPMS) alert the driver to changes in tyre pressure and temperature. It also uses a laser-based vehicle monitoring system to identify and determine the shape of moving objects using laser radar and image processing techniques [3].

The automobile accident detection system has the ability to automatically track geographic data and throw an alert SMS concerning the accident to inform location latitude and longitude of the vehicle to nearby hospital, police station, mechanic, and relatives of victim. In order to save the life of the accident victim, it also helps to provide rapid medical care [10].

II. Potential Smart Vehicle Technologies

A board called an Arduino Uno is used in the construction of the intelligent vehicle monitoring system, along with various sensors. In order to detect natural light, an LDR is employed. When natural light is no longer present, headlights are automatically powered on and turned off. Infrared sensors are utilized automatically activate the alarm by detecting the approaching vehicle at both the front and rear ends. The addition of a smoke sensor allows for the detection of fire traces within the vehicle. If such traces are found, an alarm will activate and information will be presented on an LCD. Accident detection is done using MEMS (Deviation sensor). The Hall Effect sensor is used in the seat belt sensor. The driver cannot start the vehicle without fastening the seat belt thanks to the seat belt sensor's Hall Effect sensor design. The motor will be ignited by pressing the start key when the processor receives a safe signal from the seat belt. A DC motor is utilized to replicate the engine here. The GPS-equipped car tracking system can collect latitude and longitude values from satellites, and this data will be sent to the internet via the Wi-Fi module [1].

The direct TPMS (Tyre Pressure Monitoring System) immediately sends a warning to the receiver end when lowering the pressure below the threshold value. Also, it was discovered that a drawback of direct TPMS is that if the sensor is not mounted carefully, it may be damaged, and if the battery is exhausted, it must open the vehicle's tyre to replace it. Also, LBMS (Laser Base Vehicle Monitoring System) was functioning well because it provides the precise distance and size of an object when a laser beam passes over it. The output of the sensors that are attached to the microcontroller module that is installed within the vehicle is sent to the monitoring computer via a Wi-Fi gadget, together with all of the readings. Every reading is calibrated with regard to time and unit [3].

S No.	Measured Parameter	Sensor	Range
1.	Tyre Pressure	RKI-2544	1-40kPa
2.	Fuel Level	Optical Liquid Level Sensor	0.1m to 2m
3.	Engine Temperature	LM35	-55^0 to $+155^0$C
4.	Object Monitoring	LiDAR Distance Sensor	0.1m to 12m

Table 3.1: Specification Design [3].

Yassine Sabri, et al [4] The safety of other drivers and pedestrians cannot be relied upon since roads are unpredictable and fatal accidents might occur at any time. One must be conscious of their surroundings and any nearby automobiles. Every life has value, so the motorist should exercise all due caution and keep other road users in mind. The eye-blink sensor detects driver fatigue and the alcohol sensor detects breath alcohol level The microcontroller Arduino Uno board uses the buzzer signals generated by the sensor to further process the information and warn the driver and surroundings.

As the automotive industry continues to speed the development of connected automobiles, more Internet of Vehicles (IoV) solutions are developing through developments in networking, 5G, and IoT. The development of cutting-edge industry applications now offers management tools for data, interconnectivity, operations, and security thanks to IoV and better connectivity, opening up a choice of APIs (Application Platform Interfaces) for third-party solutions [5].

The ultra-fast network makes two operations regarding the quick and trustworthy exchange of information between cars in an emergency event possible.

Stationary Vehicle Warning (SVW): when the emergency lights are activated, the program broadcasts a message to all the vehicles in the proximity, to inform the arriving ones, even if the emergency scenario is not still apparent;

Emergency Electronic Brake Light (EEBL) warning: in the event of sudden braking, the application provides a message to the back vehicles, to indicate the potentially dangerous situation to the arriving ones [5].

This research covers vehicle security and still needs development to reduce the risk of accidents. The many sensors are used for better robotization purposes and each has its own unique utility. A nearby pass is measured using an ultrasonic sensor, which causes the driver to reposition the car and reduces the chance of an accident. The Temperature sensor is utilized to recognize the automobile's lodge temperature and consequently change the cooling as indicated by the necessity. A dampness sensor is used to identify the amount of moisture that is present everywhere and to display the reward on an electronic scale. A smoke sensor is used to detect any potential

smoke that could be present inside the vehicle and distract the driver. A light surrounding sensor is used to adjust the front light's brightness in accordance with the amount of available light [7].

A vehicle equipped with SVMS (Smart Vehicle Monitoring System), the user needs to register vehicle register number that will be used as SVMS system identification number in the server. The SVMS will send a message to the registered cellphone numbers, such as the police, hospital, family members, etc. when an accident occurs. Quick medical assistance will lower the amount of accident kills and severe injuries. This might also allow the traffic authority to reroute the traffic that will save both time and money. The frequency of car thefts will gradually decline as a result of this because it will also assist the user in locating and managing the stolen automobiles [10].

The Automobile accident detection system can track geographical information automatically and delivers a warning SMS reporting the accident. This car tracking system receives GPS data and uses mobile communication to transfer it through the GSM module to the selected mobile or laptop. Vehicle Tracking System is one of the largest technology developments to track the activities of the vehicle. The security system locates the monitored or tracked vehicle using the Global Positioning System (GPS), and then transmits the coordinates and location information to the monitoring center by satellite or radio [11].

In order to improve safety, comfort, and dependability, constructed an affordable adaptive front lighting system with automatic turn indicators, fog sensors, and solar-powered batteries for a more efficient and stable power source. The new construction can be fitted into an existing fixed headlight while paying great attention to cost and dependability. The use of existing headlamps will also allow the AFLS (Adaptive front lighting system) addition to maintain the vehicle's conformity to existing vehicle aesthetics as well as government regulation [14].

The accident detecting unit consists of two metallic plates which are kept at a minimal distance apart from each other. In case of an accident, if the car is struck by any other vehicle or an item then owing to the impact the two metal plates will come in contact with each other. As a result, Arduino will get a signal. After the Arduino receives a signal from the metal plates, the GPS modem will transfer this information to the GSM modem, which will then deliver it via SMS. A text message will be sent to the driver's family members so they may act right away to assist anyone hurt in this accident [15].

Due to the demand for smart systems in telemetry, machine surveillance, and operation maintenance, IoT is increasing relevance in the communication sector. For instance, intelligent transportation systems, boiler upkeep, etc. The sensors and other devices that help this system obtain data are inexpensive and very effective. Bus resource characteristics including passenger count are measured using sensors as Infrared speed sensors, pressure sensors, fuel level sensors, etc., and the data is then transferred to a microcontroller, which serves as a data acquisition unit.

The GPS determines the bus's location and transmits that information to the microcontroller. Using GSM and GPRS, the microcontroller sends the data it has collected to a cloud server [18].

III. Conclusion

Driving is safer and more comfortable with smart cars. The provision of medical facilities to the victims, however, should be given top priority in the event of an accident, as in the majority of cases, victims died as a result of inadequate medical care. As a result, we can use a variety of sensors, including an eye blinker, an accelerometer, an ultrasonic sensor, an infrared sensor, and a gas sensor. These sensors serve as a safety aid and alert the family members, the closest hospital, and the Polish station promptly in the event of an accident.

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