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Smart Door Control System

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Abstract

The major activity that takes place around world is automation and security. The automation or remote control has become fundamental to our lives .The project presented here is a novel approach towards automation and security. In this project, we present the design and implementation of a GSM based wireless home/office/other area security system. And this system helps for people with physical disabilities. Here the system automatically controls (open or close) the door as soon it receives predefined message from the user. The system mainly consisting of microcontroller, GSM and gear motor for controlling the door. The door is controlled only by the authorized persons through sending control SMS to the GSM module. If unauthorized person wants to access the door then, he has to press call button which is kept beside the door then, automatic voice call going to authorized person, thus user can communicate with the unauthorised person lively. If he wants to open the door he can send door open SMS to the device, then door will starts opening and after some time authorized person can close the door remotely by sending another SMS. The door is controlled via H-bridge circuit. If intruder tries to enter the door forcefully, then door sensor is activated it gives signal to microcontroller and alert message is goes to authorized person.

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Keywords: *GSM, PIC microcontroller, H-bridge, Gear motor, PIR, Door sensor logic, LCD*

I. INTRODUCTION

Now a days there is a need of highly secured and automated systems for security purpose the problems being, robbery and other security issues which are increasing day by day, proving to be an increasing threat for human life. In residential areas even after providing facilities such as security guard, there seems to be no solution to these problems. In 2010, the Federal Bureau of Investigation (FBI) reports that there were more than two million home burglaries in the United States, over 70 percent of which took place in residential homes. According to 2011 reports by National Crime Records Bureau (NCRB), in India, the number of burglary cases registered was 58862 cases, with a total worth of USD 50 million. According to a 2010 study by the Alarm Industry Research and Educational Foundation (AIREF), burglars spend less than 60 seconds for breaking into a home. So, anything that made a house harder to access, including home security systems, deadbolt locks, bars on windows, acted as a deterrent. Further, according to the Electronic Security Association‟s (ESA) "Home Safety Fast Facts" report, 9 out of 10 burglars avoid homes with alarm systems and said if they did encounter an alarm, they would not attack the home and drop the attempt. These facts have encouraged the development of numerous security systems for both residential and commercial applications. This system is mainly focus on automation and security and this system very helpful for physical disable people.

II. METHODOLOGY

This project is aimed to design a system using which the door can be automated i.e. it can be opened and closed automatically by using GSM technology. A GSM modem provides the communication interface. It transports device protocols transparently over the network through a serial interface. A GSM modem is a wireless modem that works with a GSM wireless network. This GSM Modem can accept any GSM network operator SIM card and act just like a mobile phone with its own unique phone number. Advantage of using this modem will be that you can use its RS232 port to communicate

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and develop embedded applications. Applications like SMS Control, data transfer, remote control and logging can be developed easily. The modem can either be connected to PC serial port directly or to any microcontroller. This project is designed in such a way that a GSM modem will be interfaced to the controller through serial port interface along with the DC motor through voltage driver IC L293D. The door is connected to this motor.

The microcontroller will be programmed in such a way that some predefined messages will be assigned to the controller for controlling the motor in different directions i.e. opening and closing of the door. Whenever the user wants to control the door, he has to send predefined messages to the modem. When the modem receives data (SMS), it will intimate the same to the microcontroller. Now, it is the job of the controller performs the predefined task of controlling the door in clockwise or anticlockwise in accordance with the message received from the modem.

A 16X2 LCD will be interfaced to the controller to display the status of the door. This project uses regulated 12V, 1A power supply. 7805 three terminal voltage

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regulator is used for voltage regulation. Full wave bridge rectifier is used to rectify the ac output of secondary of 230/12V step down transformer.

III. LITRERATURE SURVEY

In [1] The design integrates the near field communication (NFC) reader of a Smartphone device with the door lock control system to provide a convenient single button operation. This design also offers three operation modes to the user in order to allow a one-time password with a time stamp permission to match the user's password to thus enhance the door's security.

In[2] In some high-cost industrial field, in order to make image processing technology make up for deficiencies in existing control methods and also have a high economy, this paper presents a smart elevator door control system based on image processing technology. Select atmega32 as the main control chip and ov7620 as image acquisition chip.

In[3] The design pattern with the unified modelling language (UML) for the automatic door control system development, and we define a UML class diagram to

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describe structural aspect of system, and we also define a set of sequence diagrams to specify behaviour of system. The UML is a new industrial standard for the software system modelling.

In[4] Smart home security control system has become indispensable in daily life. The design and development of a home security system, based on human face recognition technology and remotely monitoring technology, to confirm visitor identity and to control door accessibility has been reported in this paper.

In[5] A security device is proposed which is developed from the concept of conventional calling bell. The device analyzes the fingerprint of a person and matches it with stored fingerprint database to categorize the person as home member or known guest or unknown guest. When it detects a home member the entrance door automatically opens. When device detects the person as unknown guest, it generates tunes which make aware the people inside that an unknown person wishes to enter your home.

IV. WORKING

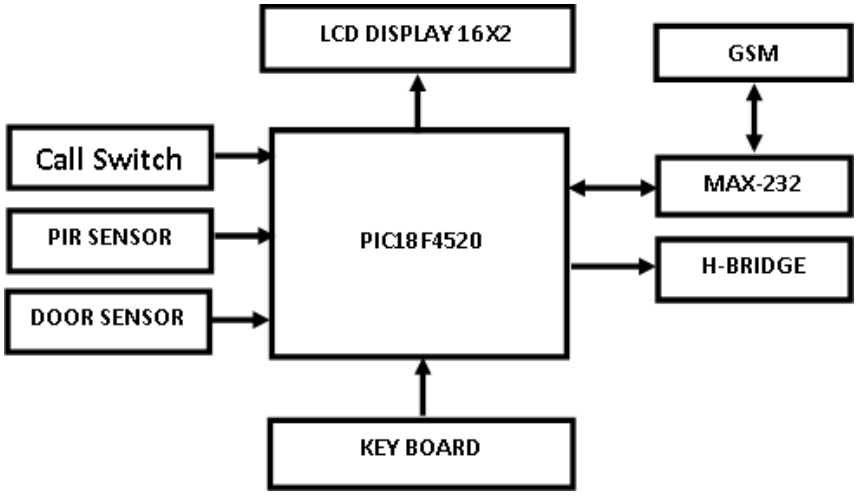


Figure1: Block diagram of proposed system

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When we switch ON the system, after certain delay that is 10seconds, the system gets initialized and microcontroller starts reading the other devices input at the rate of 20ms per channel. The function of proposed project in various parts has been explained bellow:

The first and most important part of project is providing security. The main door is controlled through SMS. When an authorized person tries to enter the door, all he has to send a SMS to GSM modem. When an unauthorized person is comes, the PIR sensor is activated it gives signal to microcontroller, and microcontroller send a alert message to authorized person via GSM modem.

The unauthorized person wants to access the door he has to press call button then, automatic voice call going to authorized person, thus user can communicate with the intruder lively. If he wants to open the door he can send door open SMS to the device, then door will starts opening and after some time authorized person can close the door remotely by sending another SMS. The door is controlled via H-bridge circuit. If intruder tries to enter the door forcefully, then door sensor is activated it gives signal to

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microcontroller and alert message is goes to authorized person.

V. HARDWARE IMPLIMENTATION

The hardware of system the system mainly consisting of following components:

- PIC microcontroller 18F4520
- GSM SIM900
- Gear motor
- MAX232 (RS232)
- H-BRIDGE circuit
- Liquid Crystal Display (LCD)
- Crystal Oscillator
- Power supply

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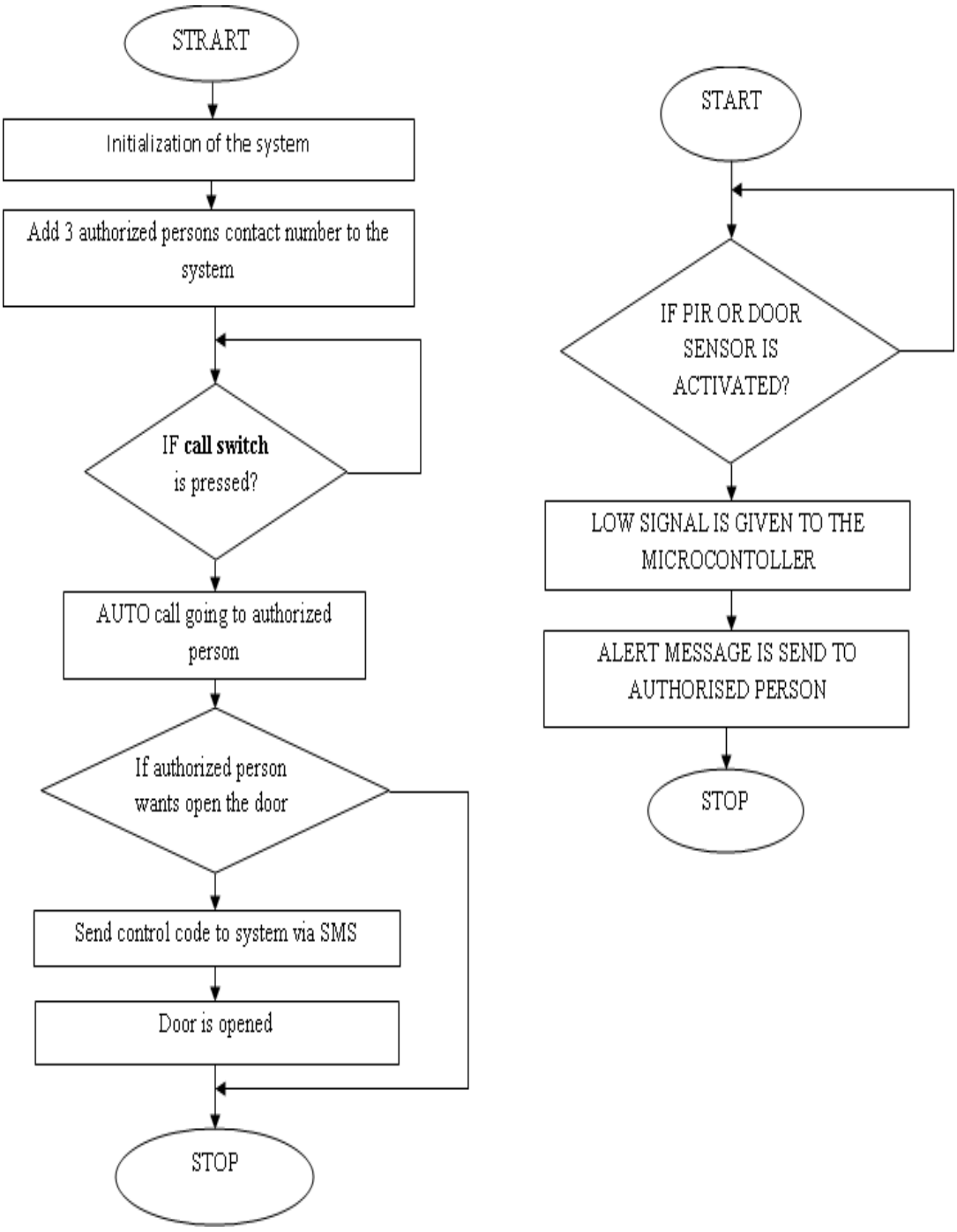


Figure2. Flowchart of proposed system

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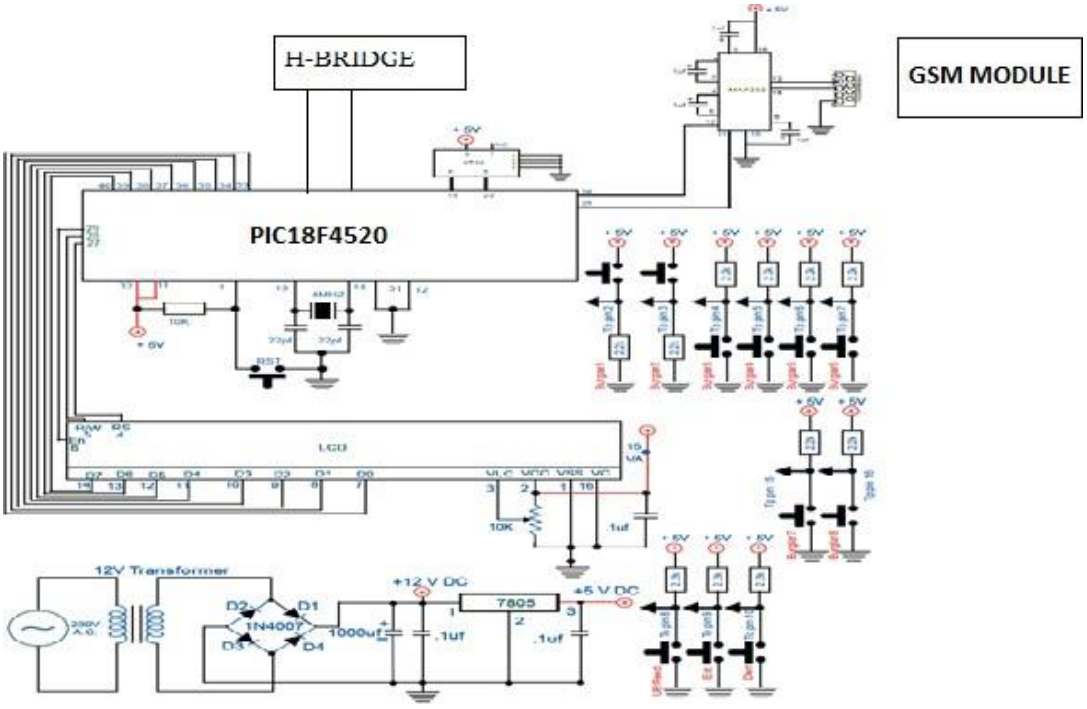


Figure3. Circuit Diagram of Proposed System

A. PIC Micro controller

PIC 18F4520 is the main controller in this system, which controls the all the operations of the system. It consists of 32KB of program memory and 40 pins (there are 33 bidirectional I/O pins).

B. GSM

GSM is known as Global System for Mobile Communication. A technology developed in 1985 by a French company known as Group Special Mobile. The door is controlled through sending short message service to GSM. And live communication takes place Between authorised and unauthorised persons using GSM module.

C. MAX232

The MAX232 is the level converter. It is mainly used to communication between microcontroller and GSM module. The MAX 232 is an integrated circuit that converts signals from an RS-232 serial port to signals suitable for use in TTL compatible digital logic circuits. The MAX232is a dual driver/receiver and typically converts the RX, TX, CTS and RTS signals.

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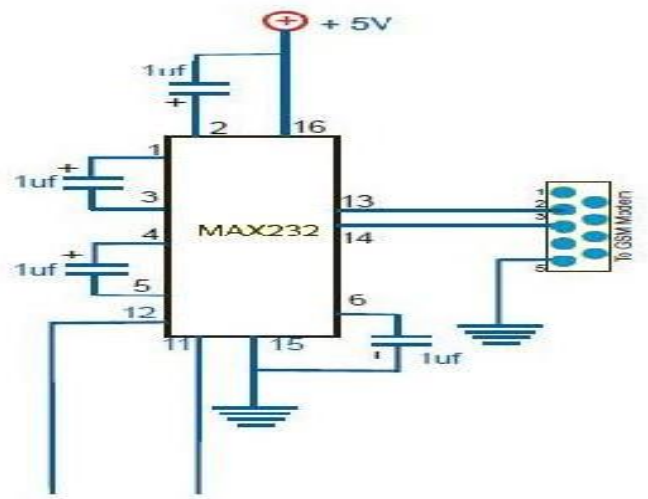


Figure4. MAX 232 circuits

D. CRYSTAL OSCILLATOR

A crystal oscillator is an electronic oscillator circuit that uses the mechanical resonance of a vibrating crystal of piezoelectric material to create an electrical signal with a very precise frequency. This frequency is commonly used to keep track of time (as in quartz wristwatches), to provide a stable clock signal for digital integrated circuits, and to stabilize frequencies for radio transmitter and receivers. In our project we use 11.059MHertz frequency.

E. GEAR MOTOR

A gear motor is a specific type of electrical motor that is used to control the door open or close and it is designed to produce high torque while maintaining a low Horse power, or low speed, motor output. Gear motors can be found in many different applications, and are probably used in many devices in your home.

F. H-BRIDGE

A D.C. Motor requires a voltage difference between its terminals to rotate. The direction in which a motor rotates in determined by which side of the motor is connected to the positive and negative terminals. Swapping the positive and negative terminals will cause the motor to rotate in the opposite direction. An H-Bridge is used to control the direction of the motor and to also provide enough current for the motor to run.

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G. LCD

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on.

H. Power Supply

Two transformers are used in this section to powering the Micro Controller section and MAX232, GSM section, and Sensor section. These two transformers are used to step down the 220 volts A.C mains supply into 12 volts A.C supply. Current handling capacity of the transformer is 500 ma. The primary resistance of the transformer is about 700 ohms, secondary resistance is about 4 ohms.

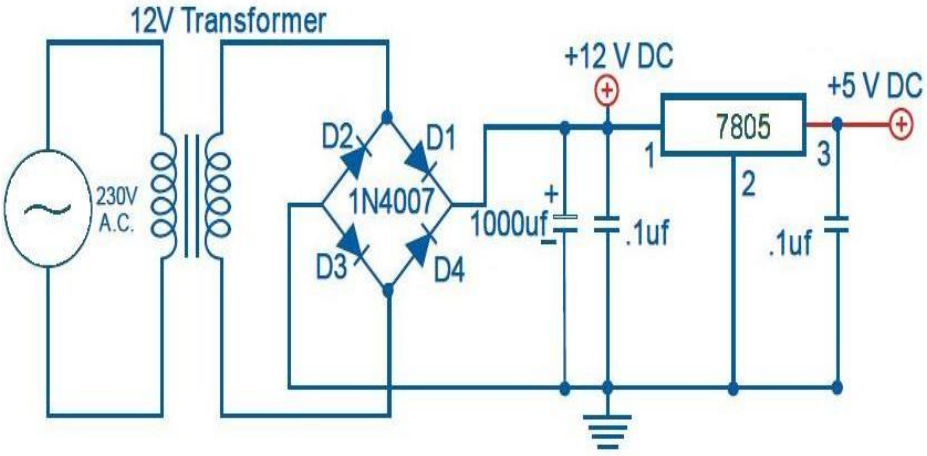


Figure5. Power supply circuit

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VI. SOFTWARE CONFIGURATION

The software is written in a combination of Basic and Assembler using the PIC Simulator MPLAB IDE. A super

The program is written in a combination of Basic and Assembly language using the PIC Simulator MPLAB IDE a super fine development tool. The Basic in the simulator includes commands for communicating through the serial port on the PIC, but there is no error handling in the receiver routine and to ensure full stability in the software a new receive routine has been written in assembly language (this is based on the studio of PIC hardware serial port written in PICUART.ASM document. You can find it on the net too). Rest of the code is written in Basic so it is straight forward to debug after initializing the system software reads the phone number from the SIM card, Which we entry from keyboard and stores it in local memory. After this it goes into a loop checking the inputs every 10 seconds checking for a new input like input from door sensor or PIR sensor.

If an input is activated the phone number is read from memory and end to the GSM modem followed by the messages. If a new SMS is received the GSM modem will store it in position 1 if free otherwise it will be stored on the first free location and after reading the message system will do required task. By clearing the first position we ensure that any new message will be stored here. This simplifies the software as it only needs to check for new message on this position. If a new message has arrived it will be read, decoded and do specified tasks.

The decoding part checks that the pin code in the message is identically with the stored pin code. If ok the included command is executed. If the system receives two new messages in a row it will only be able to handle the first one and the other one will be lost. Due to this you should disable any „service information" from your GSM operator to limit the amount of crappy SMS received. If you send a command to the system and you don"t get at respond within a minute, then just resend it.

The main tasks of program or software are:

1. Communication between PIC Microcontroller and GSM modem.

2. Communication between sensors and Microcontroller (Door sensor and PIR sensor).

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3. Communication between Microcontroller and keyboard.

4. Communication between Microcontroller and LCD.

5. Execution of command.

VII. ADVANTAGES, DISADVANTAGES AND APPLICATIONS

A. Advantages

- Remote indication: With the use of GSM technology owner of the house or industry get remote indication through SMS. So even if the user is away from home or industry, he/she will be intimated about the hazardous or undesirable conditions / situations inside the house.
- This system is fully automated. So once this system is installed inside home or industry, then it does not require any human interaction to operate.
- No complex in design.
- This system is Cost effective. Also it is Fast and efficient.

B. ***Disadvantages***

- If network is not there then system cannot accessed.

C. ***Applications***

- Since we used GSM based system Authorized person can handle the door anywhere in the world.
- It is extremely useful for physically challenged people.
- The door control system makes the life of elderly people more convenient as they can control the door from wherever they are. Also we can used in college and companies to control the gate.
- We can avoid key loss, Locking and unlocking is handled only through message, so there is no key locking facility.
- We usually cone across areas where a user needs to control his domestic or company door lock from wide

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distances. Here we propose a system that allow user to unlock a door by entering a password remotely.

- Can be used in various rooms like seminar hall, conference room, and study rooms in college where the capacity of room is limited and should not be exceeded. So the project will display the actual number of persons inside the room.

- The GSM is an excellent choice for this due to its extensive coverage. Since SMS is a text based protocol, even the most basic GSM systems can have an access to the status of the devices or make changes on these states.

- The design is completely wireless and integrated with the software to form a low cost, robust and easily operable system.

- The GSM based controlled duplex communication system provides a powerful decision making device concept for adaptation to several smart home scenarios

VII. RESULT

A. Initialization of system

When we switch ON the system, after certain delay that is 10seconds, the system gets initialized and microcontroller starts reading the other devices input at the rate of 20ms per channel.



Figure6. Initialization of system

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B. Call switch processing

If unauthorised person wants to access the door, he has to call to authorised person by pressing call switch, then live communication takes place between unauthorised and authorised persons.

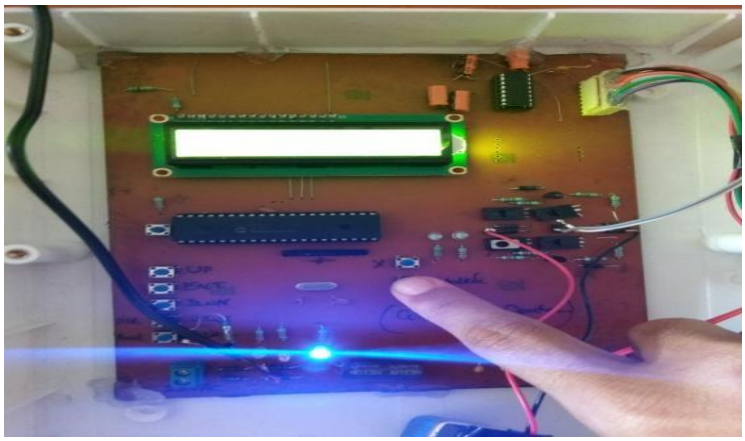


Figure7. Call switch processing

C. Auto Call Dialling

After pressing call switch then automatic call is going to the authorised person.



Figure8. Automatic call dialing

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D. Door Accessing

If authorised person wants to access the door, he will send control message to GSM Then door is opened or closed.

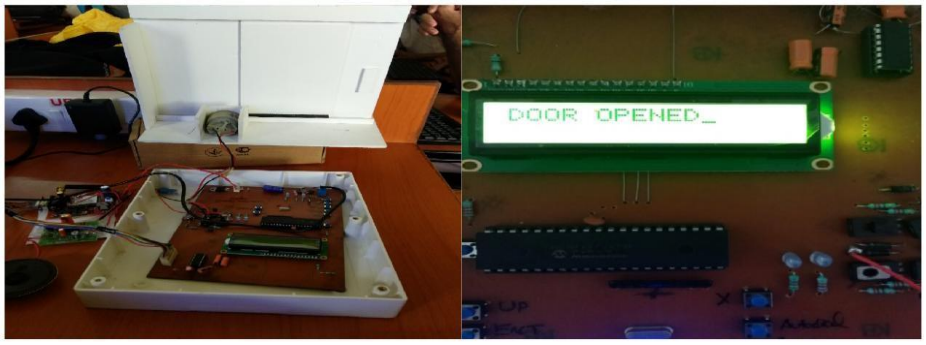


Figure9. Door accessing via SMS.

CONCLUSION AND FUTURE SCOPE

The GSM Based Digital Door Lock Security System was designed and implemented successfully. On basis of detailed analysis and trials, we could conclude that the system was stable and can be an emerging product in field of security systems for both residential and commercial applications

We suggest the following improvements in future development of system:

1) Integrating with face detecting sensors.

2) Integrating with gesture sensors.

3) Interfacing with CCTV network.

4) Integrating with 3D holographic password input keyboard.

5) Integrating with multiple locks on multiple doors inside a facility.

6) Replacing motors with pneumatic valves.

7) Addition of a lock tampering detection system.

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8) Addition of backup battery supply to facilitate uninterrupted service.

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