IR Based Automatic Access Control System

SECURITY SYSTEM

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ABSTRACT

IR Based Automatic Access Control System

We developed an IR based automatic access control system to provide high level security in real time for labs and departments with sensitive nature of job. Each individual allowed in the premises of the room provided with this security system is allotted a unique code. IR module detects the IR radiation from individual module. A Data Base would be developed, having the detail of every individual allowed in the department. Software Code is developed to capture and compare the individual's identity data with information stored in database. RFID based 1st layer security connected with central microcontroller, IR sensor configuration will be used. The software will repeat the process for each individual who tries to move in the department where this system is installed.

CERTIFICATE OF CORRECTNESS AND APPROVAL

It is certified that the work contained in this thesis title "IR Based Automatic Access Control System", carried out by GC Sameer Abbas, GC Waleed Usmani, GC Mehboob Elahi and GC Siddique Khan under the supervision of Lt. Col. Dr. Tayyab Ali in partial fulfillment of Degree of Bachelors of Telecommunication Engineering, is correct and approved.

Approved by

_____

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DECLARATION

No portion of the work presented in this dissertation has been submitted in support of another award or qualification either at this institution or elsewhere.

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DEDICATION

In the name of Allah, the Most Merciful, the Most Beneficent

To our parents, without whose unflinching support and cooperation,

a work of this magnitude would not have been possible.

ACKNOWLEDGEMENTS

What seemed to be a long endeavor a year before is finally over. There is no success without the will of ALLAH Almighty. We are grateful to ALLAH, who has given us guidance, strength and enabled us to accomplish this task. Whatever we have achieved, we owe it to Him, in totality. Looking back in time, many people have contributed towards the accomplishment of this project and they all deserve our deepest gratitude. We are also grateful to our parents and family and well-wishers for their admirable support and their critical reviews.

We are indebted to our supervisor Lt Col Dr. Tayyab Ali for extending his kind support in making it a successful project. We are thankful to the faculty of Electrical department for guiding us in our academic pursuit. In addition, as always has been the tradition of our college, we would like to thank all our seniors and batch mates for guiding us through the difficult phases.

TABLE OF CONTENTS

TABLE OF FIGURES

CHAPTER 1: INTRODUCTION

Security is the degree of resistance to, or protection from, harm [1]. It applies to any vulnerable and valuable asset, such as a person, dwelling, community, nation, or organization [1]. As noted by the Institute for Security and Open Methodologies [3], security provides "a form of protection where a separation is created between the assets and the threat". Physical security describes security measures that are designed to deny unauthorized access to facilities, equipment and resources, and to protect personnel and property from damage or harm (such as theft, or terrorist attacks) [2]. Physical security involves the use of multiple layers of interdependent systems which include CCTV surveillance, keypad security, security, protective barriers, locks, access protocols, and many other techniques [2].

1.1 WHY IR BASED SECURITY SYSTEM

Despite CCTV surveillance, RFID based security systems, security guards and various other forms of security there has always been a threat to assets and personnel. IR module based security system to provide a highly accurate and effective access control in real time for security sensitive organizations. Biggest advantage it offers is that whole of the verification process is carried out in real time while the authorized personal or intruder remains oblivious to this security system. IR module detects IR radiations emitted from user module fixed on jacket of the individuals where each of them is assigned a unique code. When an intruder enters in premises, provided with this security system, an alarm is generated. Software will repeat verification process for every person who tries to move in area where this system is installed.

1.2 PROBLEM STATEMENT

Increased level of security for the highly sensitive labs/departments in military/ governmental organizations and banks has always been the greatest demand. This project offers a viable solution to that by presenting a prototype of a real time efficient IR module based security system.

- Provides high level security system for real time intruder detection in areas where sensitive nature of job is being carried out, valuable assets are being kept or personnel security is necessary
- No one can overwrite it unless known
- provides results in real time for in time intruder detection
- Jam proof.
- Synchronizes its operation with doorway and RFID security system installed

1.3 PROJECT DESCRIPTION AND SALIENT FEATURES

We have developed an IR module based security system to provide a highly accurate and effective access control in real time for security sensitive organizations. Whole of the verification process is carried out in real time while the individual/intruder remains oblivious to this security system. IR module detects the IR radiation emitted from the module fixed on jacket of individuals. Data Base containing detail of every individual allowed in the department has been developed and installed in central microcontroller. When an intruder enters in premises provided with this security system, an alarm is generated. Verification process is repeated for every person who tries to move in the area where this system is installed.

1.3.1 PROSPECTIVEAPPLICATION AREA TARGETED

Increased level of security for the highly sensitive labs/departments in military/ governmental organizations and banks has always been the greatest demand. Especially current situation prevailing in our country i.e. increased number of crimes and burglary make security a need of time. This project offers a viable solution to that by presenting a prototype of a real time efficient IR module based security system. We

have chosen IR module and central microcontroller i.e. Arduino UNO board to perform the process of individual verification and intruder detection. Our primary objective is development of an IR module based security system to provide a highly accurate and effective access control in real time for security sensitive organizations.

1.3.2 SALIENT FEATURES

Project has been completed following order of modules given in the figure 1. Figure below shows the flow chart explaining the four project modules:

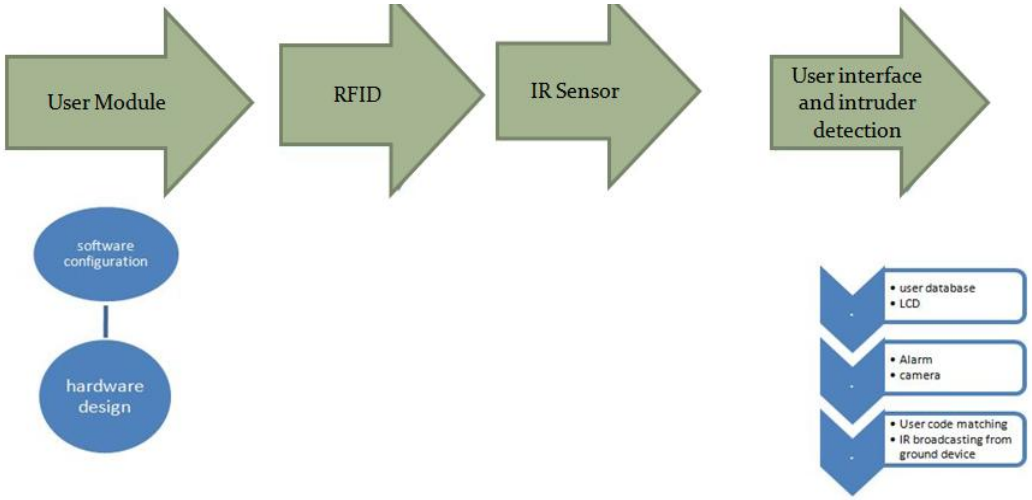

Figure 1-1 Project Modules Flow Chart

System model diagram prepared in ISIS professional is shown in figure 2:

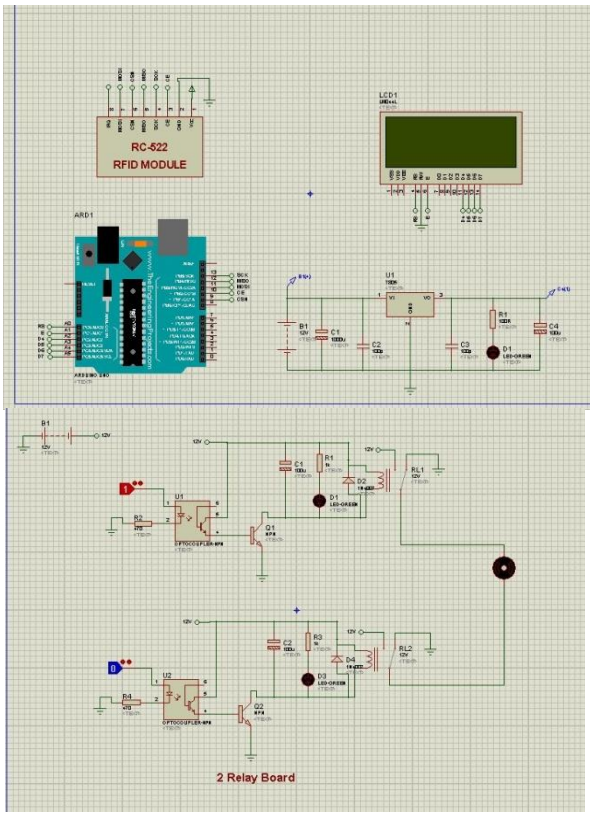

Figure 1-2 project schematics in ISIS

Salient features of project include:

- Real time intruder detection
- Jam proof
- Synchronization of central security module with keypad security module and entrance door
- Power savage offered by usage of IR sensors
- Each allowed individual is allotted a unique code increasing security level
- Cannot be overrun or overwritten unless known to intruder

1.4 PROJECT SCOPE, OBJECTIVES, SPECIFICATIONS AND DELIVERABLES

1.4.1 SCOPE

Due to increasing number of crime and burglary, need of security system is very essential. A security system that monitors the area throughout and reacts effectively to threats is in need. We have lots of security systems in the market for both indoor and outdoor applications such as ultrasonic detectors, CCTV, microwave detectors, photoelectric detectors, infrared detectors etc. [1]. Background study shows that IR modules used for an ever increasing range of applications have grown tremendously. IR module based security system can be used to provide a highly accurate and effective access control in real time for security sensitive organizations. Research related to security systems is being undertaken in many areas going from the design of more efficient system aimed at more specific applications, to the development of improved control electronics that provide for better detection, to optimized detection strategies, or to opening new application domains. The goal of this project is designing of an IR module based security system operating in real time with an improvised application of IR sensors and RFID for efficient alarm generation and intruder detection.

Future scope of project is quite vast based on various application fields it can be applied to. It can be used for conducting intruder detection operations where it's humanly impossible to detect. In terms of its military applications it can be more widely used for security purposes. As more advanced forms of this project are being developed, there range of applications increases and hence we can ensure there commercialization. Thus IR module based security systems can be used in day to day working of a human life, ensuring their well-being.

With further study and advancement in technology, designers are quite sure that IR module based security systems can be used for advanced applications [3]. The main advantage in the future use of IR module based security systems for various purposes is that risk to sensitive technology and human life, may it be because of security threats or due to commercial accidents can be greatly avoided.

1.4.2 OBJECTIVE:

Development of an IR module based security system to provide a highly accurate and effective access control in real time for security sensitive organizations.

1.4.3 SPECIFICATIONS

The objective "development of a high level security system for real time intruder detection in extremely sensitive areas" would technically be stated as "designing and development of a basic prototype of IR module based security system and making it capable of real time intruder detection by integrating the suitable microcontroller programmed to provide real time results with it".

IR based security system is an advanced next level security providing system that is assembled by IR sensors, microcontroller boards, IR module, signal processing systems and RFID enabled 1st layer to make it capable for double security while it remains hidden so that individuals remain oblivious to its installation. Specifications of prototype developed are given below:

1.4.3.1 RFID MODULE ENABLES FIRST LEVEL SECURITY

This is an important module that deals with designing of the RFID security module and its configuration with the central operating system i.e. the Arduino UNO board. The main reason for including this module is to enable the general level security from outside the room. The user, who intends to enter the room, will have to use RFID based card.

1.4.3.2 IR SENSOR MODULE RECIEVERS

The final prototype developed has an IR sensor module on board. This setup serves a very important purpose that is whenever any person tries to enter the premises of the room provided with this security system, IR sensors, fitted right at the entrance, of second door detects the transmitted signal from the user module and send that data to Arduino UNO for further processing.

1.4.3.3 INDIVIDUALS MODULE

Final prototype developed by sameer individual module for each individual allowed entering; it transmit IR rays via IR module and expects a IR sensor on second door to transmit the signal from IR module to central processing unit. In response individual module sends a reply back that contains code assigned to that particular individual. In case of no reply an alarm is generated indicating intrusion .

1.4.3.4 SECURITY SYSTEM DESIGN COMPONENT SPECIFICATIONS

As stated in the attached copy of the proposal, we have completed the design of proposed security system by assembling various components that were necessary to make prototype design possible. The figure 3shows the IR module selected:

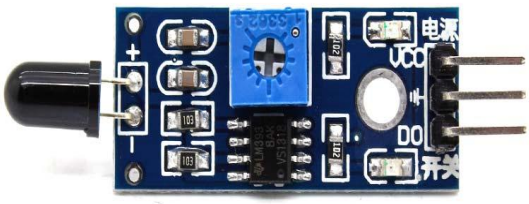

Figure 1-3 IR Module

As shown in figure 3 this IR module has been configured to give designed security system. For making it capable of broadcasting the IR signals it is controlled with the help of Arduino board. While in case of individual module it is controlled by a single microcontroller chip ATMEGA328P.

IR module has following specifications:

Model	TMC9-M□□□	TMC9-E□□□	TMC9-D□□□
Supply voltage	AC85～115V, less than 4VA	DC10～27V, less than 12VA	
		Non AC Adaptor	With AC Adaptor (AC100V)
Form	Panel mount 48 x 48 (mm)		Desk top type
Emissivity	Guaranteed range 0.3～1.0 (With Reflex calibration function)		
	Setting range 0.050～1.000(Setting resolution 0.001)		
	Function of setting by external analog input is equipped.(0～5V corresponds to emissivity 0～1.0) ★Option		
Alarm output	Standard 1 point (2 points availabe as potion)		
	Hysteresis setting width:Temperature range 0～±5%, Resolution 0.1% Photo coupler DC30V, 0.2A max.		
	Relay contact - "Alarm output1 :AC125V, 0.3A max." "Alarm output2 :AC250V, 1A max. " ★Option		
Analog output ★Option	Changeable to 4～20mA, 0～20mA, 0～1V, mV/℃, ★Optional output : 0～5V, 0～10V Enlargement to 2 points is possible. With Scaling function		
Peak hold	Reset function (selection) ①Time : 0.01～10sec changeable ②Discharge : time 0.01～10sec, Level 0.2～1.00 ③External signal : dry contact or open collector ★Option		
Sample hold ★Option	External timing signal input: dry contact or open collector		
Sensor calibration function	Span : 0.50～1.50 Zero : -50.0～+50.0℃(°F)		
Selection of indication measuring mode	Upper display : temp./alarmH/alarmL/blank Lower display : temp. unit/emssivity/alarmH/alarmL/blank		
Self-diagnosis	Internal supply voltage, Temperature converter abnormality		
Display resolution	Changeable to 1℃ or 0.1℃		
Indication unit	Changeable to ℃ or °F		
Ambient temp.	0～50℃		
Ambient humidy	30～85% RH (without dew drop)		

Figure 1-4 IR Module Specifications

1.4.3.5 SECURITY SYSTEM PERFORMANCE SPECIFICATIONS

These are some performance attributes of the configuration design of Security system:

- Real time intruder detection
- Real time broadcasting of signals by XBee module
- Real time response from the individual module
- RFID integration with database
- Auto opening and closing of door according to access grant
- Synchronized performance of IR security, RFID and doorway

1.4.3.6 SECURITY SYSTEM ELECTRICAL SPECIFICATIONS

- **IR module:** The IR Modules were engineered to support the unique needs of low-cost, low-power wireless sensor networks. The modules require minimal power and provide reliable delivery of data between devices. The modules operate within the ISM (1.4 THz ISM) [5]
- **Arduino Uno Board:** The Arduino Uno is a microcontroller board based on the ATMEGA328P. It has 14 digital input/output pins, 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack and a reset button. [3]
- **IR Sensors:** An infrared sensor is an electronic sensor that measures infrared (IR) light radiating from objects in its field of view. All objects with a temperature above absolute zero emit heat energy in the form of radiation. It radiates at infrared wavelengths and can be detected by electronic devices designed for such a purpose. [4]

1.4.3.7 ARDUINO UNO BOARD SPECIFICATIONS

Arduino board selected for microcontroller operation is Arduino UNO. It is a microcontroller board based on the ATMEGA328P having 14 digital input/output pins, 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack and a reset button [6]. Figure 5 shows the Arduino UNO board selected:

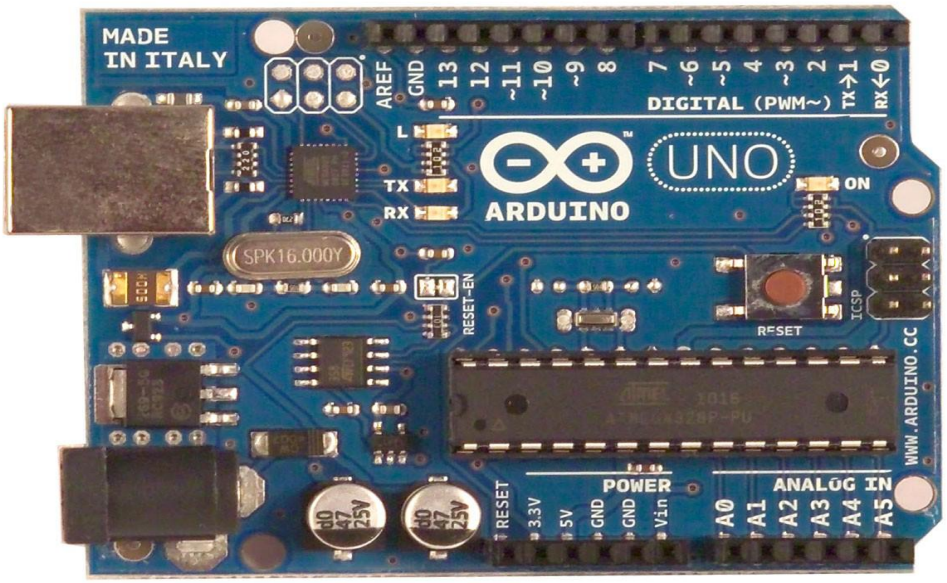

Figure 1-5 ArduinoUno Board

Technical specification of the Arduino UNO ATMEGA328P [6] is shown figure 6:

Microcontroller	ATmega328
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limits)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
Analog Input Pins	6
DC Current per I/O Pin	40 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB of which 0.5 KB used by bootloader
SRAM	2 KB
EEPROM	1 KB
Clock Speed	16 MHz

Figure 1-6Arduino Uno Specifications

1.5 DELIVERABLES

A fully assembled security system consisting of IR sensors, IR modules, Arduino board, and various chips is the final product. IR module, RFID module and doorways have synchronized operation along with alarm and camera support. This security system is capable of providing a next level security for security sensitive organizations. As discussed above, highly secure environment provision is main target in this project.

CHAPTER 2: BACKGROUND STUDY

Due to increasing number of crime and burglary, the need of security system is very essential. The security system that monitors the area throughout the time and reacts effectively to threats is always in need [1]. We have lots of security systems in the market for both indoor and outdoor applications such as ultrasonic detectors, CCTV, microwave detectors, photoelectric detectors, infrared detectors etc. [1].

Performance Analysis of IR ZB Module Based Wireless Sensor Networks by Rajeev Piyare and Seong-roLee [7] discusses performance of IR base module of wireless sensor network. It discusses performance analysis of ZigBee networks based on IR modules have been evaluated in terms of following performance metrics: received signal strength (RSS), network throughput, and packet delay and energy consumption in an indoor environment. The wireless sensor node hardware designed for this experimentation consists of IR (IR S2 with 2mW wire antenna) wireless communication module from Digi International.

The results of this study are useful for building Wireless Home Area Network (WHAN) using the IR where there are reflections due to indoor objects and also for scenarios where communication between nodes require multi-hop transmissions.[7]

"IR Wireless Sensor Networks for Temperature Monitoring" by VongsagonBoonsawat, JuraratEkchamanonta, KulwadeeBumrungkhet, and SomsakKittipiyakul [8] presents an embedded wireless sensor network (WSN) prototype system for temperature monitoring in a building. The ultimate goal of this paper is to help saving the energy cost and reducing energy consumption. The network consists of a data gateway or coordinator which wirelessly polls each WSN temperature-monitoring node located in each classroom. Each WSN node consists of a microcontroller on Arduino board and an IR wireless communication module based on the IEEE 802.15.4/IR standards. The coordinator also has an Ethernet interface and runs a simple data web server. Hence, the coordinator allows data collection over IR and data access from web browsers [8].

The results of this study are useful for building Wireless Sensor Network (WSN) using the IR module [8].

Forest Fire Detection Using Optimized Solar – Powered IR Wireless Sensor Networks" by U. Arun Ganesh, M. Anand, S. Arun, M. Dinesh, P. Gunaseelan and R.

Karthik [9] discusses two main modules present in the project are the Monitoring Area Module and the Forest Area Module. All these together are split into five sub-modules for step-by-step development and implementation. Those include Sensors' Module, Serial Communication Module using IR, Optimized Solar Energy Harvester, PC-based Web Server and Mechanical Modeling. The first three sub-modules belong to the Forest Area Module. They are integrated together and mechanical modeling is done to place it in the forest, whereas, the PC-based Web Server is developed for the Monitoring Area.

The outcome of the above implementations reveal that various sensors used in addition to the temperature sensor improves security level for areas located near the forests. [9]

"Design of intelligent sensor based on BP neural network and IR wireless sensor network" by Yun Wang and KunpengXie [10] discusses intelligent sensor in addition to the basic function, zero self-calibration and has the function of automatic adjustment, along with logic judgment and the ability of information processing, can be a measurement signal conditioning or signal processing. Multilayer BP neural network is a one-way transmission of feedforward network, and it uses the error output estimation error directly leading layer to output layer, and then the error estimation error of a layer.

The paper proposes design of intelligent sensor based on BP neural network and IR Wireless Sensor Network. Experiments show that the proposed intelligent sensor has higher efficiency. [10]

CHAPTER 3: DESIGN AND DEVELOPMENT

Chapter includes detailed design and development of project discussed in the form of various modules.

3.1 PROJECT MODULES

Project is divided into four main modules, as shown in figure 1 and 2, including:

Module-I: Configuration design and assembly of user module consisting of IR module and the chip for controlling its operation so that the IR module transmits the user code to the IR sensors attached to the central operating system whenever the RFID cards is used to access the first layer

Module-II: Designing of the RFID based security module and its configuration with the central operating microcontroller.

Module-III: Designing of the IR sensor security module and its configuration with the central operating microcontroller such that whenever any person enters into the premises of the room provided with this security system the IR sensors receives the transmitted signal from user to central processing unit in case it doesn't receive any signal for 10 sec or incase of false jacket it will set off the alarm

Module-IV: Designing of the central security module which is composed of the central microcontroller i.e. Arduino and the IR module for recieving the IR signals first and then giving back the response in form of opening/closing of back door with setting off alarm with camera taking pictures

Modules description is as under:

3.1.1 MODULE-I

This module basically deals with the Configuration design and assembly of user module. This is accomplished with the help of IR module and the microcontroller chip for controlling its operation so that the IR module transmits the IR signal to the IR sensor attached with central microprocessor

We use the IR modules based on the IEEE 802.11 infrared standards to build a low-power, low maintenance, and self-organizing WSN [2]. Small size, low power, low cost and long battery life are the reasons of using IR module. Figure 3 shows the selected IR module

Whenever central control system receives the signal from user modules, it analyses the IR rays via IR module and then decide whether to grant access to user or not on the bases of data base stored in the processor . Individual module response contains code assigned to that particular individual. In case of no reply an alarm is generated indicating intrusion.

Module schematics are shown in figure 7.

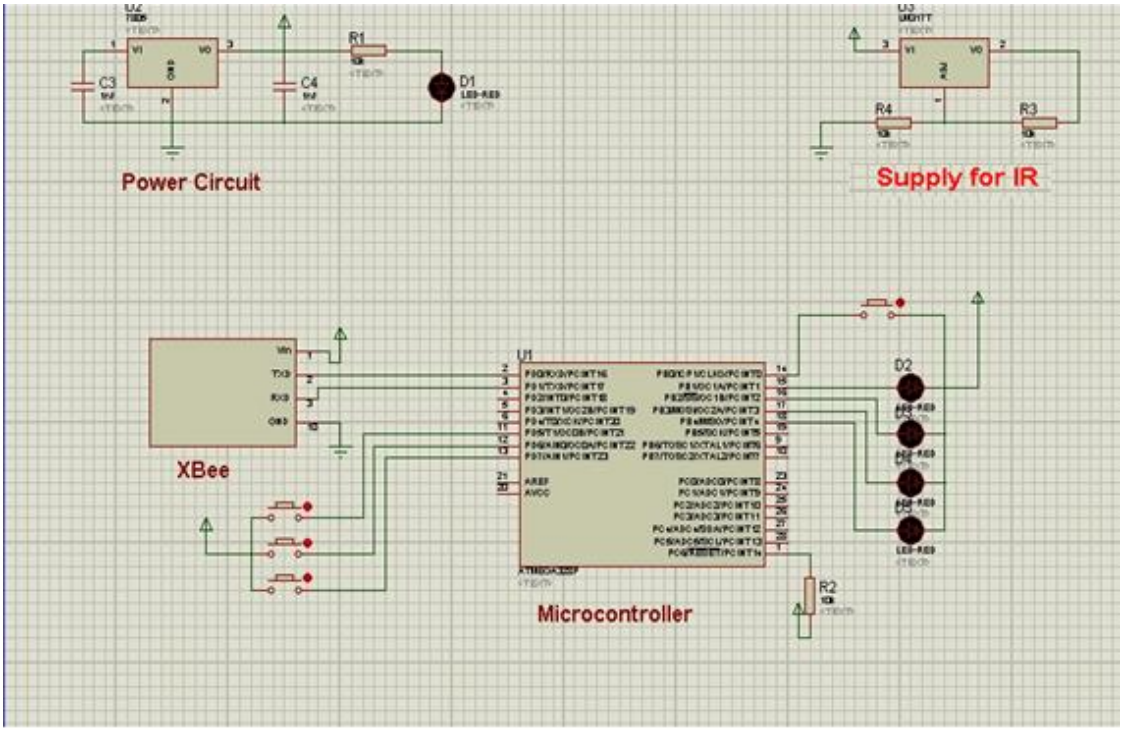

Figure 3-1 User Module Circuit Diagram

Figure 7 represents the detailed design of module basic elements being IR module, microcontroller, and power circuitry for IR and microcontroller, LEDs for output and push buttons for input indication.

Final hardware integrated circuit of individual module is shown in figure 8. ATMAGA328P microcontroller is integrated for controlling module functionality. User module contains fours buttons and four LEDS to represent four users respectively. Source voltage of this module is 12V which is converted into 5V by using IC Regulator 7805 as integrated controller works properly on 5V.

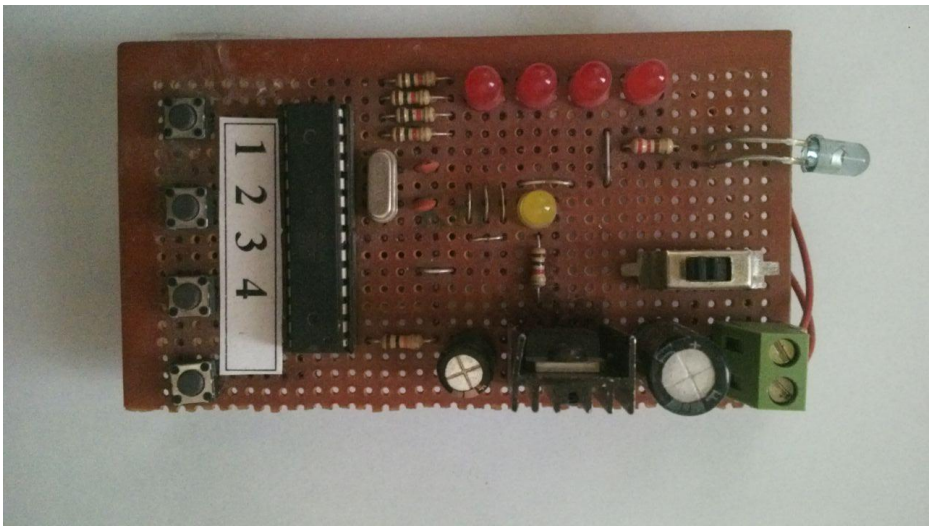

Figure 3-2 User IR Integrated Hardware

Working of the user module is explained in figure 9:

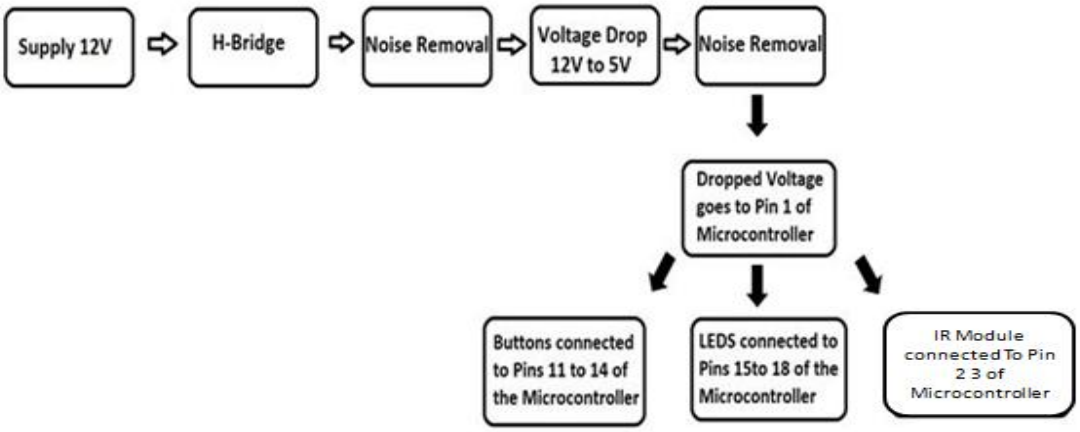

Figure 3-3 Working of the User Module

Power supply is 12V and an H-Bridge is integrated to control polarity of voltage source. IC Regulator 7805 performs voltage down conversion and capacitor is used for removal of noise. Four buttons, fours LEDS and the IR module is connected to microcontroller. Pins of controller used to connect those elements are shown in figure 9.

3.1.2 MODULE-II

This is an important module that deals with designing of the RFID security module and its configuration with the central operating system i.e. the Arduino board. The main reason for including this module is to enable the general level security from outside the room. The user, who intends to enter the room, will have to use RFID based card.

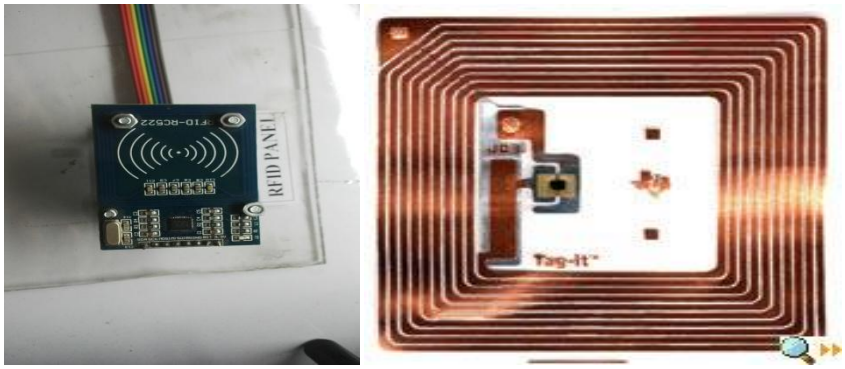

Figure 3-4 RFID Pannel, RFID

RFID connections are made at input pins of Arduino UNO board while LCD is connected at output pins. Module II contains a RFID, LCD, Arduino Uno board and some resistances. Source voltage of this module is 12V which is converted to 5V via IC Regulator 7805 as integrated Arduino Uno board works properly on 5V.

Power supply is 12V and an H-Bridge is integrated to control the polarity of the source. IC Regular 7805 is integrated for the voltage drop and capacitor is used for the removal of noise. LCD and RFID is connected to the microcontroller. The pins of the controller used to connect those elements.

Module II is working as required providing response in real time. Arduino board matches the RFID info with its database given by the user through RFID card and LED displays card accepted .

3.1.3 MODULE-III

In this module designing of the IR sensor module and its configuration with central operating microcontroller is carried out. This setup serves important purpose that is whenever any person enters into the premises of the room provided he passed the first layer with RFID cards, IR sensors, fitted right at entrance detects the IR transmitted rays from the user jacket and it passes them to central processing unit.

Purpose of including this IR sensor module is

- To save power such that the central security system is not always processing IR waves instead it is only activated once the person enters the premises of area provided with security system.

- Moreover as person leaves, IR sensors inform central security module so that count of number of people in the room goes down accordingly.

Configuration diagram of module is shown above in figure 2.Final hardware integrated circuit of module III is shown in figure 15. ATMAGA328P microcontroller is integrated in the ground module for controlling function of this module. Module III contains two IR sensors, one Arduino Uno board. The source voltage of this module is 12V which is converted into 5V by using IC Regulator 7805 as Arduino Uno board works properly on 5V.

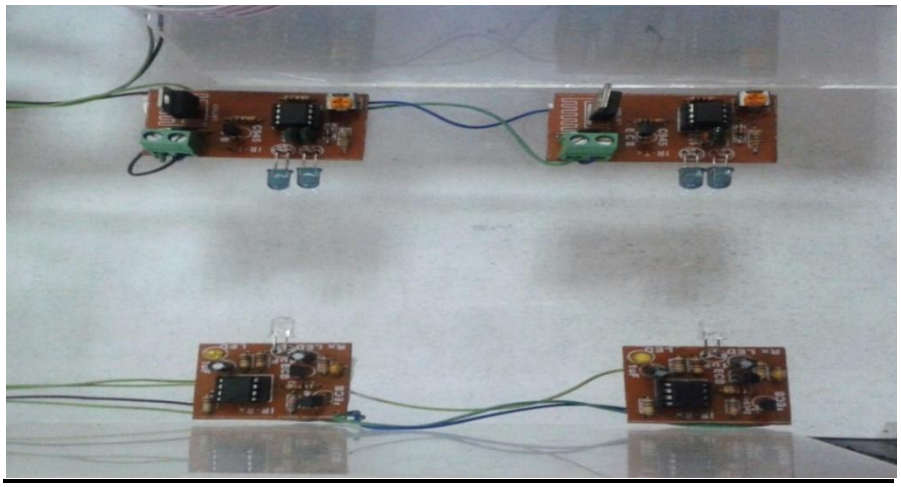

Figure 3-5 IR Sensor Module

Working of moduleis explained in figure 16. Power supply is 12V and an H-Bridge is integrated to control polarity of source. IC Regulator 7805 is integrated for voltage drop and capacitor is used for removal of noise. IR sensors are working on 5V supply and transmitters on 12V supply. IR receivers are connected to the microcontroller and the pins of the controller used to connect with the IR receivers are shown in figure 16.

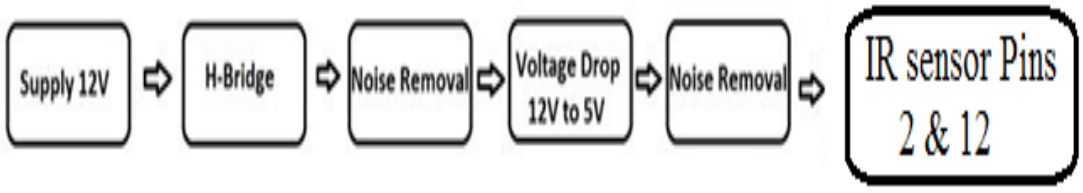

Figure 3-6 IR Receivers Working

Module III is working as required providing response in real time. IR sensors detect entering and leaving of the person. Arduino Uno collects data from IR sensors and checks for either person is entering or leaving the room and display the result on the LCD accordingly.

3.1.4 MODULE-IV

- This module deals with design of the central security module which is composed of the Central microcontroller i.e. Arduino. These board servers to control the whole security system. It is provided with database of all authorized personals.
    - It controls operation of IR sensors fitted at the entrance as well as the RFID security outside the room. If wrong RFID card is used then it will not allow opening the door for the user.
- The IR module: Whenever Arduino UNO board is interrupted by access through RFID card indicating entry of person then IR module generates response message consisting of code assigned to that individual. Central IR receives response and provides it to Arduino UNO board. Arduino UNO board performs comparison of code thus either display valid person on LCD or else generate alarm indicating intrusion.
- Central power system for energizing the whole system
- Person will scan his RFID card. If the card is correct, the door will be opened otherwise it will remain close.
- After entering, the person does not enter the room in 10 seconds; the door will be closed again.
- If the person enters the door then user module will send IR signal which will be received by the IR sensor which will transmit it to central micro processor which will compare the codes,
- The user module will broadcast its own sequence after scanning its RFID card, the ground station receive the sequence of the user module and compare the user sequence with its RFID.

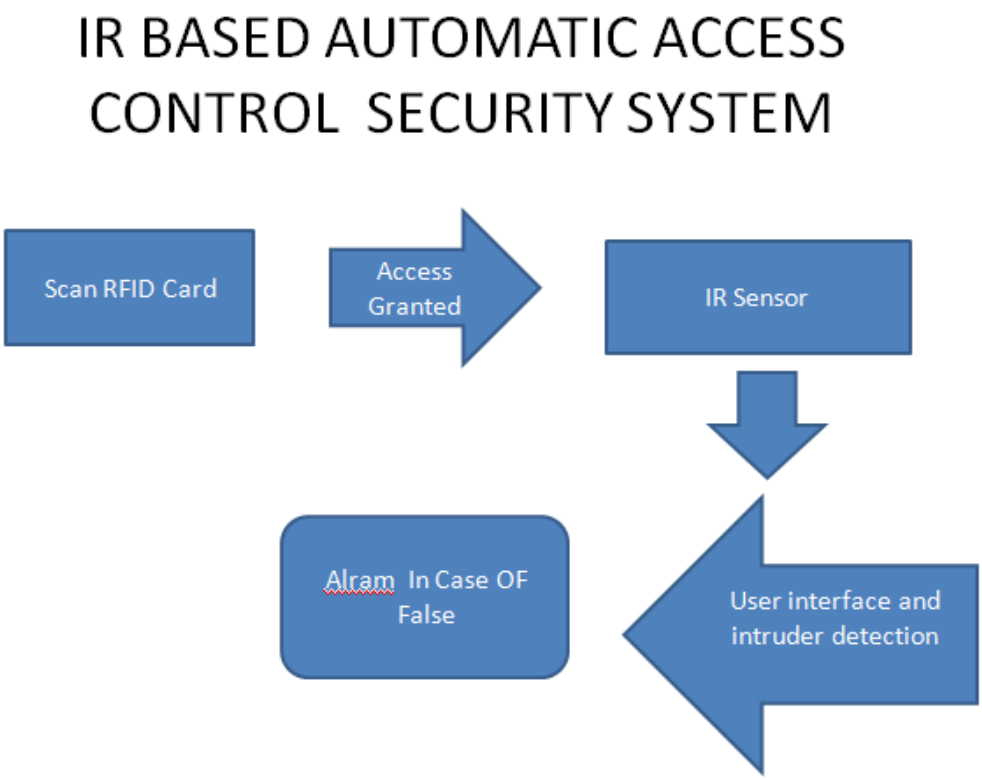

Figure 3-7 Final Working of the Prototype

CHAPTER 4: PROJECT ANALYSIS AND EVALUATION

The IR based security system was successfully integrated and all the motives were successfully achieved. Real time results milestone was successfully accomplished. Logics to make various modules workout together in complete synchronization were successfully formulated. Concept of security via IR modules was successfully achieved by synchronized operation of user module and main security module. Security achieved now allows single person approval of entry at a time, however in future skipping the RFID part model can be made to verify multiple users at a time before reaching in near premises of area provided with this security. Double security check was achieved using RFID module. A significant efficiency in operation of IR module was achieved with the help of IR sensors module making IR to broadcast only when someone has attempted to enter room. Auto opening and closing of door by synchronized operation with RFID was successfully achieved. A CD Rom came in handy in place of door. User module encompassing four users; allotted different codes was successfully worked out.

The security system was enabled to detect intruder in minimum time and generate alarm. Intruder detection is carried out at two positions: before entering at the keypad and after entering via IR, so that security system offers maximum detection probability.

As the authorized person uses a authorized RFID card, is shown 'allowed to enter', and proceeds towards the door which opens automatically. Door operation is controlled by Arduino UNO board. If RFID card used is wrong user is interrupted to try again. If three attempts go wrong an alarm is generated indicating intrusion.

After the authorized person has entered, he passes through IR sensors door closes, IR module is awakened, verification is carried out and count of number of individuals inside increases by one or in case of intrusion alarm is generated. When any person leaves the room he passes through IR sensors which serve to decrease count of number of individuals by one and door opens automatically.

Final form of project with various modules integrated onboard is shown in figure 17:

Figure 9 Project Prototype

CHAPTER 5: RECOMMENTAIONS

The security system was successfully developed using essential components and all the motives were successfully achieved. However many improvements can still be made, which are as under:

- Improvement can be made in process of intruder detection by carrying out intruder detection from outside security concerned organization
- Further decrease time of intrusion detection
- More number of sensors can be added to make security system more efficient
- Instead of IR module use infrared sensors
- Interface of finger print scanner to increase the security level
- Interface with the internet so that it can be handled remotely
- Interface of camera to detect the person's face whether he is an authorized person or not

CHAPTER 6: CONCLUSION

In totality, IR module based security system provides highly accurate and effective access control in real time for security sensitive organizations. All the modules set out for project completion were successfully achieved.

Objective of developing such a security system which is specific to allowing in workers of an organization only and any kind of intrusion is totally intolerable was successfully achieved. All the project modules i.e. user module that incorporates four users where each one of them is allotted a unique code, RFID module for intruder detection from outside room where each authorized individual is allotted a unique password, IR sensor module for the purpose of power savage so that IR module does not broadcast all time, central security module where whole of the verification process takes place including RFID and IR were successfully completed. Final prototype developed by integrating all modules is efficient enough to detect intruder first from outside the room via keypad and then inside via IR and provide results in real time.

Project contributes towards wellbeing of the society assuring physical security of personals and assets. It is more likely to be used in security concerned governmental and military organizations.

Limitation only lies with intruders from within the organization for they can overwrite the central security system.

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APPENDIXES

APPENDIX A

Main Code:

```
#include <SPI.h>
#include <MFRC522.h>
#include <LiquidCrystal.h>
#include <IRremote.h>

int RECV_PIN1 = 2;
int RECV_PIN2 = 3;
int Buzzer = 4;

IRrecv irrecv1(RECV_PIN1);

decode_results results;

#define RST_PIN 9
#define SS_PIN 10

LiquidCrystal lcd(A0, A1, A5, A4, A3, A2);

MFRC522 mfrc522(SS_PIN, RST_PIN);
int RfidNo = 0;
int Motor1 = 5;
int Motor2 = 6;
int Motor3 = 7;
int Motor4 = 8;

int IRUser = 0;
```

```
void setup()
{
  Serial.begin(9600);
  irrecv1.enableIRIn();
  lcd.begin(16, 2);
  SPI.begin();
  mfrc522.PCD_Init();

  digitalWrite(Motor1,HIGH);
  digitalWrite(Motor2,HIGH);
  digitalWrite(Motor3,HIGH);
  digitalWrite(Motor4,HIGH);
  digitalWrite(Buzzer,HIGH);

  pinMode(Motor1, OUTPUT);
  pinMode(Motor2, OUTPUT);
  pinMode(Motor3, OUTPUT);
  pinMode(Motor4, OUTPUT);
  pinMode(Buzzer, OUTPUT);

  welcomeNote();

   lcd.clear();
   lcd.setCursor(0,0);
   lcd.print("Please Scan your");
   lcd.setCursor(0,1);
   lcd.print("RFID Card.");
```

```
  FirstDoorClose();
  SecondDoorClose();

}

void loop() {
  RfidScan();
  if(RfidNo == 1){FirstUser();}
  if(RfidNo == 2){SecondUser();}
  if(RfidNo == 3){ThirdUser();}
  if(RfidNo == 4){FourthUser();}

 // CheckEntry();    // Someone entered or not?
 // CheckLeaving();  // Someone left or not?
}

void IRCheck()
{
  if (irrecv1.decode(&results))
  {
    Serial.println(results.value, HEX);
    if(results.value == 0xA90){IRUser = 1;}
    if(results.value == 0xB90){IRUser = 2;}
    if(results.value == 0xC90){IRUser = 3;}
    if(results.value == 0xD90){IRUser = 4;}
    irrecv1.resume();
  }
  delay(100);
}
```

```
void IrDetect(){
  int x = 0;
    while(1)
    {
       IRCheck();
       if(RfidNo == IRUser){RfidNo = 0; IRUser = 0;SecondDoorOpen(); lcd.clear();lcd.setCursor(0,0); lcd.print("Valid Entry.");delay(3000);FirstDoorClose();SecondDoorClose(); break;}
       x = x + 1;
       delay(100);
       if((x > 25) && (RfidNo != IRUser)){digitalWrite(Buzzer, LOW);Serial.print("$");RfidNo = 0; IRUser = 0; lcd.clear();lcd.setCursor(0,0); lcd.print("Invalid Entry.");delay(1000);digitalWrite(Buzzer, HIGH);FirstDoorClose(); break;}
       if(x > 50){digitalWrite(Buzzer, LOW);Serial.print("$");RfidNo = 0; IRUser = 0; lcd.clear();lcd.setCursor(0,0); lcd.print("Invalid Entry.");delay(1000);digitalWrite(Buzzer, HIGH);FirstDoorClose(); break;}
    }
}
```

APPENDIX B

RFID and receive checking code

```
#include <IRremote.h>


int RECV_PIN = 3;


IRrecv irrecv(RECV_PIN);
decode_results results;


void setup()
{
  Serial.begin(9600);
  irrecv.enableIRIn();
}


void loop() {
  if (irrecv.decode(&results))
  {
    Serial.println(results.value, HEX);
    //if(results.value == 0xA90){Serial.println("OKAY");}
    irrecv.resume();
```

```
  }
  delay(100);
}
void dump_byte_array(byte *buffer, byte bufferSize)
{
//Serial.print("~");
if(buffer[0] == 48){RfidNo = 1;}
if(buffer[0] == 64){RfidNo = 2;}
if(buffer[0] == 80){RfidNo = 3;}
if(buffer[0] == 144){RfidNo = 4;}
//Serial.print("!");
}

void RfidScan()
{
if ( ! mfrc522.PICC_IsNewCardPresent())
return;

if ( ! mfrc522.PICC_ReadCardSerial())
return;
dump_byte_array(mfrc522.uid.uidByte, mfrc522.uid.size);
}
void welcomeNote()
{
   lcd.setCursor(0,0);
   lcd.print("Project Name:");
```

```
  lcd.setCursor(0,1);
  lcd.print("Security System");
  delay(2000);
  lcd.clear();

  lcd.setCursor(0,0);
  lcd.print("Project Advoisor:");
  lcd.setCursor(0,1);
  lcd.print("Lt. Col. Tayyab");
  delay(2000);

}
```

```
void FirstMotorForward()
{
  digitalWrite(Motor1, HIGH);
  digitalWrite(Motor2, LOW);
}

void FirstMotorReverse()
{
  digitalWrite(Motor1, LOW);
  digitalWrite(Motor2, HIGH);
}

void FirstMotorStop()
{
  digitalWrite(Motor1, HIGH);
  digitalWrite(Motor2, HIGH);
}
//////////////////////////////////////
void SecondMotorForward()
{
  digitalWrite(Motor3, HIGH);
  digitalWrite(Motor4, LOW);
}

void SecondMotorReverse()
{
  digitalWrite(Motor3, LOW);
```

```
  digitalWrite(Motor4, HIGH);
}

void SecondMotorStop()
{
  digitalWrite(Motor3, HIGH);
  digitalWrite(Motor4, HIGH);
}
////////////////////////////////////
void FirstDoorOpen()
{
  FirstMotorReverse();
  delay(1000);
  FirstMotorStop();
}

void FirstDoorClose()
{
  FirstMotorForward();
  delay(1000);
  FirstMotorStop();
}
////////////////////////////////////
void SecondDoorOpen()
{
  SecondMotorReverse();
  delay(1000);
```

```
  SecondMotorStop();
}

void SecondDoorClose()
{
  SecondMotorForward();
  delay(1000);
  SecondMotorStop();
}

void FirstUser()
{
    lcd.clear();
    lcd.setCursor(0,0);
    lcd.print("Card Accepted.");
    delay(2000);

    lcd.clear();
    lcd.setCursor(0,0);
    lcd.print("Welcome User 1");
    FirstDoorOpen();

    IrDetect();
}
void FourthUser()
{
    lcd.clear();
```

```
   lcd.setCursor(0,0);
   lcd.print("Card Accepted.");
   delay(2000);

   lcd.clear();
   lcd.setCursor(0,0);
   lcd.print("Welcome User 4");
   FirstDoorOpen();

    IrDetect();
}
```

MATLAB Code for Camera

```
  go = true;



s = serial('COM34');
%set(s, ‘ Terminator’, ‘LF’); % Default terminator is \n
set(s,'BaudRate', 9600);
set(s,'DataBits', 8);
set(s,'StopBits', 1);
fopen(s);
while go
out = fscanf(s)

if out == '$'

      obj=videoinput('winvideo',2);
```

```
        obj.ReturnedColorspace = 'rgb';
        B=getsnapshot(obj);
        imshow(B);
        imwrite(B,'B.jpg');

        delete(obj);
end
end
fclose(s);
```