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Car Security Using A-B-C Analysis

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Abstract:
ATMEGA 2560 based car security system differs from other car security system in comparison of peripherals and overall security. The idea behind the project is to improve car security. In the project ATMEGA 2560 controller is being used, we placed three proximity switches below the accelerator, the brake and the clutch. A sequence is generated according to the pedals pressed by user. For example, if we assign 'A' to accelerator and 'B' to break &'C' to clutch, the user can enter a number of sequences, like ACBA, AACB, BACB, etc. This sequence is transmitted to the microcontroller, which compares the entered sequence with the pre-stored sequence. If sequence matched microcontroller will allow ignition. If the sequence entered is wrong for more than three times, System uses a GSM module to send SMS to the owner of the car and a GPS to broadcast the location of the car. As well as buzzer will on and doors will be locked. The applications of this project can be extended to safes as well. System is also providing facility of changing password through mobile & facility of sending message to multiple mobile numbers. There is no need to carry extra accessories for this security system & this system is user friendly as entering password through accelerator break and clutch is quite simpler.

Keywords: *Atmega-2560, GSM, GPS, PIR Sensor*

1. Introduction

In 2013, around 715,373 motor vehicles were reported stolen. The value of stolen motor vehicles was more than $4.3 billion. As we can see from these statistics, an effective car security system is very much required in today's world, as the number of car thefts keeps increasing day by days. So it is very important issue to develop security system as an improvement to current security systems. There is growing concern about vehicle's security. There are traditional security systems including door lock, GPS navigator, gear lock and GSM etc. But as per survey no individual system is effective since they are not able to stop car stolen. As per current situation there is need of system which will control ignition of the engine so effectively it will not be able to start car without ignition. Initially to start the car password has to be entered through accelerator, break and clutch. For right password controller will provide required current for spark plug. For wrong entered password controller will not pass necessary current to spark plug for ignition hence car will not start. Our objective is to provide a smart alternative to the conventional locking system and to create a resolute security system. The secrecy or covertness of the security system provides it an edge over other such systems. Even if a person steals the key of a car, he/she may not be aware of the provision on such a system and without the correct combination, the car will not initiate ignition

2. Conceptual Understanding of System

2.1. Block Diagram Explanation

In the system overall controlling unit is ATMEGA 2560 as micro controller. As shown in figure 2.1 there is ATMEGA 2560, there is PIR sensor, GPS module for tracking current location, GSM module for sending status of the car over wireless media to owner of the car or to the registered numbers.

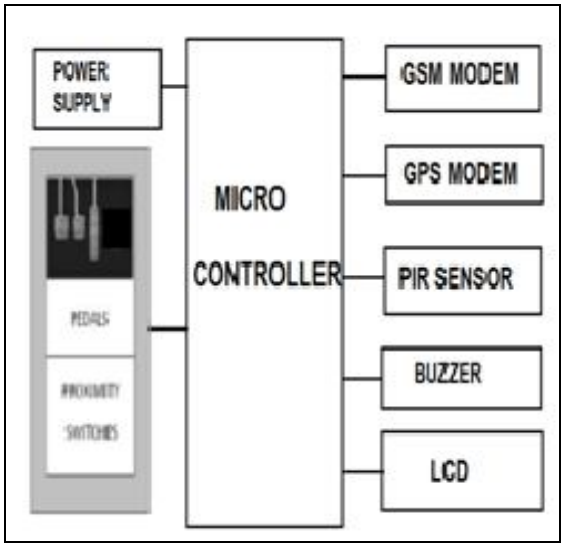

Figure 1: Block diagram of system

As to get password as an input to the system, three proximity switches are placed under each pedal- the accelerator (A), the brake (B) and the clutch (C). Proximity sensors can also be used but their work is thwarted in the presence of heavy metals. When a pedal is pressed, the contact will close and voltage will pass to the microcontroller. Each pedal creates a character which will form a string of certain length. The length can be decided by the user. This string is the combination, which is the input to the microcontroller.

2.1.1. Microcontroller

Microcontroller ATMEGA 2560 is heart of the system. It has control over PIR sensor, LCD, GPS & GSM module and on ignition of the car.

2.1.2. LCD

The Liquid Crystal Display is used to make the system more user-friendly. It does function of user interaction as initially it displays message to enter the password. After entering the password it will indicate whether entered password is correct or not.

2.1.3. GPS Modem

GPS stands for Global Positioning System. In case of theft, this modem is used to broadcast the location of the car (In terms of longitude and latitude).

2.1.4. GSM Modem

GSM stands for Global System for mobile communication. System will locate itself with the help of GPS module which is interfaced to system and then system will communicate with owner with the help of GSM module. In case if more than one number are registered to the system then message can be sent to all numbers.

2.1.5. PIR Sensor

Figure 2: PIR Sensor

PIR sensor is used to detect human presence in the car. If user of the car is new and car engine gets off while driving then while starting the car user don't need to be press password again and again. As the person in the car leaves the car PIR sensor output is low and system will reset and asks for password before starting car again.

2.2. Main Circuit Diagram

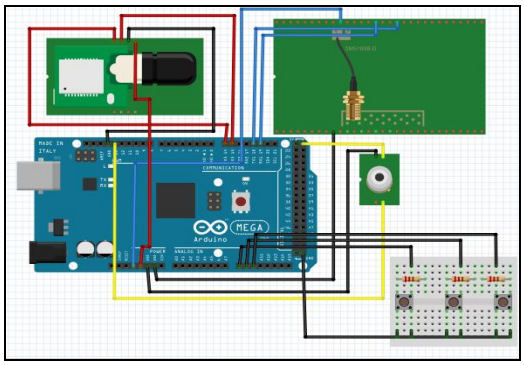

Figure 3: Main diagram of system

Here in system controlling unit used is atmega2560 microcontroller which is faster & Out of 4 UART's 2 are used for gsm and gps module. Controller requires supply of 5v dc. So that even it can be drawn from battery of the car. Circuit consist 3 Proximity Switches for the purpose of switching after peddle press. Switches are connected using pull up Resistor of 10KΩ.normally one end of switch is connected to Vcc and other end to ground while entering the password when key is pressed that particular controller pin is set to ground and key pressed is detected.
Here this system uses GPS module in the circuit for the purpose of getting the location of the car at any time. There is also GSM module to send message to owner after attempting three wrong attempts & it is also use to send location of the car to the owner.

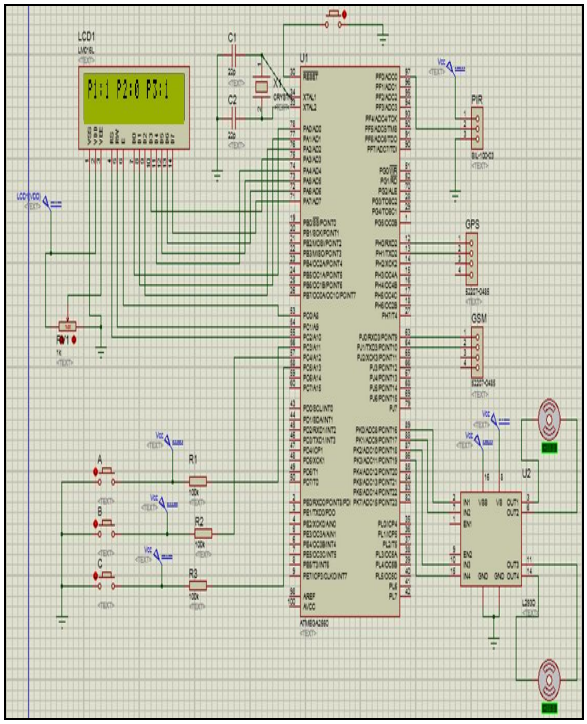

Figure 4: Circuit diagram of system

System's password can be changed through owner's registered mobile number, which will be able to change password by simple command through sms.
PIR sensor works as to detect the human presence in the car. If human is present then no need of entering password again & again after car get off. If human is not present Controller will reset & owner have to enter password to get start car. For the faster response we are using here crystal of 16MHZ with 22pf Capacitor. Here Reset pin is active high hence we are connecting it to ground through switch.

For demo purpose we are using here simple robot instead of car. To drive the motors of robot we are using IC L293D. In fig2.2.1 in the right part shows interfacing of L293D & two Motors.

3. Signal Conditioning for PIR Sensor

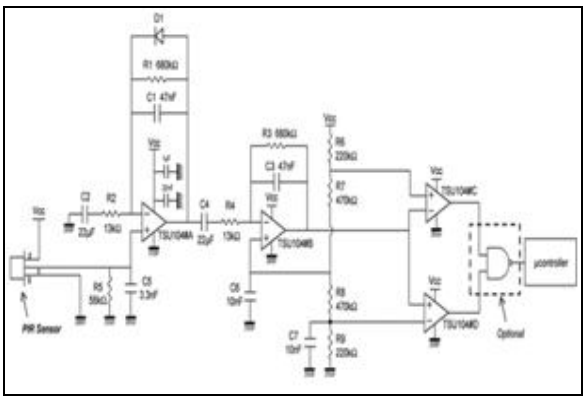

Figure 5: Signal conditioning circuit of PIR

PIR sensors are widely used and require op-amps to amplify and filter the signal they generate which is noisy and small in amplitude. Op-amps or comparators can be used to compare the amplified signal with threshold voltages before it goes into the I/O of a microcontroller.

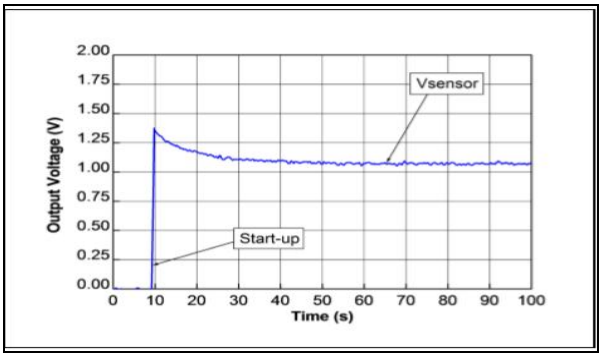

Figure 6: Actual Output voltage of PIR

Figure 6 shows the output voltage of the PIR sensor. The common mode voltage is 1.1 V this voltage may vary from one sensor to another With help of diagram we can say that we can't detect any motion, By signal conditioning we can amplify the peak.

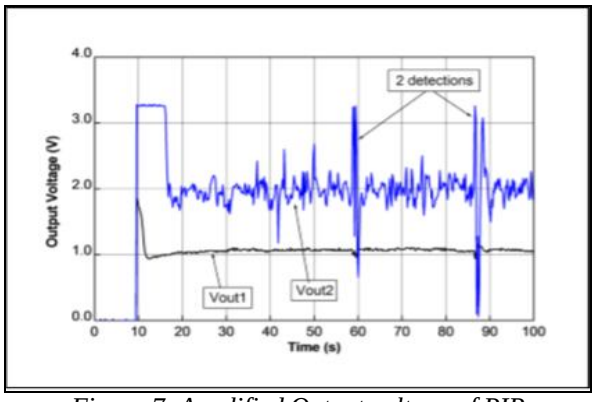

Figure 7: Amplified Output voltage of PIR

Figure 7 shows the output voltage of stage 2 where the signal has been further amplified how common mode voltage (1.1V) has changed with amplification. The signal generated by the sensor is now sufficiently amplified to set a threshold detection. In our case, we have a low threshold voltage of 0.53 V and a high threshold voltage of 2.77 V (Vcc - 0.53 V). At the output of this comparator,NAND gate could be added to use only one microcontroller input

4. Software

4.1 Flowchart

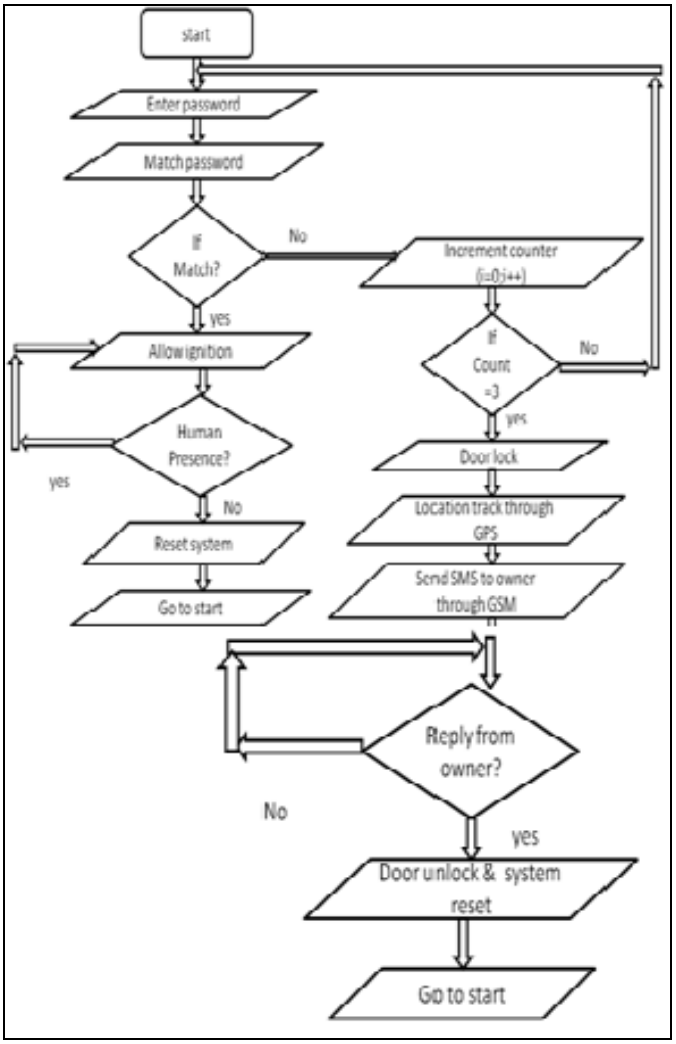

Figure 8: Flowchart for programing.

5. Conclusion

After implementing this project, owner of the car is able to secure vehicle as status of the car can be sent to registered mobile numbers through system's GSM module. GPS module is used to track the actual location of the car and that location can be sent after wrong password or as per owner's wish through GSM module to owner. The sensor used to sense presence of human in the car is PIR sensor. Also with the help of ATMEGA2560 controller, processing of data can be done easily. Since owner can change password with simple message to system, this approach of car security makes this project different, reliable, efficient and secure than other applications.

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