Smart Ignition System in Automobile Industries

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***Abstract*- Normally available locks in the two wheeled vehicle do not provide any security to vehicle owner, traditional locking system used keys to lock or unlock the vehicle and these locks are well known to thieves and they can be easily broken by them, if a person having the keys of locking system then that person have the authority to lock or unlock the vehicle, the locking system doesn't know about the person is authorised or not. If the keys are lost or stolen then the owner will unable to unlock the system. About 8.1% of accident caused by teenagers (the person don't having appropriate license) and 6.4% of the accident is happens by drunk and drive cases. Statistics says that only 20% of stolen vehicles can be recovered in India.**
Thus, there is a need for more security options to be available for the two wheeled vehicle which is unique and must be different from the traditional key locks. The aim of this paper to develop a biometrics system which can be used as a good and effective security option along with alcohol detector and GPS system. An important and very reliable human identification method is fingerprint identification. As fingerprint of every person is unique thus it can be used in various security options. In this study a review on various locking system in the two & four wheeled vehicles is presented. The till date work in this direction is analysed and further possible development may be analysed.

Index Terms- fingerprint module, ignition system, GPS module, alcohol detector, micro-controller.

I. INTRODUCTION

Because of increasing number of theft cases of the two wheelers there is a need to enhance the security level of the two wheeled vehicles. Traditional and commonly used key locks available in the bikes are well known to the thieves and thus it can be easily unlocked by the professional thieves. With the help of master key it becomes very easy to unlock or broke the lock of the vehicle by the thieves. The owner of the vehicle has to handle those keys carefully, those keys shouldn't be stealing or loss. Nowadays the road accident caused by teenagers is getting increases day by day, the children of the owner have those keys and they used to drive their vehicle without appropriate training and license. The statistics shows that the 8.1% of road accidents are caused by teenagers or the person who don't have license. The numbers of the drunk & drive cases are also big, there are 6.4% of road accidents are caused by driving the vehicle by driver whose consume the alcohol over the limit. As the number of stolen vehicles are also getting increasing and there are only 20 % of the vehicles can recovered from the stolen vehicles and the cases of eve teasing and girl kidnapping are also raised in today's world so we need some system that can trace the location of our vehicle accurately on our mobile phone.

This creates the demand of such type of lock which is new and provides an additional security level. The new and modern lock must be unique in itself i.e. it must be only unlocked by special and specific key. This type of feature is available in the biometrics locks i.e. the lock which can only be locked and unlocked by the human body features. Biometrics can include: face recognition, voice recognition, fingerprint recognition, eye (iris) recognition. Of all these type of special biometric recognition techniques the fingerprint recognition is the most widely used because fingerprint of every person on the earth is unique and can provide good reliability. Also, the implementation of the fingerprint recognition system is easy and cheap than other ones. Thus, fingerprint recognition locking system can provide better reliability than traditional locks and also is cheaper and easy than other biometric locking system.

Thus, here we are proposing a model which utilizes the concepts of fingerprint recognition with GPS and alcohol detector in the two wheeled vehicles to enhance the security level of the vehicle.

II. RELATED WORK

Indeed, we are not the first to observe the flaws and limitation of the present-day vehicle security system, several researchers have described potential vulnerabilities in automotive security system. the traditionally security are priced low, but they merely act as an alarm and re no match to the well-equipped thief. Many security systems have been proposed over year, but almost all the recent advanced security system is designed especially for cars. Several researches have even used image processing technologies to capture the face of driver and compare it with the picture of authorised driver to detect the intrusion. Whereas some proposed system includes fingerprint detection system long with face detection. These security system are complex, costly and cannot be implemented on two wheelers. The wheeled vehicles offer very less space to install and hence even area is one of the major constraints. The demand is to design a system that perform necessary function, simple to operate, reasonably priced and small enough to be placed under the seat of the vehicle.

III. DESCRIPTION OF PROPOSED TWO-WHEELER VEHICLE SECURITY SYSTEM

An overview of the complete system is described in this section before detailing the specification and the necessity for each module in the system. The general view of operation of proposed security system is shown in fig. the conventional locking system is replaced by a smart ignition system operated by micro-controller. Micro-controller receives signal from other modules like finger print and alcohol and transmits signal to Global System for Mobile communication (GSM) module, relay and Global Positioning System (GPS) module is used to track the location and monitor the speed of vehicle.

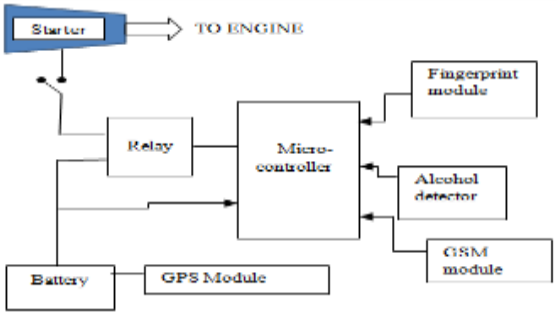

Fig.1 General view of smart ignition system

The fingerprint module and alcohol detector module are installed on the vehicle. |The owner of the vehicle first checks his/her alcohol level and then go for verification of fingerprint. If the alcohol level of the driver is lower than allowable level and the fingerprint is matched with the sample stored in database of the micro-controller then the relay makes the circuit complete from battery to ignition switch. The fingerprint stored in the micro-controller is integrated with number of the owner's driving license by which only person having appropriate driving license can drive the vehicle. As the circuit is completed by relay the owner receives a short message service (SMS) on his registered subscriber identity module (SIM) via Global System for Mobile communication (GSM) module whenever the owner unlocks his vehicle. In that Short Message Service (SMS) it gives information of 'name' who unlock the vehicle, fingerprint 'verified/not verified', 'license number', 'alcohol level' and 'on/off' condition of relay.

If an unauthorised person trying to verify his/her fingerprint the relay cannot complete the circuit and he/she will unable to start vehicle and the owner receives a Short Message Service (SMS) of "fingerprint not verified" and owner gets an idea that someone is teasing the system. If someone try to steal the vehicle the location of vehicle can be track and monitor on mobile phone via Global Positioning System (GPS) module.

IV. HARDWARE MODULE

1. Micro-controller (ATmega328)

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins(of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter.

The Arduino Uno can be powered via the USB connection or with an external power supply. The power source is selected automatically. External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm centre-positive plug into the board's power jack. Leads from a battery can be inserted in the Gnd and Vin pin headers of the POWER connector.

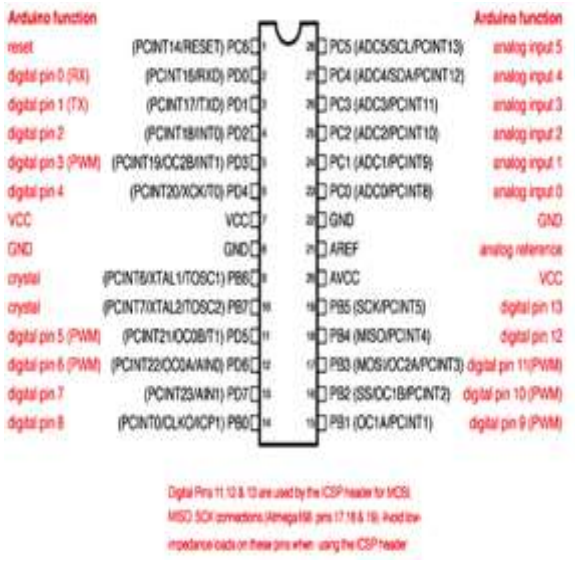

Fig.2 pin configuration of ardunio micro-controller.

The board can operate on an external supply of 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts.

Once arduino IDE is installed on the computer, connect the board with computer using USB cable. Now open the arduino IDE and choose the correct board by selecting Tools>Boards>Arduino/Genuino Uno, and choose the correct Port by selecting Tools>Port. Arduino Uno is programmed using Arduino programming language based on Wiring. To get it started with Arduino Uno board and blink the built-in LED, load the example code by selecting Files>Examples>Basics>Blink. Once the example code (also shown below) is loaded into your IDE, click on the 'upload' button given on the top bar. Once the upload is finished, you should see the Arduino's built-in LED blinking. Below is the example code for blinking:

```
// the setup function runs once when you
press reset or power the board
void setup() {
  // initialize digital pin LED_BUILTIN as
an output.
  pinMode(LED_BUILTIN, OUTPUT);
}
// the loop function runs over and over
again forever
void loop() {
  digitalWrite(LED_BUILTIN, HIGH);   //
turn the LED on (HIGH is the voltage level)
  delay(1000);                       //
wait for a second
  digitalWrite(LED_BUILTIN, LOW);    //
turn the LED off by making the voltage LOW
  delay(1000);                       //
wait for a second
}
```

2. Fingerprint Module

We used 15MHz Fingerprint Recognition Module Compatible with MSP430 and it consist of optical fingerprint sensor, high-speed DSP processors, high performance fingerprint matching algorithm and large capacity FLASH chip, this module can be operated easily by all development boards (MSP430 / 51 / AVR / PIC / STM32 / ARM / FPGA / Arduino / pcDuino) with serial ports. And during the fingerprint verification process, the latest collected fingerprint features would be integrated into the fingerprint database automatically so that the users would obtain better and better fingerprint verification result.

Its working frequency is 433MHz/868MHz/915MHz, window with the dimensions of 14 x 18mm, the sensitivity of this module is 100dB with working voltage of 1.9~3.6V, special characteristics it searches time is very low i.e. less than 1 sec It can store 1000 samples with Character file size of 256 bytes and of Template size: 512 bytes. The finger print module can operate satisfactory under the environmental condition of temperature of -20 to 50 centigrade and relative humidity of 0%RH to 85%RH (No condensation).

3. Alcohol Sensor

MQ-3 module is suitable for detecting Alcohol, Benzine, CH4, Hexane, LPG, CO. Sensitive material of MQ-3 gas sensor is SnO2, which with lower conductivity in clean air. When the target alcohol gas exists, the sensor's conductivity is higher along with

the gas concentration rising. MQ-3 gas sensor has highly sensitive to Alcohol, and has good resistance to disturb of gasoline, smoke and vapor. This sensor provides an analog resistive output based on alcohol concentration. When the alcohol gas exists, the sensor's conductivity gets higher along with the gas concentration rising. There is a resistance across an A and B inside the sensor which varies on detection of alcohol. More the alcohol, the lower the resistance. The alcohol is measured by measuring this resistance. The sensor and load resistor form a voltage divider, and the lower the sensor resistance, the higher the voltage reading will Structure and configuration of MQ-3 gas sensor is shown in the figure above for Configuration A or B, sensor composed by micro AL2O3 ceramic tube, Tin Dioxide (SnO2) sensitive layer, measuring electrode and heater are fixed into a crust made by plastic and stainless-steel net. The heater provides necessary work conditions for work of sensitive components. The enveloped MQ-3 have 6 pins, 4 of them are used to fetch signals, and other 2 are used for providing heating current.

Fig.3 actual alcohol sensor

4. GSM Module

The GSM module is required to establish a communication link between the owner of the vehicle and the security system, we used sim 300 GSM module in our system. AT commands were used to control this module. Sim300 is a tri-band GSM/GPRS engine that works on frequencies EGSM 900 MHz, DCS 1800 MHz and PCS 1900 MHz SIM 300 also provides General Packet Radio Service (GPRS). The current consumption is low as 2.5mA in sleep mode. SIM memory is used to store message the SIM300 module communicates with the MCU using a synchronous serial communication with a baud rate of 9600.If an unauthorised person teases or try to start the vehicle the owner receives a short message service (SMS) on a registered number.

5. GPS Module

It is a global navigation satellite system that provides geolocation and time information to a GPS receiver anywhere on or near the Earth where there is an unobstructed line of sight to four or more GPS satellites Obstacles such as mountains and buildings block the relatively weak GPS signals. The GPS does not require the user to transmit any data, and it operates independently of any telephonic or internet reception, though these technologies can enhance the usefulness of the GPS positioning information. The GPS provides critical positioning capabilities to military, civil, and commercial users around the world. We used ZAICUS GT02A with weight of 141 gm and its dimensions are 16.9 x 16.4 x 6.7 cm, it's consumption of battery is very low operated on direct current power supply of 5-12v

6. Servomotor

A starter (also self-starter, cranking motor, or starter motor) is a device used to rotate (crank) an internal-combustion engine so as to initiate the engine's operation under its own power. Starters can be electric, pneumatic, or hydraulic. In the case of very large engines, the starter can even be another internal-combustion engine.

Internal-combustion engines are feedback systems, which, once started, rely on the inertia from each cycle to initiate the next cycle. In a four-stroke engine, the third stroke releases energy from the fuel, powering the fourth (exhaust) stroke and also the first two (intake, compression) strokes of the next cycle, as well as powering the engine's external load. To start the first cycle at the beginning of any particular session, the first two strokes must be powered in some other way than from the engine itself. The starter motor is used for this purpose and is not required once the engine starts running and its feedback loop becomes self-sustaining.

Fig.4 servomotor

7. Relay

A relay is generally used relay is made up of electromagnets which in general used as a switch it can applied to this systembecause the signal received from one side of the device controls the switching operation on the other side. So, relay is a switch which controls (open and close) circuits electromechanically. The main operation of this device is to make or break contact with the help of a signal without any human involvement in order to switch it ON or OFF. It is mainly used to control a high-powered circuit using a low power signal. Generally, a DC signal is used to control circuit which is driven by high voltage. We used electro-magnetic relay is basically designed using few mechanical parts like Electromagnet, a movable armature, contacts, yoke, and a spring. An Electromagnet plays a major role in the working of a relay. It is a metal which doesn't have magnetic property but it can be converted into a magnet with the help of an electrical signal. We know that when current passes through the conductor it acquires the properties of a magnet. So, when a metal winded with a copper wire and driven by the sufficient power supply, that metal can act as a magnet and can attract the metals within its range. Movable armature is a simple metal piece which is balanced on a pivot or a stand. It helps in making or breaking the connection with the contacts connected to it. These are the conductors that exist within the device and are connected to the terminals. It is a small metal piece fixed on a core in order to attract and hold the armature when the coil is energized. Few relays don't need any spring but if it is used, it is connected to one end of the armature to ensure its easy and free movement. Instead of a spring, a metal stand like structure can be used.

V. SOFTWARE MODULE

The Ardunio integrated development environment (IDE) v 1.52 was used for writing the code. The Ardunio programming language is implementation of writing, a similar physical computer platform, which is based on the processing multimedia programming environment. Arduino is an open- source electronics prototyping platform based on flexible, easy-to-use hardware and software. Arduino Uno R3 board was used as programmer to dump the boot loader and the code into the much. We created cases

CASE 1- the person is having appropriate license and alcohol level is low and the fingerprint is stored in database

```
case 1:

      Serial.println("case 1");

      value= analogRead(A0);//reads the
analaog value from the alcohol sensor's
AOUT pin

      Serial.print("Alcohol Level:");

      Serial.println(value);

      delay(10);

      SendMessageFingerPrintIDVerified();

      if (value < 500)

      {

      digitalWrite(7,LOW);

      }

      temp=88;

      break;
```

CASE 2: person having no license and no fingerprint stored in database

```
Serial.println("case 2");

       value=
analogRead(A0);//reads the
analaog value from the alcohol
sensor's AOUT pin

       Serial.print("Alcohol
Level:");

       Serial.println(value);

       delay(10);


SendMessageFingerPrintIDNotVer
ified();

       if (value > 500)

       {

       digitalWrite(7,HIGH);

       }

       temp=88;

       break;
```

VI. CONCLUSION

The hardware module we tested on Honda activa (110 cc) was chosen to demonstrate the compatibility of the hardware module. The module was placed under the seat . the 12v battery of the vehicle is the power source to the module. The fingerprint module and the alcohol sensor is placed on dashboard of the vehicle near the start button. The Atmega328 MCU was interfaced with the computer via Ardunio Uno R3. Arduino Uno R3 converts a USB connection into serial TX and RX which is turn connected to MCU serial pins. When the authorised person's fingerprint scanned by sensor and with low level.

Fig.5 some screen-shots of messages received on registered number via GSM module.

VII. FUTURE SCOPE

a. The systemcould be integrated with the database of Road Transport Office (RTO), by which the all license holder's identity and fingerprint save in system.
b. Now, only SMS feature is available, we can bring calling feature by which we get call on our registered cell phones.
c. This system could be used by the companies, who gave their vehicle on rent like zoom cars, ola etc.
d. SIM 300 even supports GPRS coding by which excess GPS module can be eliminate.
e. Micro-phone and speakers are also integrated with GSM module by which the sound/conversation of thieves can be recorded and they could be alert by live sound of owner.

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