An Intelligent Automatic Traffic Control and Clearence for Electric Vehicles

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Abstract— *In India most of the accidents occurs due to the human errors. It is very difficult to avoid such accidents because of the speeding of vehicles and time required to control it. In this project an effective solution is presented by building an intelligent system to avoid the accidents and a traffic management control. The primary goal of proposed system is to avoid possible collision with the help of Ultrasonic sensor and speed control by using the RFID reader which reads the road signs with RFID tags. We propose a system for monitoring, tracking, and automating the Vehicle with speed control. In contrast to the existing methods, we employ a global position system (GPS) and Wi-Fi system, by which each vehicle is individually monitored by interfacing with a Microcontroller, if collided the information is passed on to the Accident Recovery Centre proactively. The proposed system has advantages in terms of communication range and accuracy with respect to Wi-Fi, RFID based vehicle tracking method. The work has potential applications in bad weather and emergency situations.*

Keywords— *Microcontroller, RFID reader, Ultrasonic sensor, WIFI Module, GPS.*

I. INTRODUCTION

Electric Vehicles:
An electric car is an automobile vehicle that is propelled by one or more electric motors. Most electric cars use energy which is stored in rechargeable batteries.

Capacity
An electric vehicle's battery capacity is measured in terms of kilowatt-hours, the same unit your home electric meter records to determine your monthly electricity bills. In the EV world, kilowatt-hours are to the batteries as gallons are to gas tanks. But a full battery can't be completely equipped with a full fuel tank. Electric Vehicles have a 120-volt "trickle-charging" cord. A trickle-charging cord is intended to top off batteries from any standard electrical outlet that can be reached without an extension cord (an extension cord is a big no-no in this process). Unfortunately it can take more than 20 hours to complete a full charge on 120 volts.Instead, an EV buyer will likely want to install a 240-volt home charger, which will enable much faster fills. The Nissan Leaf's battery, for instance, takes seven hours to recharge with a 240-volt charger, stated by the Environmental Protection Agency

Safety in cars already available:
The most important thing you can do to protect your life is to buckle your seatbelt. Safety belts save lives on their own and many of the more advanced safety features, such as forward-collision warning and automatic emergency braking can help you avoid accidents.Don't overlook safety features when comparing different models. Antilock brakes and electronic stability control, for instance, are very desirable. Although now standard on new cars, these features are well worth seeking out if you're buying an older car

Front airbags have been standard on all new cars since 1998 and light trucks since 1999. Most vehicles had them even before then. Crash sensors connected to an onboard computer detect a frontal collision and trigger the bags. The bags inflate in a few milliseconds—the blink of an eye—then immediately start deflating.

Before antilock brakes came along, it was all too easy to lock up the wheels (stop them from turning) during hard braking. Sliding the front tires makes it impossible to steer, particularly on slippery surfaces. ABS prevents this from happening by using sensors at each wheel and a computer that maximizes braking action at each individual wheel to prevent lock-up. ABS allows the driver to retain steering control while braking, so that the car can be maneuvered around an obstacle, if necessary.

Forward-collision warning uses cameras, radar or laser (or some combination thereof) to scan for cars ahead and alert the driver if they are approaching a vehicle in their lane too fast and a crash is imminent. Most systems alert the driver with some sort of visual and or audible signal to a potential crash, allowing time for you to react.

These systems add to the benefits of forward-collision warning. AEB will sense a potential collision and if you don't react in time, the car will initiate automatic braking.

This system uses the features of forward collision warning and automatic emergency braking to help protect pedestrians. The vehicle's camera(s) or radar are looking for a pedestrian in the vehicle's path. Some systems will alert the driver with an audible or visual alert and some will even start automatic emergency braking if a collision is deemed high.

These systems sense traffic that may cross your path as you reverse, which can be helpful when you are backing out of a parking space or driveway. Some systems will automatically brake for the driver to avoid an object.

RFID Tags:

RFID tag consists of an integrated circuit and an antenna. This tag carries 12 unique number. The tag is also composed of a protective material that holds the pieces together and shields them from various environmental conditions. The protective material depends on the application. For example, employee ID badges containing RFID tags are typically made from durable plastic, and the tag is embedded between the layers of plastic. RFID tags come in a variety of shapes and sizes

Passive tags are the most widely used, as they are smaller and less expensive to implement. Passive tags must be "powered up" by the RFID reader before they can transmit data.

Passive tags are comprised of three elements: an integrated circuit or chip, an antenna, and a substrate. The RFID chip stores data and performs specific tasks. Depending on its design, the chip may be read-only (RO), write-once, read-many (WORM), or read-write (RW). Typically, RFID chips carry 96 bits of memory (12Bytes).

Unlike passive tags, active RFID tags have an on-board power supply (e.g., a battery), thereby enabling them to transmit data at all times. Like passive RFID tags, active tags have both a microchip and an antenna. The chips, however, are usually larger in size and have greater capabilities than the RFID chips in passive tags.

A. ***RFID Readers:***

It is used to read unique ID from RFID tags. Whenever RFID tags comes in range, RFID reader reads its unique ID and transmits it serially to the microcontroller or PC. RFID reader has transceiver and an antenna mounted on it. It is mostly fixed in stationary position.

The RFID reader used in the project is RC522:

RC522 - RFID Reader / Writer 13.56MHz with Cards Kit includes a 13.56MHz RF reader cum writer module that uses an RC522 IC and two S50 RFID cards. The MF RC522 is a highly integrated transmission module for contact-less communication at 13.56 MHz. RC522 supports ISO 14443A/MIFARE mode.RC522 - RFID Reader features an outstanding modulation and demodulation algorithm to serve effortless RF communication at 13.56 MHz. The S50 RFID Cards will ease up the process helping you to learn and add the 13.56 MHz RF transition to your project. The open-hardware community already has a lot of projects exploiting the RC522 – RFID Communication, using Arduino.

Ultra sonic Sensor:

An Ultrasonic sensor is a device that can measure the distance to an object by using sound waves. It measures distance by sending out a sound wave at a specific frequency and listening for that sound wave to bounce back. By recording the elapsed time between the sound wave being generated and the sound wave bouncing back, it is possible to calculate the distance between the sonar sensor and the object.
It is important to understand that some objects might not be detected by ultrasonic sensors. This is because some objects are shaped or positioned in such a way that the sound wave bounces off the object, but are deflected away from the Ultrasonic sensor. It is also possible for the object to be too small to reflect enough of the sound wave back to the sensor to be detected. Other objects can absorb the sound wave all together (cloth, carpeting, etc.), which means that

there is no way for the sensor to detect them accurately. These are important factors to consider when designing and programming a robot using an ultrasonic sensor.

The module used is HC-SR04 ranging from 2cm-4cm. It has the accuracy of 3mm. The sensor consists of ultrasonic transmitter, receiver and control circuit. It consists of 4 pins they are VCC of 5v, input trigger pulse, output echo pulse, and ground. The electric parameter of ultrasonic sensor is, it's working voltage 5v DC, its operating frequency is 40 kHz. It has triggered input signal of 10us TTL pulse. Ultrasonic sensor works on the basic principle of piezoelectric effect.
To trigger input a short 10us pulse is supplied, and then the module will send an 8 cycle sonic burst of ultrasound having the frequency of 40 kHz.

GPS System:
The Global Positioning System (GPS) is a satellite-based radio navigation system developed and operated by the U.S. Department of Defense. GPS permits land, sea, and airborne users to determine their position, velocity and the time 24 hours a day, in all weather, anywhere in the world. The GPS signals are available to an unlimited number of users simultaneously. The GPS satellites can be used free of charge by anyone.

WIFI Module:
The is an ESP8266 with 1 MB of built-in flash, allowing for single-chip devices capable of connecting The **ESP8266** is a low-cost Wi-Fi microchip with full TCP/IP stack and microcontroller capability to Wi-Fi.

II.Blockdiagram

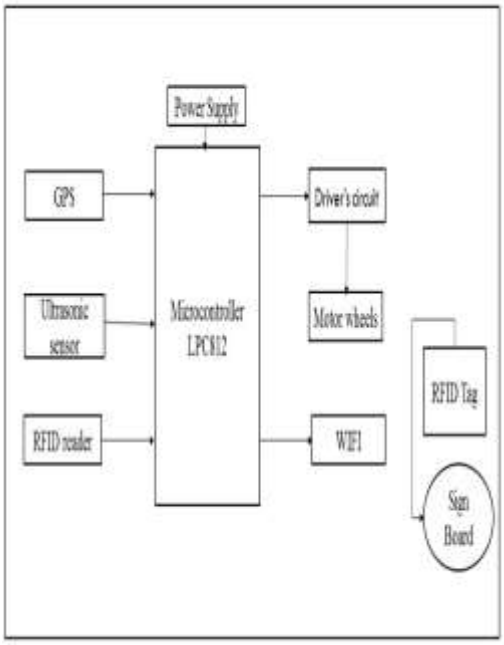

FIG:-1

III.WORKING

Working procedure:
The actual working of the project consists of two phases.
Speed Control at Accident prone zones
Collision Detection and sending information to server

We have used ARM LPC812 microcontroller with 16 kB of Flash, 4 kB of Data Memory as a base device for traffic clearance and controls. The microcontroller is interfaced with the electric vehicles, which will be dominating the roads in the near future. Electric vehicle are charged and a small electric power is required for the operation of the system. GPS, RFID reader, Wi-Fi Module **ESP8285 is** connected through the serial port to the controller, also Ultra sonic sensors is activated for detection.

4 Ultrasonic sensors HCSR04 is placed in the front bumpers of the electric vehicles. 2 sensors in the front side and 2 at the lateral bumpers of the vehicle, which gives you high precision for obstacle detection. Once the obstacle is detected, the reflected waves (echo) are sensed by the receiver and analyzed by the microcontroller. If the distance is not in the safe limit, then the microcontroller issues a warning signal to the driver. When the received echo is faded away, the next trigger pulse is sent and this time period is called cycle period. HCSR04 cycle period must not be below 50ms.

Embedded module gets area information from GPS tracker module and the alert information is sent through WIFI module to the nearest EOS. This emergency station in turn sends the details of the vehicle to the server.

The implemented model uses two main underlying concepts. These are the GPS and GSM. The main application of this system in this context is tracking the vehicle to which the GPS is connected, giving the information about its position whenever required. This is done with the help of the GPS satellite and the GPS module attached to the vehicle which needs to be tracked. This GPS module comes as a shield which can be interfaced with Arduino microcontroller. The model combines the GPS's ability to pin-point location along with the ability of the Global System for Mobile Communications (GSM) to communicate with a control center using WIFI.
Here in this project, we are going to build an Arduino based vehicle accident alert system using GPS. GSM module sends the alert message on your Mobile Phone with the location of the accident if the EOS is not in operation. Location of accident is sent in the

form of Google Map link, derived from the latitude and longitude from GPS module

The RFID reader RC522 working with a range around 13Mhz is connected with the base device will act as black box and it will be triggered on when it reads the RFID Tags which is stored with the data of the speed limit on the roads, Especially at special zones like School, Hospital, Zigzag bends and weak bridge etc., are programmed in the RFID tag and whenever vehicles crossing that area, embedded module will alert the driver to reduce acceleration and the speed of the vehicle is controlled. The module uses SPI to communicate with microcontrollers. This process will control accident ratio. The RFID tags are active tags and are placed in the sign boards, as well they are powered by a solar panel and programmed to their corresponding speed limit values and instructions to the driver passenger.

Transportation related problems are drastic in day today life. Some of the problems that require immediate attention are accident risk management, environmental alert system, traffic rule violation control, vehicle theft identification and traffic signal management. RFID tags are placed on the road giving area information and environment alerts (such as school zone, industry, market, bridge etc.). One RFID is placed in vehicle with owner info, RC book, insurance details, service details etc. to send vehicle identification to traffic information database. RFID reader will be placed with embedded controller in vehicle, Toll Gates, Parking areas and also in traffic signal areas.

Whenever vehicle meets with an accident, the system reads area information from RFID tags placed on the roads and transfers this information to embedded module. The details are transmitted to the appropriate numbers that are stored in database and transmits this emergency situation to owner, police control office and hospital through EOS.

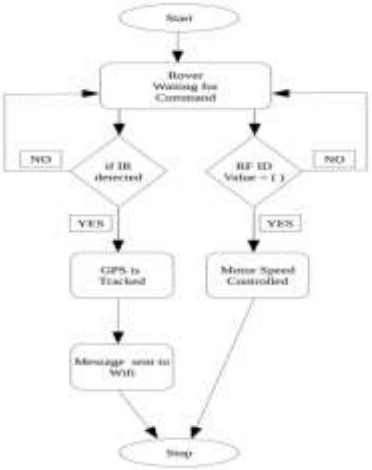

FIG:-2

IV.CONCLUSION

This project is designed as a system to give complete solution for transport related problems such as accident alert, Speed control. It is proposed as a low cost optimized solution using RFID, Ultrasonic sensor and GSM mobile technology. This project can also extended with small changes for Toll gate control, traffic signal control, traffic rules violation control, vehicle theft and special zone alert using the latest RFID technology

V.References

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