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MMS Based Car Security System

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Abstract

With the growing number of automotive vehicles and their improvements, the primary concern of the owners is the security. In this paper, an automatic security system is developed by applying GSM technology along with a prototype camera (OV7670). This system uses light sensor in the vehicle's door which is used to send a signal in the devolopment board (Arduino mega2560) that the car door is closed. If the thief enters wrong passcode, the door will be automatically locked in this case with the help of a solenoid lock. Simultaneously, the GSM module (SIM900) will send a MMS that the vehicle is under attack along with a photo of the thief to the vehicle owner's mobile. There is also a buzzer to alert the people around the vehicle. In a word it will be a bad decision for the thieves to try to breakdown in this type of secured vehicle.

Keywords: *GSM system, MMS, prototype camera (OV7670), Solenoid lock,* Arduino mega2560.

1. Introduction

For a relaxed parking experience without any type of unwanted occurrences, one needs to have a superb anti-theft system as now-a-days car theft has become a common types of criminal activity. And with the improvement of anti-theft vehicle security system, thieves are also using updated technology for stealing vehicles. Therefore, it is necessary to introduce more compact and multi-stage security system in the vehicle for demotivating the thieves. Especially it will be a nightmare for the thief if he or she is locked inside the car while trying to steal the vehicle along with a blaring sound of buzzer. With this feature, the new addition is the camera which will capture the image of the thief and with the help of GSM module that image will be sent instantly to the vehicle owner's mobile.[1,2] A message will be send to the police station so that police can locate the Car position. By that image send by the GSM it will be a matter of time to detain the thieves. There is a 4 ×4 keypad for inputting passcode to verify authentic user of the vehicle. An LCD display will show the entered passcode. The whole system will be powered by a separate power source and certainly not from the vehicle's main battery so that merely cutting the wire from vehicle's battery won't dismiss the main security system. Along with those extra features it is a bit expensive compared with the local limited feature anti-theft system but the fact is this system enables the user to get the image of the thief immediately during the stealing attempt and due to the door locking mechanism, vehicle's owner will get enough time to reach the vehicle or to take any kind of steps he wants to take. And for the further legal action by the police, that image will act as an evidence.

2. System structure and working principle

In this paper only one kind of sensor is used. We used LDR sensor in the vehicle door.[3] When the doors are closed, the light sensors will detect darkness to activate the ON/OFF switch of the solenoid lock.The keypad will be activated for passcode input. LDR resistance which varies according to amount of light falling, So the LDR will send signal to the microcontroller that the doors are closed when they detect darkness. The LCD screen will then ask for a passcode. If the passcode that is entered is wrong then there will be a second chance to enter the correct passcode. If the passcode is wrong again, the microcontroller will activate the solenoid lock.The vehicle's door will be locked. The microcontroller will simultaneously raise an alarm. The camera module will receive a signal to capture an image and the GSM module is set to a specific number so that it will send a MMS to the owner's number. If it's applicable for the country concerned, then the GSM module can also make a call to the Police station automatically. The locked door can be opened by inputting the correct passcode.

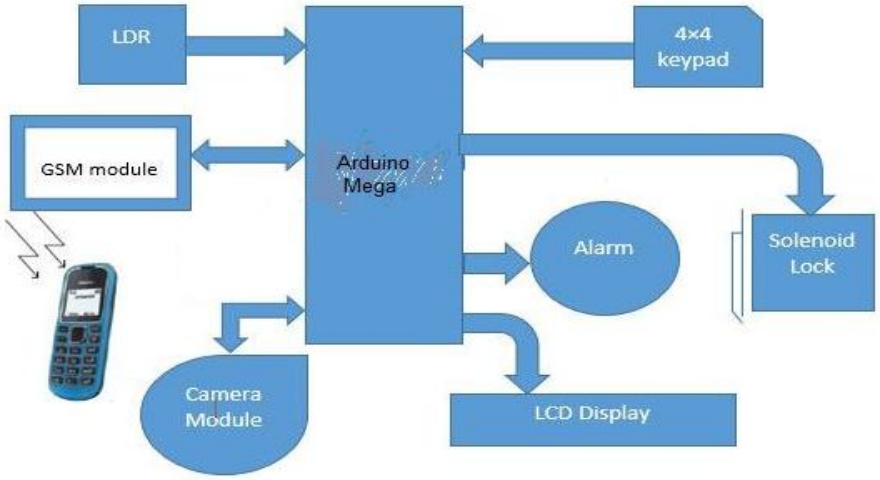

Fig. 01. Structural Diagram

3. Selection and design of system hardware

A. Arduino mega2560:

Arduino Mega 2560 is well known for its simplicity. It is a board based microcontroller on the ATmega2560. This high performance, low power 8-bit microcontroller combines 8KB SRAM, 4KB EEPROM, 256KB ISP flash memory, 32 general purpose working registers, 86 general purpose I/O lines, real time counter, six flexible timer/counters compare modes, PWM, 4 USARTs, 16 channel 10-bit A/D converter, a JTAG interface for on-chip debugging and byte oriented 2-wire serial interface. Most sheilds designed for Arduino, the Mega is very compatible . This device achieves a throughout approaching 1 MIPS per MHz and runs between 4.5-5.5 volts when executed a single clock cycle powerful instruction. It can operate simply by a battery or by connecting it to a computer with USB cable or by an AC to DC adapter.

B. GSM module:

In our system we used a SIMCOM SIM900 GSM module. It is used to send a MMS to the owner's mobile. It's used to have RS232 serial interface. This module operates on four frequencies - 850,900, 1800, 1900 MHz called as Quad-Band. RS232 allows connecting to PC and also with microcontroller. We have used AT commands to configure GSM module to send MMS. In this module baud rate is configurable from 9600-115200 through AT commands. We used 19200 as baud rate. The range of reception is good as well as good receiving facility. The protocol used by GSM for control and setup depends on AT command set. The GSM modem offers different services. Since this project is concerned about sending MMS, only a few subsets of AT-command sets are needed to be implemented. Some of the AT-command sets are given below.

Table 01. AT command sets

Command	Description
AT	Check if serial interface and GSM modem is working.
AT+CMMSCURL	Set the URL of the MMS center.
AT+CMMSPROTO	Set the protocol parameter and MMS proxy.
AT+CMMSCID	Set the networks parameter for MMS.
AT+CMMSSENDCFG	Set the parameters for sending MMS.

C. Liquid crystal display (LCD) unit

In our project we used a 16×2 character line LCD module which is a parallel port module. This program must interact with the outside world using I/O devices that communicate directly with human being. LCD requires 3 control line as well as 8 I/O lines for the data bus. So there is in total 11 data lines. Three control lines are referred to as EN, RS, RW. Three control line are used to tell the LCD that data is someone is sending data. The EN line is called "Enable". As data is supplied to data pins, high to low pulse has to be be applied to this EN pin so that the data present at the data pins can be latched. The RS line is called "Register Select" line. The "RW" line is the "Read/Write" control line.

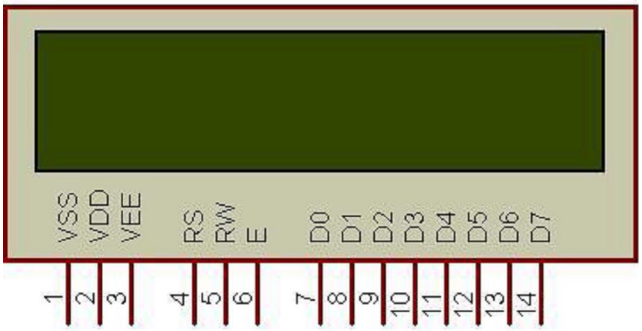

Fig. 02. Schematic diagram of LCD

When RS is low, that means 0, it is considered as a command or a special types of instructions like clear screen, position cursor. On the contrary when RS is high that means 1, it is a text data and it is going to be displayed on screen. When RW is low (0) then the information on the data bus is being shown on the screen. As RW is high (1), the system is effectively querying the LCD. For reference purpose, some commands given below.

Table 02. LCD command codes

Code (Hex)	Command to LCD instruction Register
1	Clear display screen
2	Return Home
80	Force cursor to beginning of 1st line
0C0	Force cursor to beginning of 2nd line

D. 4×4 matrix keypad

The most widely used I/O devices are keypads and LEDs. For microcontroller projects this 16 button keypad provides a human interface component. Its simple adhesive type back part enables it to mount in a variety of applications. Its other benefits are excellent price performance ratio, easy communication with any microcontroller, ultra-thin design.

Key specifications:

- Max Rating: 24 VDC, 30 mA
- Operating temperature range: 32 to 122°F(0 to 50°C)
- Interface: 8-pin access to 4×$ matrix
- Dimensions: Keypad(2.7×3.0 inch), Cable: (0.78×3.5 inch)

E. Camera module

We used an OV7670 camera module. It has a digital image processing chip-OV706, which is specially designed for image acquisition and processing application. Most important fact is that it is very convenient to connect with Arduino controller, can read image and data via UART serial port. After that it performs some image processing such as AWB (Auto White Balance), AGC (Automatic Gain Control) AE (Automatic Exposure).

This module can produce a high quality digital video signal with the help of a standard CCIR656 interface It can do real time encoding for collected image. External controller can easily read M-JPEG video streams. It's also capable of self-defining detection area and sensitivity. So in a word it's very competent to do our work. There is an external SD card module to store the pic that is captured by the camera. There are 4 terminals in both SD and camera module. The assigned port for SD module is 50,51,52,53 in Arduino mega and the RX, TX is connected with 25 and 23 respectively. Port configurations are depicted below.

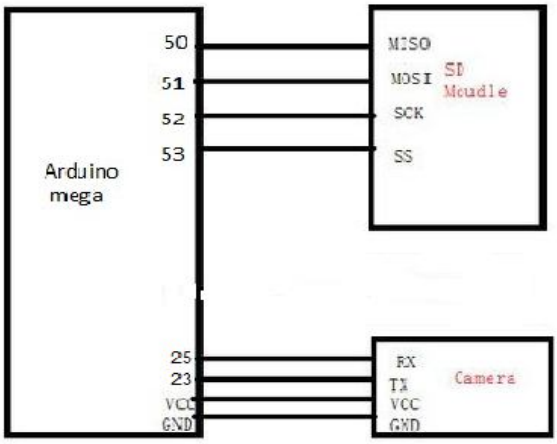

Fig. 03. Schematic diagram of Camera Setup

F. Solenoid lock

A simple circuit like below can be used to control a solenoid lock. But this circuit can be replaced by a relay. It's worth noting that a solenoid lock requires more current than an Arduino can provide directly from its output pins. We will use an alternative power source for solenoid due to its large power consumption. It will be driven by a TIP120 transtor.

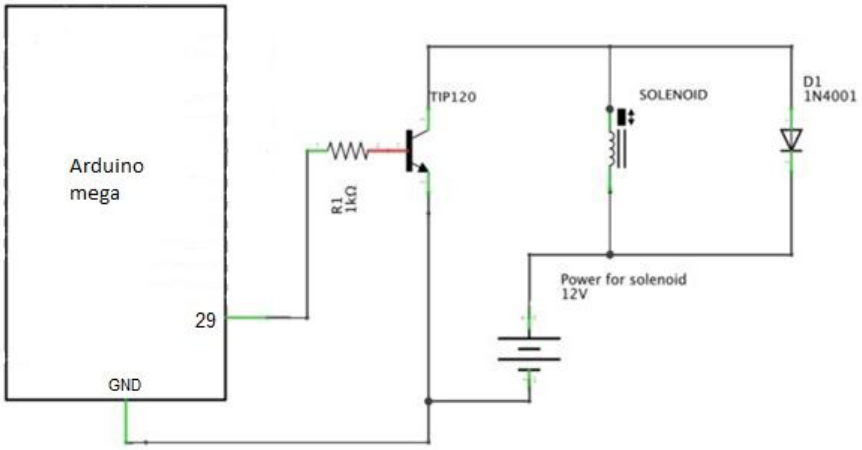

Fig. 04. Solenoid circuit

G. Buzzer

A simple buzzer is used in our project. Buzzer is actually an audio signaling device which can be mechanical, electrical, electro-mechanical. An auxiliary battery can be used so that it can operate if the main battery connection is cut down. A direct current of range 1.5V to 12.0V can be used as voltage supply to ensure smooth operation. As the voltage rises, the magnitude of sound of the buzzer becomes much louder.

4. Flowchart of the whole system

The whole system is described step by step in the flowchart. This system works on the basis of some logic. This flowchart represents those logic and decision making process. It shows all the possible outcomes of the system.

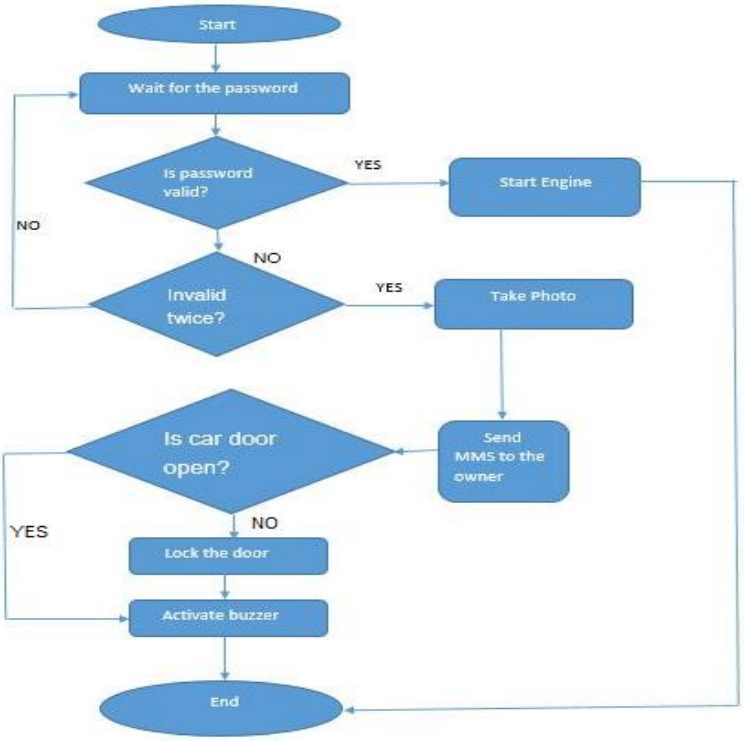

Fig. 05. Flowchart

5. Circuit diagram

The overall diagram of the circuit is just like the picture given below. This circuit diagram is developed in Fritzing circuit maker. It's a bit clumsy in this figure but PCB will make the appearance simple. Here Arduino is used for test basis.

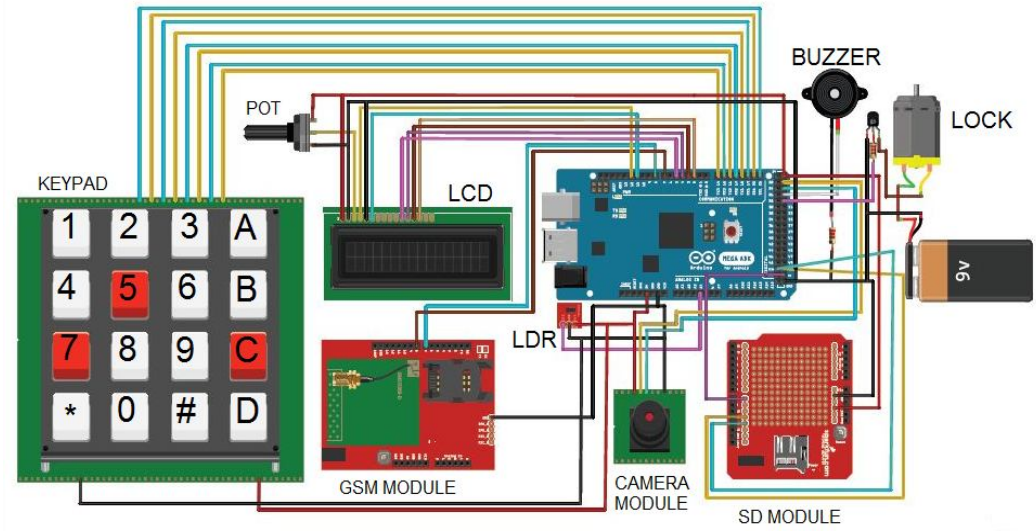

Fig. 06. Circuit Diagram

6. Test and result

The system is tested several times and each time it produced satisfactory result. Every single time when the entered password is wrong for twice, the solenoid lock and the camera acted simultaneously. And the GSM module sent MMS to the owner's mobile. LCD showed whether the system is blocked or ON.

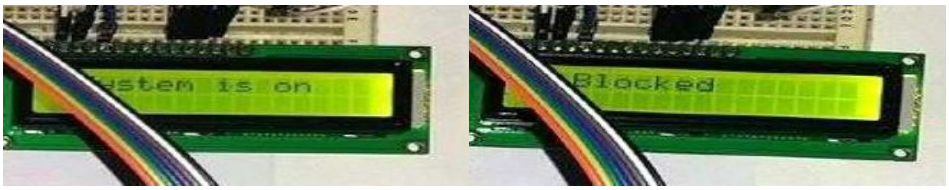

Fig. 07. Password varification output in the LCD

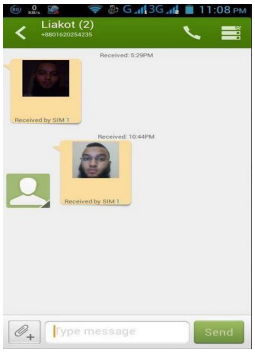

Fig. 08. MMS received in the owner's mobile

7. Conclusion

This project is so designed to make an anti-theft system in the vehicle. With this smart kit in the vehicle it is almost impossible to steal a vehicle. Besides, the owner can instantly get the picture of the thief so the Police can take a real effective step. This picture also works as an evidence against the thief. In near future, there is no doubt that all the vehicles will be embedded with this security system.

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