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FINGERPRINT BASED IMMOBILIZER FOR VEHICLE USING GSM & GPS

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ABSTRACT

This project is a kind of device for immobilizing a motor vehicle to prevent theft. When this system is equipped with car no one can steel it, it is known as anti-theft ignition immobilizer. Here the system is designed to identify the authorized driver through fingerprint module, if the driver fingerprint matches with pre-defined stored image, then the system allows the driver to start the vehicle. If any un-authorized person attempts to start the vehicle without proving his identity, then the buzzer will be energized automatically. Vehicle tracking system is also incorporated in this project work such that if any thief steels the vehicle by bypassing the ignition key and by shorting relay contact with a piece of wire, immediately the system acquires the vehicle location data from GPS module, and it will be transmitted through GSM. By monitoring the situation, the owner of the vehicle can de-energize the motor through another relay contact & through same mobile to detect that the vehicle is in running condition by un-authorized person, here Hall Effect sensor is used to detect the rotating wheel. The main processing unit is constructed with Arduino mega board.

Keywords: Immobilizer, Vehicle, Buzzer, Arduino, Tracking, Un-Authorized.

I. INTRODUCTION

An electronic security device fitted to a motor vehicle that prevents the engine from being started by unauthorized person is known as immobilizer. This prevents the vehicle theft from burglars. There are many ways to prevent the car theft and out of so many, the proposed system described in this project work is the best solution by which under any clever thief cannot steel the car. In this project work latest technology is implemented using Hi-tech devices like car theft detection, car tracking device, engine locking system etc., are implemented such that the vehicle will be under control of its owner.

The concept present in this system utilizes GSM & GPS technology by which vehicle theft information along with vehicle tracking system (geographic location) or vehicle location information will be passed to the vehicle owner mobile phone through mobile communication system. To detect the collided vehicle GPS (Global Positioning System) is used, it is the function of GPS to acquire its global position through satellites. As this instrument is interfaced with microcontroller at its input side, information in the form longitude and latitude values are transmitted through GSM (Global System for Mobile communications) unit to the concern mobile phones. As the microcontroller is programmed to gather information from GPS and transmit the same to the mobile through GSM, it is called central processing unit. Based on the information gathered from GPS, the controller reads the data and it will be updated, means wherever the vehicle goes its present position data remains the ROM and previous data will be erased. If the processor gets collision signal immediately fresh data stored in the processor will be passed to the cell phone through GSM. The information contains the position of vehicle and this information gathered from GPS in the form of longitude and latitude values will be transmitted through GSM by which the vehicle position over the globe can be identified. The detailed description of overall function of the system is explained in following chapter. Whenever the switch is activated, controller understands that it is a collision signal and based on this signal immediately present position of the vehicle will be transmitted in the form of SMS.

The information gathered from the GPS will be displayed through an LCD, the information contains vehicle details and position data, by which the user can identify where exactly the vehicle has been collided. The main processor that is supposed to be installed in the vehicle is aimed to acquire global position data through GPS. This data in the form of longitude and latitude values are decoded by the microcontroller and same values are

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displayed through an LCD interfaced with the microcontroller. As the vehicle is running, these values will be changed frequently at every distance of 15-20 meters. Now whenever the collision sensor is activated, the controller will acquire present position data of vehicle, and it will be transmitted to the concern mobile through GSM module. In addition, the system can be used as vehicle tracking system. If the communication link is established, running vehicle position will be displayed through mobile screen. The GPS receiver used in this project work acquires its global position data through satellites, this information in the form of longitude & latitude values are displayed through LCD interfaced with GPS data decoding circuit designed with microcontroller unit.

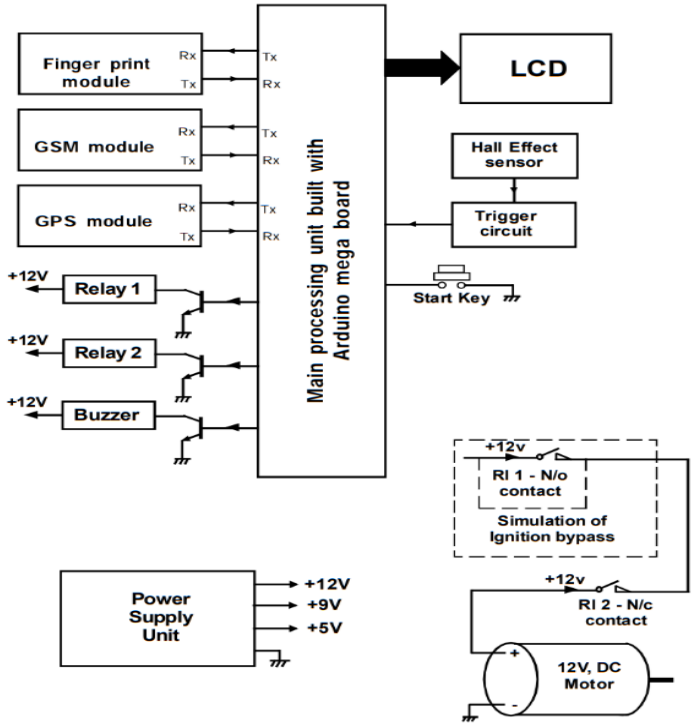
As the GSM and GPS processors are playing major role in this project work, more information must be provided, in this regard separate chapter is created to introduce the GSM technology in following chapter, whereas the following is the brief introduction about GPS receiver.

II. METHODOLOGY

As described in previous chapter, collision situation is simulated with magnetic switch. The idea of using this switch is, when accident took place and due to bumping action, the long flexible metal leavers of the switch may vibrate by which an interrupted signal will be produced to the main processing unit.

This unit designed with 89C52 controller required an input signal when accident took place and here this situation is created by activating this magnetic switch manually through a piece of permanent magnet shown to the switch. This switch is also known as reed switch contains two magnetically and electrically conductive reeds which have end portions separated by a small gap when the switch is open. The reeds are hermetically sealed in opposite ends of a tubular glass envelope. When a power magnet is bought in proximity in the presence of Reed switch two leads meet each other and result in the closed circuit thereby helping in detection of the signal by the micro controller.

Block Diagram



Magnetic switch

The magnetic switch used in this project work is assembled in a glass container, when any medium power magnet is brought near to this magnetic switch; the contact of the switch gets closed automatically due to the magnetic field occurred near the switch. As one end of the switch is connected to the ground, logic low signal

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will be generated when the switch is activated. This signal from the magnetic switch is fed to the microcontroller for taking the necessary action. On receipt of this signal from the magnetic switch, the microcontroller performs the operation automatically that is defined in the program written in it.

Figure: Magnetic switch

Now coming to the magnetic switches, different shapes and sizes are available in the market. Since technologies of the product have more and more advance, the products need comply with a requirement for more safe, convenient, and low cost. The magnetic switches are extremely compact, simple and are easy to install on any small space. These switches are not affected by electrical interference. They can withstand to chemicals, high temperatures and pressures. When the magnetic field of permanent magnet inside the float is moved to the proximity of the reed switch inside the stationary stem, the reed switch "snaps" the contact together and closes the electrical circuit. When the magnetic field is removed away from the switch the contact of the switch does not touch and the circuit will be in open condition.

Function of the main processor:

The main processing unit designed with Atmel 89C51/52 is programmed to perform four main functions. Description as followed.

1) As the magnetic switch is connected to pin no. 1, the program is prepared to monitor pin 1 continuously, if the controller finds any interrupt signal from this pin it acquires global position data from GPS unit and transmits the same to the concern mobile through GSM.

2) Since the chip is having only one data input and whereas both modules (GSM & GPS) outputs must be connected to the input pin, it is difficult to read both units data simultaneously. There by here using transistor logic, both units' data is acquired one after another in a sequence, for this purpose two low power switching transistors are used and out puts of both devices are fed through transistor collectors independently. Now both transistors' emitters are clubbed together and fed to the data input pin of main processor. Both transistors' bases are controlled independently through two control pins of microcontroller. For example, if first transistor is energized through pin 23 of controller chip, the processor acquires data from GSM module, during this period second transistor remains in off condition such that GPS data will be held at input of the second transistor. If the processor requires data from GPS module, it energizes second transistor and de-energizes fist transistor simultaneously, now the GSM output data will be held at the input side of first transistor whereas the processor receives data from the GPS module. Likewise, the processor switches on and off the transistors in a sequence and acquires data from both units one after another in a random manner. The time delay can be programmed, here five seconds time is sufficient to acquire data and hence at the interval of every five seconds both units' data can be acquired.

3) The processor data output pin is utilized to send global position data through GSM module, this happens when pin 1 is interrupted. In fact the processor doesn't require any input data from GSM module, here the application is to send data, but even though facility provided such that if authorized mobile user wishes to send any information to the inmates of the vehicle, this feature is provided. The received information in the form of SMS can be displayed through LCD interfaced with main processor.

4) The display section is designed with 2 X 16 (2 rows and 16 characters) LCD, this device is interfaced with microcontroller at its output port and the device is programmed to display the Global position data acquired from GPS. This information will be in the form of longitude and latitude values and here location name will not be displayed only values are displayed. By entering this data into the Google network of your computer exact

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location of the vehicle will be displayed. AS the processor is supposed to be installed in the vehicle and the vehicle moves, GPS data will be changed continuously. Now the program is prepared such that the processor regrets the previous data and fresh data will be displayed continuously. If the vehicle stops at one place that position data will be displayed continuously until the vehicle moves further.

Alarm

Whenever the processor gets collision signal from pin 1, alarm will be energized automatically, and it remains on continuously until the reset button is activated.

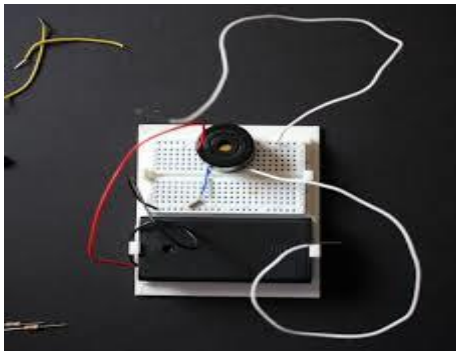

Figure: 3.2 Alarm

Lcd Display

The function of LCD panel used in the processor is aimed to display the information that is gathered from the GPS module. The information will be displayed in the form of longitude and latitude values. The LCD used here is having two rows and each row contains 16 characters, depending up on the availability of LCD panel 3 lines or 4 lines panels can be used for the purpose, so that more information can be displayed simultaneously. LCD Displays are dominating LED displays, because these displays can display alphabets, numbers, and special symbols, whereas LED's (seven segment display) can display only numbers. These LCD displays are very useful for displaying user information and communication. LCD displays are available in various formats. Most common are 2 x 16, is that two lines with 16 alphanumeric characters. Other formats are 3x16, 2x40, 3x40 etc.

In recent years LCD is finding widespread use replacing LED's, because of the ability to display numbers, characters, and graphics. Another advantage is, because of its compactness and ease of programming for characters and graphics, more information in the form of text message or graphics can be displayed. Generally, the LCD modules have an 8-bit interface, besides the 8-bit data bus; the interface has a few other control lines. The 8-bit data bus is connected to port '0' and the control lines are connected to port '2'.

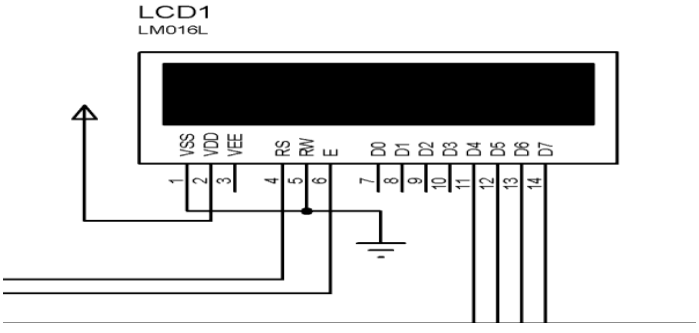

Figure: Lcd pin diagram

The default data transfer between the LCD module and an external device is 8-bits, however it is possible to communicate with the LCD module using only four of the 8-data lines. The R/W line is connected to ground and hence the processor cannot read any status information from the LCD module but can only write data to the LCD.

III. MODELING AND ANALYSIS

To prove any project work practically for the demonstration purpose, construction of described model is essential. For this purpose, suitable hardware in the form of electronic and electrical components are essential

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to perform the given task. When these components are integrated together or working together, better results can be obtained from the project work. Since it is a practical oriented project work, the content presented in the abstract must be proven practically. In this regard required active hardware like IC's and other special components must be gathered and their details must be described in this chapter to fulfill the concept of perfect project report.

Electronic hardware is Hardware, in the context of technology, refers to the physical elements that make up electronic system or electro-mechanical system, and everything else involved that is physically touchable. When an embedded system is considered, that contains a processing unit (Often microcontroller chips are preferred to build a processing unit) Sensors, control circuits that includes the motors, relays, switching devices. Hardware works together with firmware and software to make a system function Software is a collection of code installed into the microcontroller chip. Often LCD displays are used to monitor the system performance or results.

When computer is considered as example, Hardware is only one part of a computer system, but there is also firmware, which is embedded into the hardware and directly controls it. There is also software, which runs on top of the hardware and makes use of the firmware to interface with the hardware. Hardware is a surrounding term that refers to all the physical parts that make up a computer. The internal hardware devices that make up the computer and ensure that it is functional are called components, while external hardware devices that are not essential to a computer's functions are called peripherals.

The following are the active components used in this project work.

1 – Arduino Uno board

2 – Voltage regulator

3 – DC motor

4 – Buzzer

5 – Relay

6 – Fingerprint module

7 – GSM (stage-2)

8 – GPS (stage-2)

Detailed description about fingerprint scanning technology

Computerized fingerprint scanners have been a mainstay of spy thrillers for decades, but up until recently, they were exotic technology in the real world. In the past few years, however scanners have started popping up all over the place -- in police stations, high-security buildings and even on PC keyboards. You can pick up a personal USB fingerprint scanner for less than $100, and just like that, your computer's guarded by high-tech biometrics. Instead of, or in addition to, a password, you need your distinctive print to gain access.

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IV. RESULTS AND DISCUSSION

The biometric ignition system is developed in such a way to provide high security and safety to the vehicle. The ignition circuit can only be controlled by providing an authorized user's fingerprint. The system verifies and unlocks the ignition circuit in 0.3 seconds which makes the system robust.

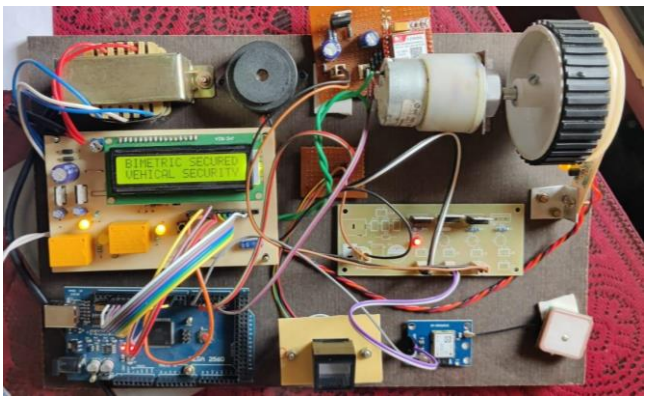

Figure: 9.2 Output Result

The immediate SMS will be sent if an unauthorized person accesses a vehicle, by locating co-ordinates of longitude as well as latitude through a SMS and then by clicking the URLthe location will be associated through Google map.

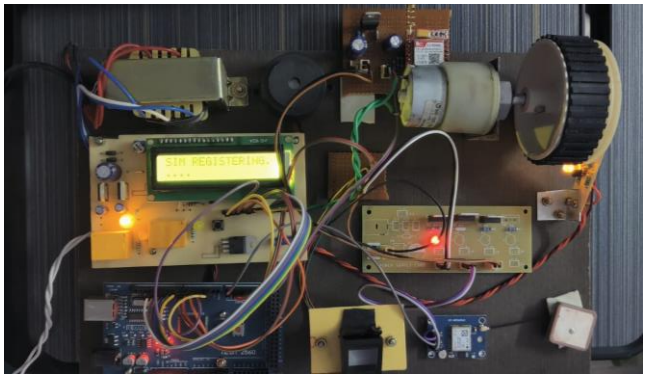

Figure: 9.3 GSM Initiating

Final analysis of this method that tracks the vehicle, when authorized individual access with verified fingerprint the vehicle starts moving that is ignition of vehicle will be turned-on. If an unauthorized individual access vehicle, ignition of vehicle will be turned OFF, thereby an instant SMS along with location will be directed through a registered mobile proprietor.

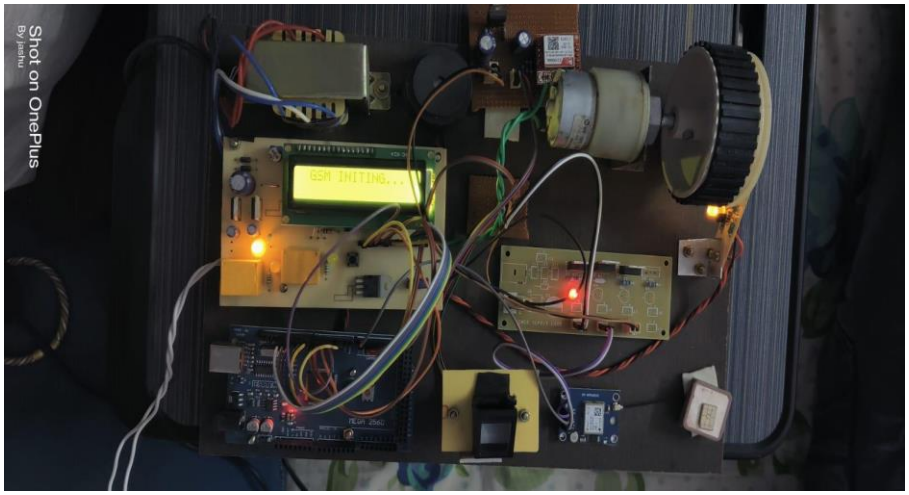

Figure: 9.4 SIM Registering

V. CONCLUSION

We got to learn a lot about system implementation, component interfacing on the board and efficient, compact programming. Vehicle theft detection device is the need of the hour, and a compact, efficient and cheap device can be made using Arduino board. A powerful product can eventually be made from this system. We can improve the accuracy by increasing the cost of the components. The application can be made capable of generating the voice-based alert to the user. Also, the features to block the ignition unit by sending some instructions to the microcontroller can be added make the vehicle impossible to start for improved security. The entire system can be integrated with an android app and the relevant data can be stored in a database so that it might more easily be accessible to the user.

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