

GSM Based Door Lock System

A. Najma, B. Mohana, A. MohanBabu

Abstract: In this work, we analyzed the door lock and unlock system using GSM. Today's world be it offices, laboratories, school or home the first thing which concern is the security. In order to make your data, money, premises and personal belonging safe and secured from unauthorized person. This paper represents a GSM based door lock system to controlling of door lock by short message service. In this security system we are using ARDUINO microcontroller, GSM module, Keypad, LCD display, Motor drive, DC motor and Buzzer. Interface Matrix Keypad is the main aspect of the project. ARDUINO microcontroller is controlling the whole driver unit. It is used for communication. The GSM system for sending the alert message on mobile for unsuccessful attempts of password. A keypad module is used for entering the password for authentication. Once the password entered is incorrect the unsuccessful message will be displayed on the LCD screen. GSM module gets triggered and the registered user gets a message, the buzzer connected will be initiated to alert the people or the security official in the surroundings.

Keywords: ARDUINO, GSM, Keypad, LCD display, Buzzer

I. INTRODUCTION

Today it is essential to provide the security system employing various sensors and alarm system in residential communities. A secure alarm system for residential and other applications had been developed. A central monitoring system for continues indication of sensors. Transmitters were connected with sensors and receivers were connected with monitoring system for essential communication [1]-[2]. The display with central monitoring, the message with respect to each transmitter connected with particular sensor. A home security system with the GSM/GPRD technology services to achieve controlling of door lock by short message service (SMS). ARDUINO is the microcontroller which controls the whole driver unit. Keypad, GSM module Buzzer is connected to the microcontroller [3], [4]. ARDUINO board can be used as a tool to interchange information with a computer or other microcontrollers. GSM system for sending the alert message to the mobile for three unsuccessful attempts of password. At present time door security is the most important and so we designed and implemented a digital door lock system which works in three different modules. The Keypad module is used for entering the 4-digit password. GSM module is the most secured mode in which the owner has to enter the password through his mobile via text message to open or close the lock.

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The main advantage of GSM module is that it enables user to lock/unlock the door from remote location. The main advanced feature in all three modules is that if unknown person enters three consecutive wrong passwords, it will send an alert message on GSM mobile number of the owner which is stored in ARDUINO program and also start the buzzer alarm for security alert of the society.

Block Diagram

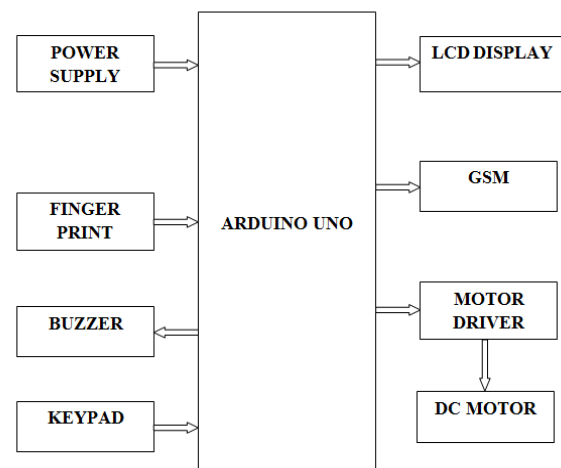


Fig. 1 ARDUINO UNO block diagram

II. COMPONENTS

A. ARDUINO Microcontroller

ARDUINO UNO is a board based design on the microcontroller ATmega328P. It has 14 digital input/output pins, 6 analog inputs, a USB connection, an ICSP header, a 16 MHz quartz crystal, a power jack and a reset button. It has module to support the device microcontroller; simply interface USB cable into the computer or power it with battery or AC-to-DC adapter to get started. The microcontroller board can works on an external power supply in the range of 6-20 volts. The UART TTL (5V) serial communication can be enabled using ATmega328P microcontroller which can be carried out using digital pin 0 (Rx)/ pin 1 (Tx).

B. GSM Module

GSM module is mainly used for mobile communication. GSM module is connected to ARDUINO for sending and receiving of messages. SIM900 GSM module is used that supports communication in 9000MHz band. This GSM module requires a 12V power supply. The block of GSM modules are enabled by interfacing GSM modem to PCB and giving outputs for RS232. The data can be feed from GSM module to ARDUINO UNO through the output pins.



C. LCD display

LCD is an alphanumeric display, can display both alphabets and numbers. The operating voltage is 4.7 to 5V and can consume 1mA current without backlight.

The LCD consists of V_{CC} , GND, V_{EE} , EN (Enable), RS (Register Select) R/W (Read/Write), pins (DB_0 to DB_7) and Led+ and Led- pins of LCD module are interfaced with PIC. It has 16 pins and the first one from left to right is the Ground pin. The second pin is the V_{CC} which we connect 5 volts pin on the ARDUINO board. RS or register select pin is used to send data or commands to the LCD. R/W pin is used for either read or write to the LCD. EN pin which enables the writing to the registers or the next 8 data pins from D_0 to D_7 .

The pins A (anode) and K (cathode) pins for the LED backlight. The registers for LCD from D_4 to D_7 will be interfaced to digital pins 4 to 7 of ARDUINO's board. The pin 2 will be connected to Enable pin and the pin 1 will be connected to RS pin. The R/W pin and V_0 pin are connected to ground and potentiometer respectively.

D. Motor Drive

A motor drive (L293D typical motor driver IC) is used for operating and driving the circuit and it works on the principle of H-Bridge.

E. L293D Motor Driver IC

L293D Motor Driver IC which has a capability to drive DC motor on either direction. It has a control with 16-pin IC to drive two DC motor simultaneously in any directions. i.e., to control the two DC motors using single L293D IC and it is based on the principle of H-Bridge is shown in fig: 5.

The two enable pins of L293D driver can be controlled and enabled using Pins 1 and 9 with needs to be high to operate the motor. For Left H-Bridge and Right H-Bridge driving enable pin 1 and enable pin 9, respectively. There are 4 input pins, pins 2,7/ 15,10 on the left and right. The rotation of motor is based on LOGIC 0 and LOGIC 1.

F. Voltage regulator IC 7805

Voltage regulator IC 7805 is a regulator IC's which has three terminal linear voltages. The 5 V supply is used for IC which is used for wide range of requirements. It can able to deliver up to of current, which has both thermal shutdown and internal current limiting features, requires minimal external blocks/ components to function properly [5] – [6].

Pin 1, pin 2 and pin 3 are the input, ground and output ports respectively. In the circuit V_{IN} and V_{OUT} are the input and output voltage to the 7805 IC which is a regulated 5 V and the source can be from either a battery of an unregulated DC.

G. Motor

We used high quality low cost DC geared motor with 500 RPM 12V DC. To ensure longer life, it has steel gears and pinions to get better wear and tear properties. The DC geared motor operated at 12 V with 500 RPM gives better torque and wide range of RPM.

H. Buzzer

A buzzer is used to alert the persons nearby. The buzzer produces a same noisy sound irrespective of the voltages

applied to it. When potential is applied to it, they push on one conductor and pull on the other. This results in producing sound. It can produce voltage of 2 to 4kHz.

I. Fingerprint Sensor

Fingerprint Sensor is used for storing the fingerprint of the authenticated person [6]. It will store the data of the user. Each and every individual has a unique fingerprint. So it impossible for an unauthorized person to hack

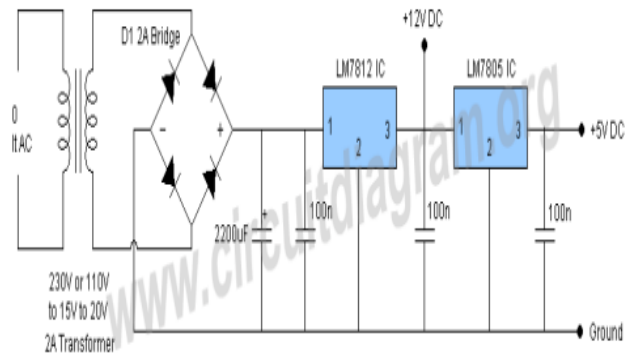


Fig. 2 Regulated power supply

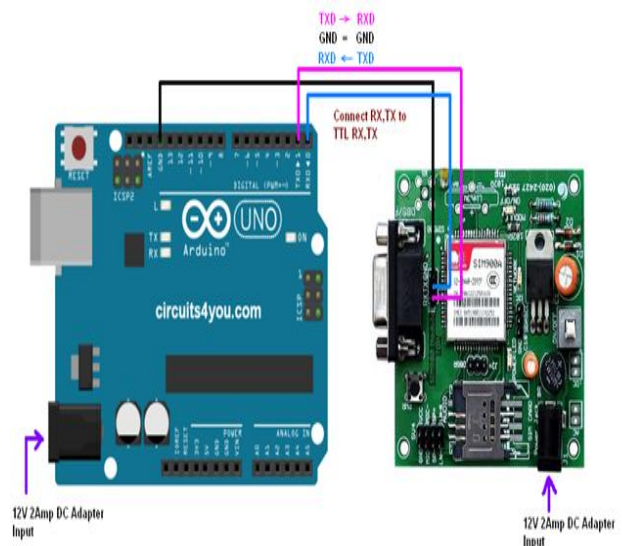


Fig. 3 Connection with ARDUINO UNO

III. WORKING PRINCIPLE

ARDUINO microcontroller is used as the controlling unit of the circuit [7]. It controls the whole driver unit. It is commonly used for communication. The GSM module, Keypad, Buzzer, LCD display is connected to the ARDUINO microcontroller as shown in fig: 4. It is connected to an USB or any other microcontroller for power supply. The fingerprint sensor is connected to the microcontroller. The power supply for Keypad, GSM and the Buzzer is taken from the ARDUINO microcontroller. There will be a motor driver for driving the circuit.

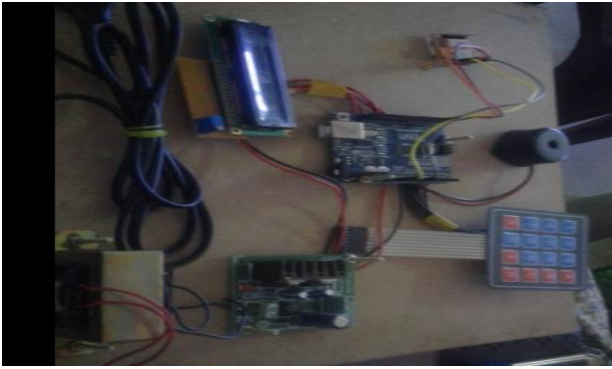


Fig. 4 Module Board Connection

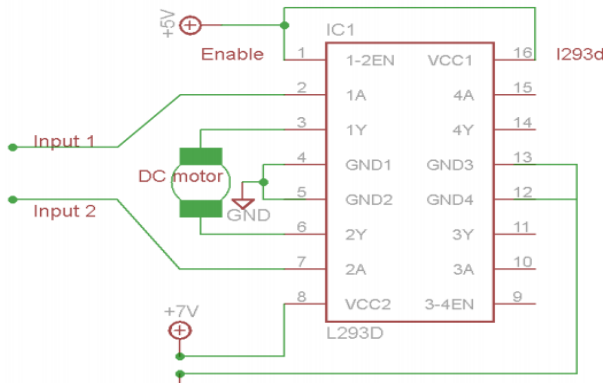


Fig. 5 Pin Diagram of L293D IC

Initially, the 4-digit password is entered using the keypad. Every individual person has unique password to open the door. Once the password is entered is correct the door opens, the LCD displays successful message on the screen and the user gets a notification message on his mobile through the GSM module. GSM module is used for the sending and receiving of message.

The keypad is set with a three attempts for entering the password. The user can enter his password three times to open the door. If an unknown person enters the password for the first attempt, the password entered is wrong the door remains closed and the LCD display two attempts left and an unsuccessful message. He tries for the remaining two attempts and the buzzer connected will alarm to alert the people nearby. At the same time, the user also gets an alert message on his mobile. The alarm will be continuously ringing for 10 to 15 minutes as per the user need. The user can stop the alarm and reset the password from the remote location.

For more security we have used a Fingerprint sensor [8]-[11]. It will scan the individual fingerprint and stores in the database. If the user enters the fingerprint, it will search in the database whether the fingerprint scanned already stored in the database and if it is correct the door opens otherwise it remains closed till the authenticated user keeps the thumb print.

IV. RESULTS AND DISCUSSION

The GSM Based Door Locking System has developed for safety of individuals and it is achieving its goals among individuals.

The user has his unique password for opening the door. If the password entered is "9432865" the user is given only

three attempts for unlocking the door. If the password entered is incorrect, the notification will be send to the authenticated person's mobile and the "unsuccessful attempt" will be displayed on the LCD screen. The development of this technology is useful and it will be implemented in the developing technologies.

An unknown person cannot have the access to open the door. Only the registered user can be given the right to access. Hence the system is safe and secure. If in case, the user can change the password from his remote location to open the door.

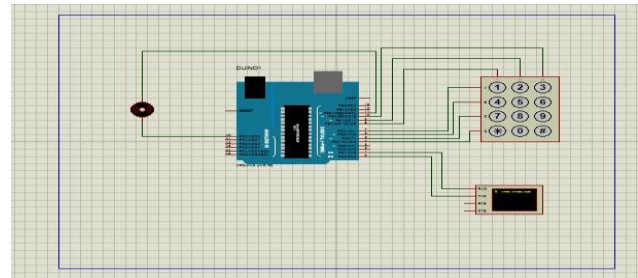


Fig. 6 Simulation set-up

V. CONCLUSION

The door locks or unlocks system using GSM module was implemented successfully. The design can be used for security based systems and procedures. It is a safe and secure system. The system can be used in residential and commercial development. The following improvements can be suggested for further improvements of system:-

- 1) Face recognition
- 2) Designing based on the individual need
- 3) Integrating with thumb impression
- 4) Integrating with CCTV network

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