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SELF-GOVERNING HALTING MECHANISM AND VELOCITY REGULATION OF VEHICLES WITH SMART INSURANCE FACILITY USING IOT

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Abstract - With the increase in number of vehicles, traffic congestion and the number of accidents due to lack of vigilance have also increased. When accidents occur, the process of claiming insurance for the damage is painful and tedious. Some clients even fake a damage to get a ransom with forged evidences. The proposed idea provides protection from possible accidents to great extent by providing speed control with Self-Governing Halting Mechanism. The velocity of a vehicle is controlled in accordance with the velocity of the neighboring vehicles with the help of sensors and a microcontroller to avoid collision. When the adjacent vehicles are too close the collision can be avoided by regulating the velocity. Once the Self-Governing Halting Mechanism is activated, the vehicle stops. The Self-Governing Halting Mechanism will intervene only when there is an emergency. In case, if the accident takes place, a smart insurance system is implemented. Here, the vehicle is provided with an IoT connected On-Board Diagnosis(OBD) Module, which tracks the vehicle continually. It collects data about the state of various parts, detection of any failure in the engine, signs like speed warnings and proximity levels and transmits the data automatically, which can be accessed using Android or iOS or a web browser. The data received, is shared with the insurance providers and the clients for further proceedings of the insurance claiming procedure. This enables faster insurance claims for genuine cases of accidents and just sanctioning of claims depending upon the magnitude of the damage.

Keywords - Self-Governing Halting Mechanism, Electric vehicle, IoT, Microcontroller, On-Board Diagnosis Module (OBD), Sensors, Smart Insurance, Velocity Regulation.

I. INTRODUCTION

Theissue of deaths due to road accidents has become a major concern with the increase in automobile usage. This is of greater magnitude in developing countries with increasing population. The causes for accidents may be various reasons of which ignorance or lack of skill of drivers is the major reason. Sometimes, the drivers do not have enough time to react and this may lead to a disaster. In the worst case, when the accidents do occur, the customers expect just compensation for their suffered damage from their Insurance provider. However, this a tough and time-consuming job as the insurance providers first need to analyze the candor of the claim so that the sum is not sanctioned for deceitfully fragmented evidences. This has resulted in a need for remodeling the navigation system for a safer and more secure transport. The projected idea tries to solve theabove mentioned problems.It involves regulating the velocity of the vehicle depending upon the velocity and closeness of the adjacent vehicles with the help of sensors. Under emergency conditions, aSelf-Governing Halting Mechanism gains control of the vehicle and stops the vehicle. In the extreme cases, if ever the vehicle meets with an accident, with the help of IoT, the data regarding the status of the vehicle at the time of accident is shared with the insurance provider to give a better perception of the situation.

II. SPEED CONTROL MECHANISM

The speed control part of the vehicle is purely dependent on the sensors and a microcontroller. The idea is expected to work for electric vehicles. The sensors used here are the ultrasonic sensors, which detect the distance of an object with the help of Ultrasonic waves. The principle of ultrasonic sensor is that, it calculates the time taken for the ultrasonic wave to hit an object and come back. One half of this time is the time taken by the ultrasonic sensor to reach the object (here, the adjacent vehicle). As the speed of sound in free space is already known, the distance of the object (i.e., the vehicle) can be calculated using the formula,

Distance= (Speed of sound) *Time/2 (in meters) [1]

An Infrared sensor can also be used for this purpose of determining the distance. This information is fed to a microcontroller. An example of such a microcontroller is the Arduino Board.

The microcontroller is programmed beforehand with a specific threshold value, andis connected to the motor driver which drives the motors in an electric vehicle. If the received value (distance) is less than the preset threshold, the microcontroller gives commands to the LCD Display to display an alert signal to the driver/person. It waits for some time and if there is no action taken on the part of the driver/person, the Microcontroller gives commands to the motor driver to slow down the Motors by varying the voltage levels fed to the motors. In this way, the speed of the vehicle is controlled. It may be noted that three sensors are installed on the vehicle ,one in the front side; the other two sensors on either side of the vehicle. The inputs from these sensors are obtained simultaneously and fed to the microcontroller, which analyses the data from all the three sensors and acts accordingly. Thus, the speed control mechanism is achieved.

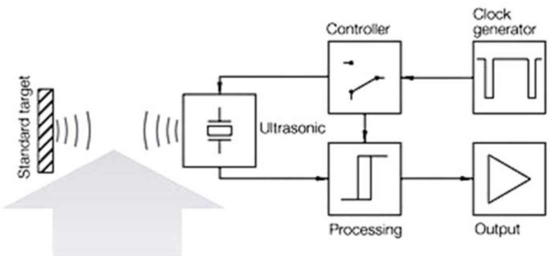

Figure1: Working of Ultrasonic Sensor[3]

III. SELF-GOVERNING HALTING MEHANISM

When the vehicles are too close to avoid any collision, the Self-Governing Halting Mechanism is activated. This system includes the setting a critical threshold for the closeness of a vehicle. When this critical threshold is exceeded, the Microcontroller gives directions for the motor driver to stop the motors by giving a low signal (i.e.,0V) to all the pins of the motors. Thus, the vehicle stops, preventing itself from major damage. It may be noted that the Self-Governing Halting Mechanism takes over the control of the vehicle only under critical conditions when there is less response time for the driver to react.

IV. ON-BOARD DIAGNOSTICS FOR ELECTRIC VEHICLES

The On-Board Diagnostics module receives data as inputs from various systems in-built within the automobile. The Motor Controller Module in the automobile provides information related to the indicators,motor controller, accelerator pedal and battery. The motor controller is armed with a powerful Microprocessor and thus can control the electric motors by limiting or redirecting the current to the motors. The Regenerative Braking system permits the taking out of energy from the braked components, which can be reused later. Accordingly, the braking information can be extracted from the vehicle. The Drive system is associated with the transfer of mechanical energy to the traction wheels and hence, the data related to this can be received from the drive system. The Battery Monitor is a sensor that can monitor the charging, discharging and recharging of the vehicle battery and consequently can be used to gather evidence about the battery condition of the vehicle. All these data are fed to the Electronic Control Unit (ECU) of the vehicle. These data are made available at the OBD-II port in-built in the vehicle. Then, with the help of a Wireless OBD-II WI-FI Scanner/adapter, this data is stored in the cloud and can also be sent to an android/iOS device or a desktop.

V. SMART INSURANCE USING IOT

In certain critical scenarios, when the accident takes place despite all these precautions, the Smart Automobile Insurance is implemented using IoT. The notion here is to eliminate all the errors arising due to the faulty manual inspections. The vehicle is fitted with an IoT based On-Board Diagnosis Module (OBD), provided by the Insurance provider.

The OBD module has a Cellular Radio that connects to the Verizon network, a Bluetooth Radio, a simple computer and a GPS Receiver. The module is plugged into the OBD-II port which will be installed under the dashboard and stays there. [2] Once installed, it transmits data automatically, and the information is stored in the Cloud. This information can later be accessed from Android and iOS apps or a Web browser. The information referred here includes data about the driver behavior while driving (including speed and braking) and the status of various parts of the vehicle (which is usually monitored with the help of various sensors), failure detection, warning signs proximity levels etc. These data are shared with the insurance providers and can be accessed anytime. [4]

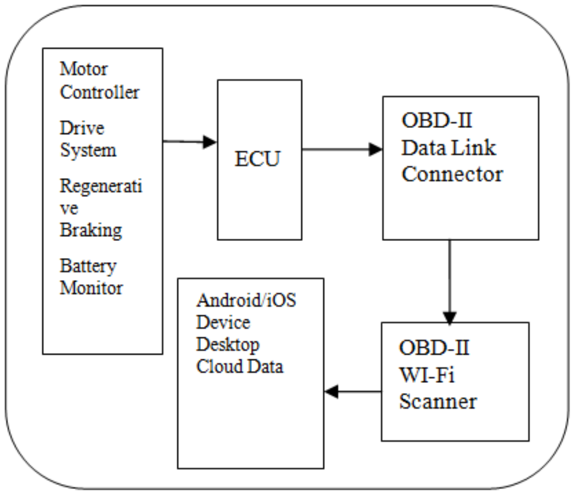

Figure 2: On Board Diagnostics on an Electric vehicle

VI. ADVANTAGES

- The risk of accidents is reduced.
- A reliable system for the actual interpretation of the causes of an accident and the status of the driver and the engine at the time of accident is achieved.
- The use of IoT facilitates the insurance provider with information and this eliminates the need for manual examination.

- Any new damage created to the vehicle with the motive of increasing the insurance money can be identified with increased accuracy.
- The Velocity regulation and Self-Governing Halting Mechanism create a sense of reliability and security.

CONCLUSION

A complete remodeling of the navigation system is projected. Smart navigation is theorized with the motive of reducing the possible threats introduced due to rash driving. The entire driving experience is changed to a stress-free process with increase in the sense of security. The practical difficulties associated with the inspection by the insurance company after an accident are eliminated. The insurance processes would become less dreary and the actual price of the damage can be determined with a high level of accuracy. This would result in amplified levels of satisfaction on the customers' side.

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