Digital Authentication Based Vehicle Monitoring For Smart City

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Abstract

The aim of this project is to digitalize the vehicle documents so that a secure platform for storage, insurance and verification of documents and certificates can be made digitally. It will help in bringing transparency. This will help in people getting rid of corruption. It reduces the administrative overhead of government departments by minimizing the use of paper and makes it easier to validate the authenticity of documents as they are issued directly by the registered issuers. This project also verifies whether the individual is wearing helmet or not. In this work, it proposes to detect the alcohol consumption of the rider so that many accidents can be avoided. It also senses any accident in the vehicle and intimates pre-programmed numbers like family members of the rider and nearest hospital using GSM technology.

Keywords: PIC microcontroller, RF Transmitter & Receiver, GPS, GSM.

I. INTRODUCTION

Transport is one of the important infrastructure of any country. The usage of vehicles has been drastically increased in these days which also cause the steep rise in the number of accidents so that lots of people lose their lives. Only 28 countries, covering 7% of the world's population have comprehensive road safety laws on some risk factors such as drinking and driving, speeding and failing to use the motor helmets, seat belts and child restraints. Drunk and driving is one of the major causes of such accidents. This paper gives a solution to these accidents. If a rider consumes alcohol and tries to start the vehicle the ignition system will not be ignited and also if he is not wearing helmet, the vehicle will not get started. Also that the pressure sensor is attached to the helmet which is used to detect the pressure experienced when the person undergoes any accident. If it so the information is sent to the nearby hospital or family with the help of GSM module.

 Vehicle ownership comes with its fair share of paperwork. When you have slew of documents related to your ride, keeping track of everything can be tough. For making this situation easier we have come with the solution of digitizing the document. Digitizing the documents helps to access them anytime, anywhere and forgery by the traffic police and the rider can also be avoided.

II.METHODOLOGY

In this project there are several modules used for the safety ride and to avoid the forgery. The modules can be described as, vehicle module, helmet device, police module and RTO module.

A. HELMET MODULE

Helmet is a form of protective gear worn to protect head from injuries. And nowadays it's essential to wear a helmet as high risks of accidents are possible on roads. So using helmet as our chief component we can implement a design to helmet which can help the user to get a fast access to medicinal help in emergency
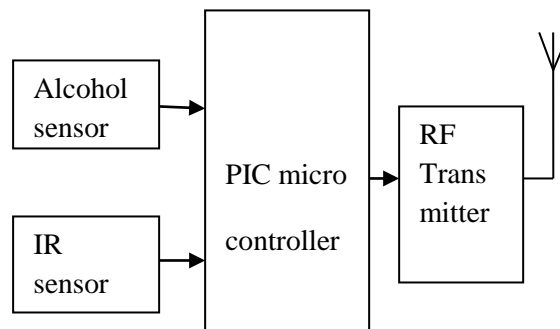
Fig.1 Block diagram of helmet module

a. Alcohol sensor

MQ3 sensor to detect the alcohol consumption of the individual. The sensor is fixed inside the helmet inorder to mismatch with the other gases in the environment. This sensor is fixed closure to the mouth of the helmet. If the rider drinks the alcohol and tries to start the vehicle, the smell which comes from the individual will be sensed by the sensor. The electrodes in the sensor reacts with the alcoholic smell and increases the voltage.

b. IR sensor

M-H sensor is a special type of IR sensor used to detect the rider wears the helmet. This sensor produces the light path between the two ends of the helmet. If the person wears the helmet the distance between the two ends will be less compared to the original distance. This gives the difference in the voltage which is used to detect the rider wears the helmet or not.

c. RF transmitter

RF encoder codes the received electrical signals into suitable form so that the transmitter can send it to the receiver section in the vehicle.

d. PIC micro controller

The PIC microcontroller PIC16F877A is one of the most renowned microcontrollers in the industry. It can be write-erase as many times as possible because it use FLASH memory technology. It is used in remote sensors, security and safety devices, etc. An EEPROM is also featured in it which make it possible to store some of the information permanently like transmitter codes and receiver frequencies.

B.VEHICLE MODULE

Key factor related to road accident such as over speeding should be monitored. The below block diagram is clearly explained in the figure.
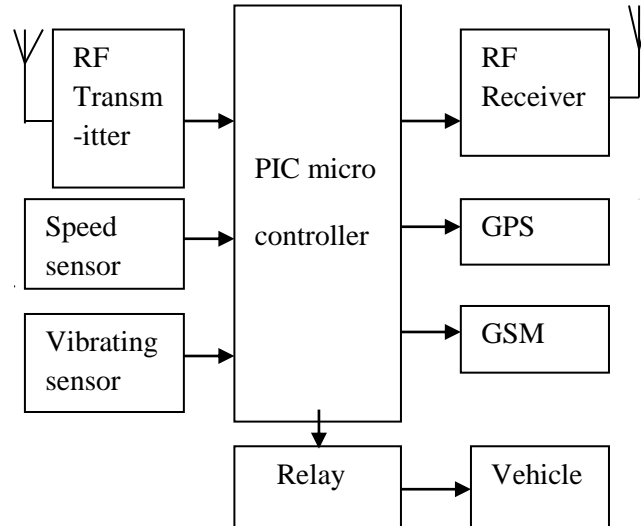
Fig.2 Representation of vehicle module

a. Speed sensor

The speed sensor used is a magnetic sensor, which senses the presence of the magnetic field and a micro controller. The number of count is calculated by the detection of magnetic presence, which is used to calculate the distance travelled by the vehicle. Time is derived from the micro controller. The magnet is fitted on the wheel. The sensor senses the magnetic field whenever the wheel rotates and magnet crosses the sensor. Whenever the sensor senses the presence of magnetic field, the counter is activated. For every one second the speed is calculated.

b. GSM/GPRS Modem

General Packet Radio System is also known as GPRS is a third generation step toward internet access. GPRS is also known as GSM IP that is a global system mobile communications internet protocol. The GSM/GPRS module is responsible of establishing connections between an in-vehicle device and a remote server for transmitting the vehicle's location information, using TCP/IP connection through the GSM/GPRS network.

c. GPS

The Global Positioning System in vehicle tracking systems is commonly used to provide users with information such as   the location coordinates, speed, time, and so on, anywhere on Earth. In this work, a GPS module is adopted to implement the in-

vehicle device. The GPS module has the GPS receiver with antenna which will provide the geographical coordinates. GPS provides specially coded satellite signals that can be processed in a GPS receiver enable the receiver to compute position velocity and time.

d. LCD display

LCD is a flat panel display, electronic visual display, based on Liquid Crystal Technology. It is used to display the initialization messages from microcontroller, latitude and longitude positions from GPS. This LCD display shows the information about the result of the module.

e. RF Module

The RF module comprises of an **RF transmitter** and an **receiver.** The transmitter /receiver pair operates at a frequency of 434MHZ.An RF transmitter receives serial data and transmits it wirelessly through RF through its antenna. The transmission occurs at the rate of 1Kbps-10Kbps.The transmitted data is received by an RF receiver operating at the same frequency as that of the transmitter. The RF module is often used along with a pair of encoder or decoder. The encoder is used for encoding parallel data for transmission feed while reception is decoded by the decoder.

f. Relay

A Power relay is an electrically operated switch that is used in countless applications that require the control of a circuit by a low power signal, where the control and controlled circuits must be electrically isolated from one another. Mechanical relays are also used wherever multiple circuits need to be controlled by a single signal. Waytek carries electro mechanical relays with moving contacts, as well as solid state timer relays, which have no moving parts, and are extremely vibration resistant, making them ideal for heavy duty equipment.

g. Vibrating sensor

In this we have chosen a pressure sensor for the detection. Pressure sensor is used to detect the pressure experienced when the person undergoes any accident .so when the person undergoes any accident the pressure sensor detects the pressure when this pressure exceeds the set value of pressure then the alert is given to the respective person using PIC micro controller and a GSM module.

C. RTO MODULE

This module clearly gives the information to the vehicle with the necessary documents from the RTO office.
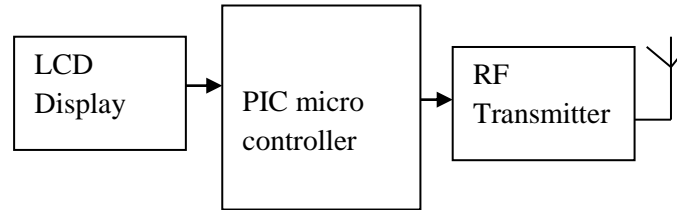

Fig.3 Block diagram of RTO module

It updates the information whether the document expires or not. If it expires then the individual will get a notification to update the documents. The below block explains with the figure. Driving licenses, registration cards, insurance details and other vehicle related documents can now be issued and saved digitally on the Government register office. Users can also register themselves and upload their existing physical documents into the digital document and access them anytime. This will also help to reduce administrative efforts of Government Department's by making it easier to validate authenticity of documents as they are issued directly by registered ministries or issuers only. This information is mainly to avoid the carelessness of the rider document updation. The issued information is displayed in the vehicle module. RF transmitter, transmits the information which will further be received to the vehicle from the RTO office. If the issued information to the ministry is failed to update their physical documents then the necessary actions will be taken by the Government.

D. POLICE DEVICE

This device is used to monitor and alert the police regarding speed and the vehicular documents when the vehicle comes around the distance of 200m from this device.
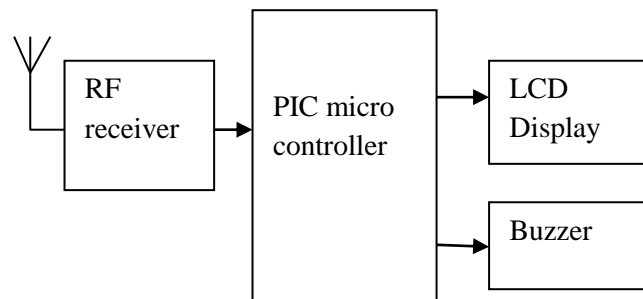
Fig.4 Representation of police device

a. Buzzer

Buzzer is an electrical device, which is similar to a bell that makes a buzzing noise and is used for signaling. Typical uses of buzzers and beepers include alarm devices, etc. Sound commonly used to indicate that a button has been pressed or a click ,a ring or a beep. When the input port pin from micro controller is changed, the sound wave is changed in buzzer.

This device is with the traffic police. When the vehicle crosses around the distance that above mentioned metre the related information is shown to the device. The information consists of the vehicle necessary documents and the speed. These are displayed in the LCD display of the police device. If the person does not update with the regular documents an alert will get by the police through the buzzer.

III. EXPERIMENTAL RESULT

To avoid the problems caused due to manual document verification we implemented this project to verify the documents digitally to make things easier. When the person crosses the traffic police from certain distance around 200m the intimation about the documents will be given to the police device module. If the driver does not have any of the document an alert will be given through the buzzer to the police device. Thus the police will get information about the driver's vehicle. In addition to make the ride safe the helmet should be mandatory for the driver. And the alcohol sensor is also included in the helmet to detect the consumption of alcohol. These two informations are sent to the vehicle module through the RF transmitter. In the vehicle the vibration sensor is fixed so that if the person meets with an accident the occurred vibrations are monitored by the sensor and then by the GPS and GSM the informations about the accident will be sent to the hospital or family.

IV. CONCLUSION

Even though there are projects dealing with vehicle security and speed monitoring individually, only a very few project that deals with both. Here lies the significance of this project.The proposed project is used to develop a system for digital vehicular documents through which verification of such documents become easier. The system was able to experimentally demonstrate its effective performance to track the accident location anytime from anywhere. Furthermore, our implementation is low-cost that is based on easily accessible off-the-shelf electronic modules. In future the project can be developed furthermore using cloud computing technologies so that several network can be grouped together to expand the accident coverage area and the intimation zone.

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