

Electrical Eye

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2013

A Report is submitted to the Department of Computer Science,
Bahria University, Islamabad.
In partial fulfillment of requirement for the degree of BS(ETM) .

Certificate

We accept the work contained in this report as a confirmation to the required standard for the partial fulfillment of the degree of BS(ETM).

Head of Department

Supervisor

Internal Examiner

External Examiner

Dedication

I want to dedicate this project to my beloved parents who always stood behind me in every aspect of life. I also like to dedicate this project to my friends and teachers who supported me and co-operated with me in any difficulties that i faced.

Acknowledgements

First of all the entire acknowledgement is to the ALLAH almighty who gave me strength and courage to face difficulties and problems that came in my way.

I would like to thanks my supervisor Dr. Shagufta Henna for her support to complete my project.

At the end I would like to thank my faculty members and friends for their help and co-operation.

Abstract

With the increasing rate of robberies in town, there is a need to design an effective and efficient security system. The aim of this project is to design a security system which is easy to use, maintain and which is cheaper than other systems in market. This system is a combination of gsm and internet technologies. If any intruder tries to enter in defined premises, system capture image and forward it to owner for confirmation if owner doesn't know the person, an online report is generated and sent by e-mail to law enforcement agencies.

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Chapter # 1

INTRODUCTION

1.1 Introduction:

Now a day's Home Security is of great concern. People who are protecting themselves by home security systems have lot of good reasons for using these systems. These systems protect their homes, family and property. The best home security system is defined as the system which provides you safety and peace of mind. There is not a complete guarantee that no one steals from you or harms you. People have lot of options in their minds when they are looking for security measures, and sometimes it turn out to be little troubling. The best security system should guarantee you three things; to alert you if there is a burglar, make noise to warn the intruder and keep him away from your premises and alert law enforcement agencies for you.

1.2 Project Overview:

There is vast possibility of external threats that can endanger your property, home and family. The most common threat in Pakistan is theft. There are many solutions regarding this problem but all in vain. These solutions are out of reach for a common man. Providing solution to this problem there should be a system which is in the reach of common man. GSM industry is one of the emerging industry in all over the world with 60 billion users and 116 million in Pakistan in February 2012. Our system provides security based on gsm with owner feedback. This system is based on database for effective communication with law enforcement agencies informing about the location which is being affected. In this project we are trying to implement the cheaper and simple design which it accessible for common man.

1.3 Project Scope:

1.3.1 Objective:

The objective is to control the increasing ratio of robberies in towns, identification at locker rooms, jails and in mental hospitals by combining GSM and database technology. Providing effective and efficient security system, which is not only for security purpose but also helpful for law enforcement agencies to keep record of that kind of events. It also helps them for identifying and chasing the suspect.

1.3.2 Sub Objective:

- To detect the suspect with the help of infrared detectors and capture the image of the suspect.
- Send image of the intruder to owner through MMS and law enforcement agencies through online software.
- Alert the suspect through alarming device.

Chapter # 2

LITERATURE REVIEW

There is not a lot of work done on online mms based security system. But security through MMS has been done to some extent. In this system , when the infrared sensors detects motion, the mobile phone with camera captured the image and send it to owner. There is no feedback of the owner, no precautionary measures for safety and no contact with law enforcement agencies as in our system. There are number of security systems available in market, let's take an overview of them.

A home security system may benefit you financially, mentally and physically by defending you against unpleasant situations. Security alarm systems should need to be effective, efficient, easy to install and maintain properly. Selection of right type of security system and methods used for securing home is entirely up to owner. Finding right type of security system not only provides you safety but peace of mind which is invaluable and an excellent deterrent to intrusion. People may worried about by the increasing ratio of robberies in town, so there is a need of installing a security system.

2.2.1 Types of Security Systems

There are number of security systems available in market. Its up to you which type of system you need depending on the neighborhood you live and the level of security required. There are some systems described below.

This type of security systems are placed in windows and doors where there is a chance for intruder to get inside your home, apartment, and alarm activates by sensing the sound, like breaking of glass.

This type of security systems are very popular now a days, these systems need a numeric or alphabetical code to disarm. If the wrong code is entered alarm activates or the security company which is monitoring the device will take further actions as needed.

These type of security systems are simple. these are not automatic but self controlled. If the owner senses any danger, owner will push the button to activate alarm. These type of systems are very cheap and easy to install.

Video surveillance record video of a specific location where it is installed. These type of systems are very effective, efficient and it sometimes provide strong evidence of the crime scene and leads directly to criminals involve in the crime.

Wireless systems belong to latest technology and provide reliable security. These systems are convenient as they are free with wires. Easy to install and no need of hiding wires. They are useful at places where there are limited options of wiring.

Security Systems provides safety and peace of mind. If you place a security system at your place it will warn the intruders by keeping them away and avoid confrontation with them as they will harm you. Usually intruders don't like alarms, because they scare them by increasing the risk of being caught. It also reduce your loss because intruder doesn't find too much time to take anything as help will on the way.

Security systems provides us peace of mind and safety, but sometimes many problems has been raised, these problems are often related to individual components failure or communication loss, but some problems are also related to design of the system.

Mobile communication is a wireless network and it is widely used for talking, texting or sending data or image files. The current GSM and CDMA technologies offer Mobile Communication.

Mobile communication has developed very rapidly during last decade. Nowadays, mobile handsets are not only making and receiving calls, they are multimedia. Nowadays, technology does not only focus on functions but also on design and outlook. Industry continuously wants to reduce weight and size in which it is quite successful. Mobile phone is the device which is always with people so market expects more attractive applications and the technology progresses day by day. It has also made possible to watch high definition videos online. Applications are increasing day by day and they are unlimited as long as the devices have the capabilities to provide such type of services.

Exchange of text messages using certain protocols through phone line is called short messaging service. It is a way of transferring messages to and from mobiles (also software's).

Short messaging service is basically originated from telegraph system. SMS or Short Message Service is a revolution in the world of communications. It allows two mobile users to communicate through text without any sort of delay.

Our cell phones are continuously sending and receiving information through signals. Each network has control channels which know that which number belongs to which mobile phone. SMS centers are designed for the service. Whenever we message someone it is transferred to the SMSC through the nearest tower which then transfer it to the tower nearest to the cell phone to which message was sent. SMS is basically a service which formats the message in the form so that it can travel from one phone to another through signals. If the recipient is unavailable the message is stored in SMSC and can be sent later.

Multimedia messaging service is a standard way to send messages including

multimedia content in it, to and from mobile phones. It is a successor of sms. Its most popular use is to send images, it is also popular in delivering entertainment content like videos, ringtones and sound clips.

General Packet Radio Service is a technology called packet switching. It is used for different purposes like MMS, internet and other data transferring communication. It has a speed limit of 35 kbps to 115 kbps. Speed vary from system to system.

E-MAIL stands for electronic mail. E-MAIL may consists of protocols of sending or receiving of text messages, images, attachments and files of different formats.

Chapter # 3

REQUIREMENT SPECIFICATIONS

3.1 Existing Systems:

As discussed in previous chapter, there are number of security systems available in market. Like Video surveillance, acoustic sensors, digital alarms, wireless security systems and fire alarms. Some other GSM based security systems like GSM camera mms alarm system, GM01 home security system gsm based, alarm gsm wireless, wireless MMS alarm with camera monitor are also available. But these type of systems are lacking effective security, not easily implemented, and expensive. In our case system is cheaper, providing effective security, easily implemented, easily understandable for common user.

3.2 Proposed systems:

I am going to design a particular system, which is not yet implemented. There are many security systems in market. But they are of complex design, and are not easily implemented. My system is simple as it looks. It is an online MMS based security system, which not only informs the owner but also law enforcement agencies to send help.

3.3 Requirement specification:

- GSM for mobile communication.
- Infrared sensors for detecting the intruder.
- 5v of power is necessary for each component we are using.
- Mobile phone with camera and MMS capabilities.
- Computer with no constrain for processor.
- Serial Port male female.

3.4 Software Specification

- Proteus
- PIC C Compiler
- Screen Capturing Software

Chapter # 4

SYSTEM DESIGN

4.1 Block Diagram:

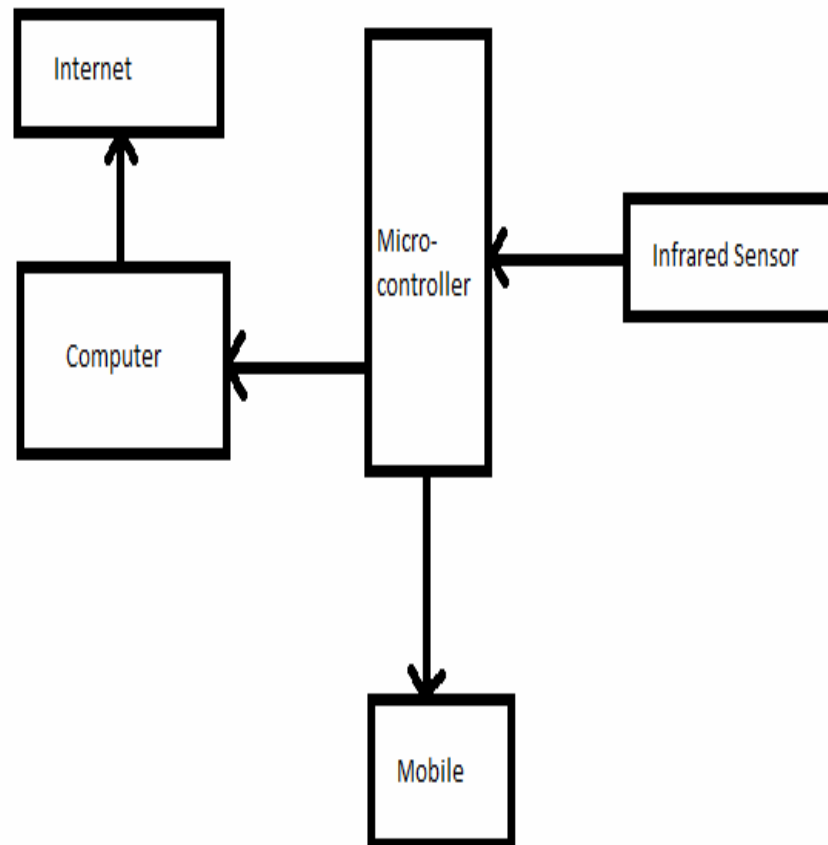


Figure 4.1

4.2 Hardware Components:

4.2.1 PIC 16f877a MICROCONTROLLER:

Because of its low price, high in quality, variety of applications and easy availability this Microcontroller is used widely for experimental and modern applications. For applications i.e. controlling machine applications, measurement of devices and studying purpose it is ideal.



Figure 4.2

4.2.1.1 Specifications:

- 40 pin device
- 5v power supply needed for controlling devices
- Frequency for operating is 20 MHz
- Flash memory of 8k
- Data memory 368 bytes
- Analog to digital converter is built-in
- EEPROM memory 256 bytes
- 35 set of instructions

4.2.1.2 PIN CONFIGURATION:

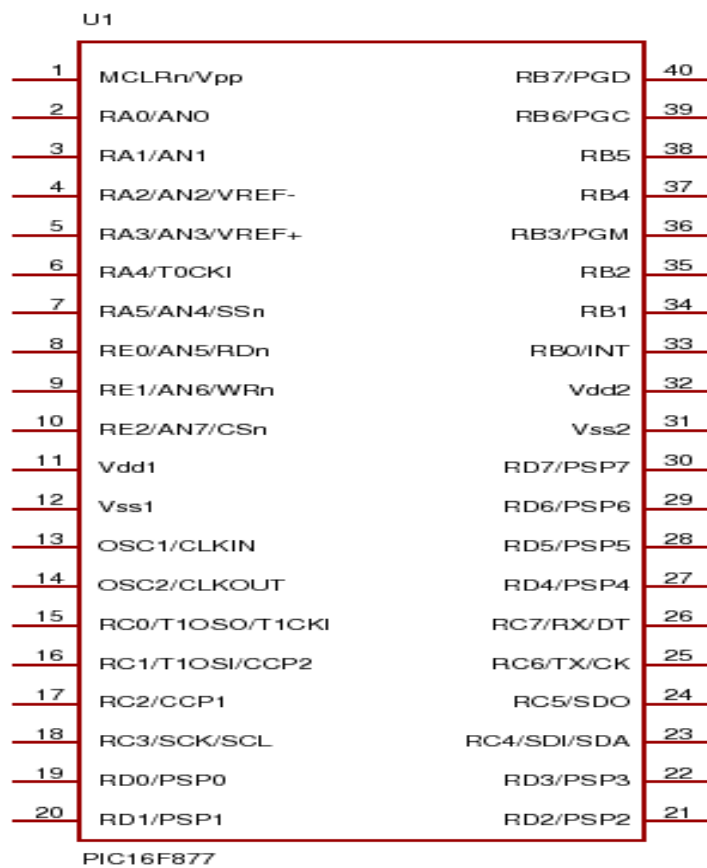


Figure 4.3[1]

4.2.2 Crystal Oscillator:

A crystal oscillator is an electronic device that uses resonance of a vibrating crystal and voltage across the crystal deforms it, deforming it generates a voltage and thus creates a signal with precise frequency. I am using crystal oscillator of 20 MHz



Figure 4.4[2]

4.2.3 Capacitor

A Capacitor is a two terminal component and used to store electrical energy. But in electrical circuits it is used for different purposes. Here we are using capacitors for removal of noise. We are using capacitors of 220 microF, 10 microF, 22 picoF.

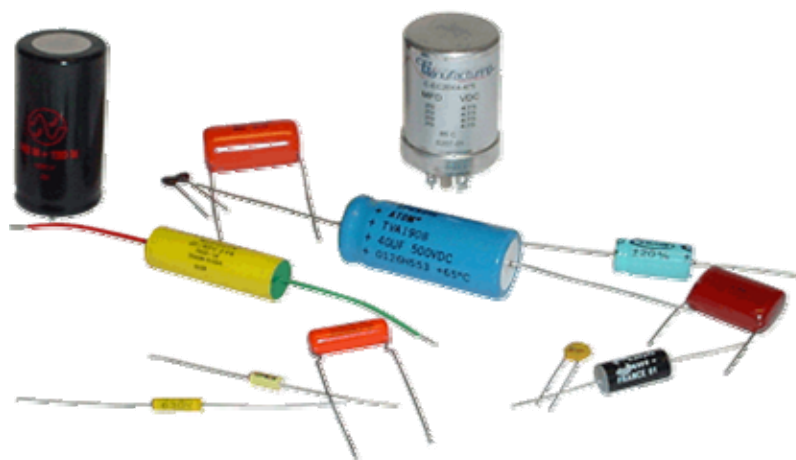


Figure 4.5[3]

4.2.4 LED

LED stands for light emitting diode and in electrical circuits it is used for indication purposes.



Figure 4.6[4]

4.2.5 Diode

Diode has a voltage drop of 0.7V. So where there is a need of voltage drop diode is used



Figure 4.7[5]

4.2.6 Relay

Relay is a electrical switch and operates at certain voltage. When we have to control the circuit through electric current we use relays.

4.2.7 ULN2803

It is comprised from eight Darlington pair drivers, which are used to switch inductive loads. We are using ULN for switching relays.



Figure 4.8 [6]

4.2.8 Infrared Sensors

Infrared radiations is a part of electromagnetic spectrum, which are larger than visible light wavelength and smaller than microwaves. The infrared region is between 0.75 micrometer to 1000 micrometer roughly. We are using Infrared sensors for detection purposes here.

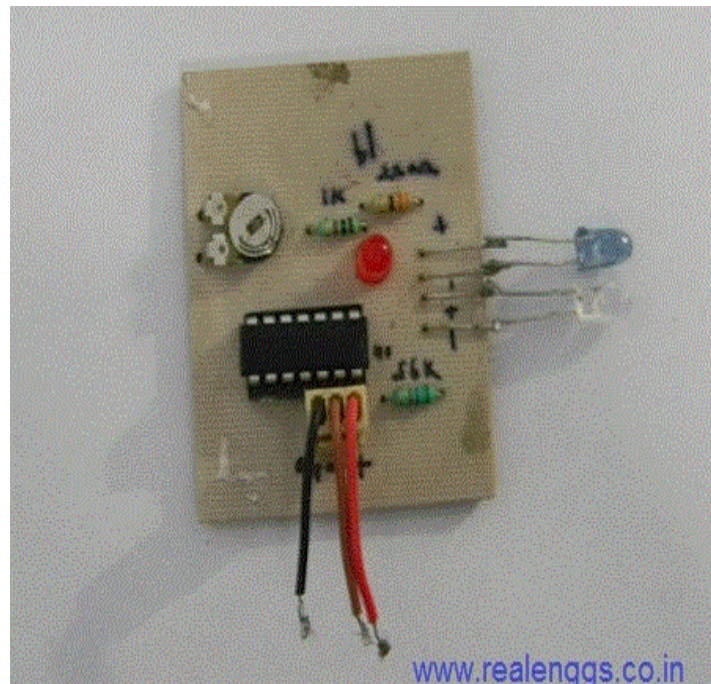


Figure 4.9[7]

4.2.9 Mobile Phone

We need a Mobile Phone with camera, MMS and com port features. So, we are using Sony Ericsson K510i. It is reliable, easy to use and disassemble.

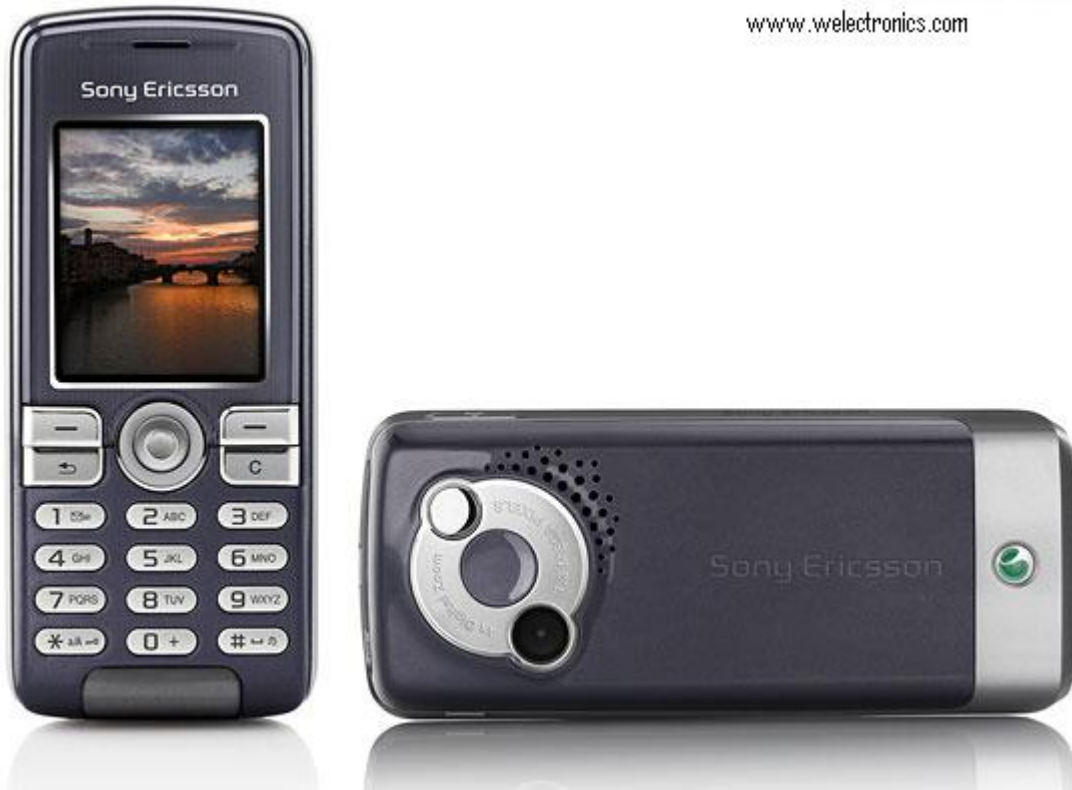


Figure 4.10[8]

4.2.10 Serial communication

With the help of Serial communication GSM mobile phone can accept AT commands. The port of mobile phone is connected to PC COM port.

4.2.11 MAX232

The MAX232 is an integrated circuit, which converts RS-232 signals to TTL compatible digital signals. The MAX232 typically converts the CTS, RTS, RX and TX signals. The voltage level outputs (approx. ± 7.5 V) from a single + 5 V provided by RS-232 are on chip charge pumps and external capacitors. This is useful for applying RS-232 in devices that do not work other than the range of 0 to 5v, there is no need of designing power supply more complicated for driving the RS-232.

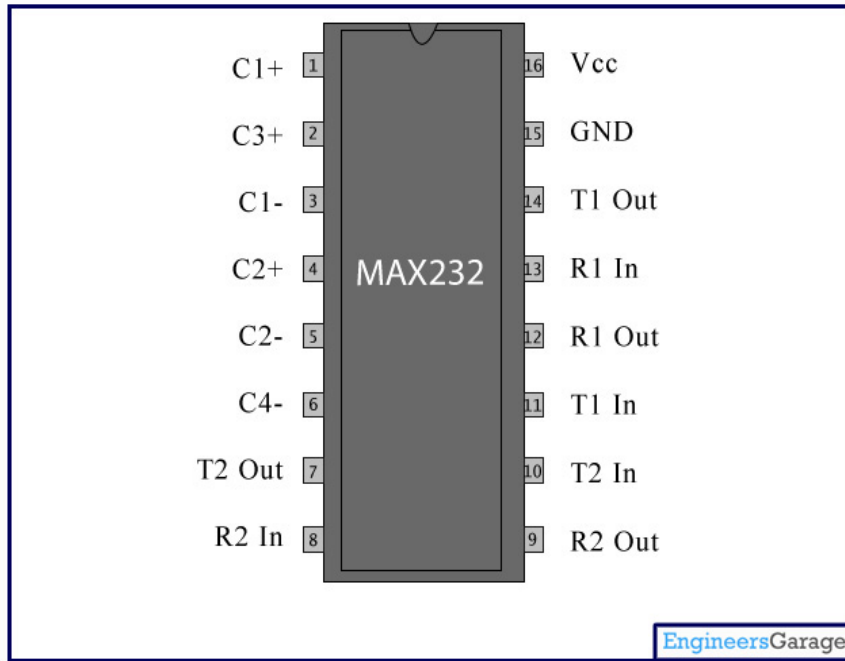


Figure 4.11[9]

4.3 Design and Architecture:

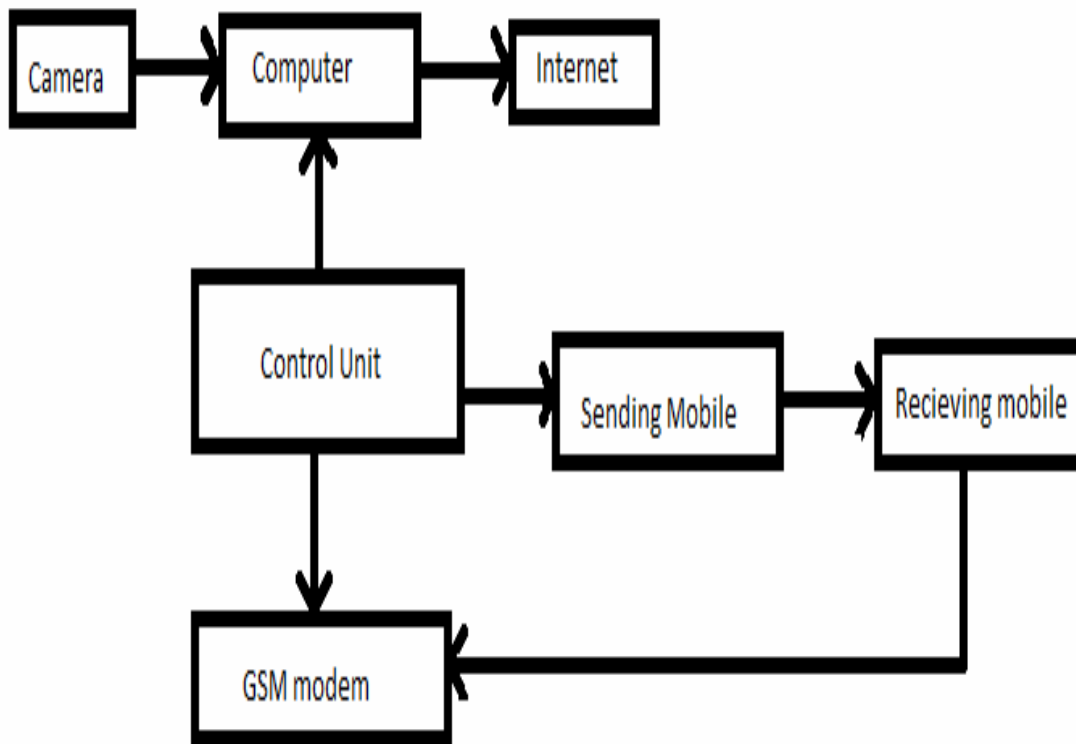


Figure 4.12

Chapter # 5

System Implementation

5.1 Implementation on Software:

5.1.1 System Architecture:

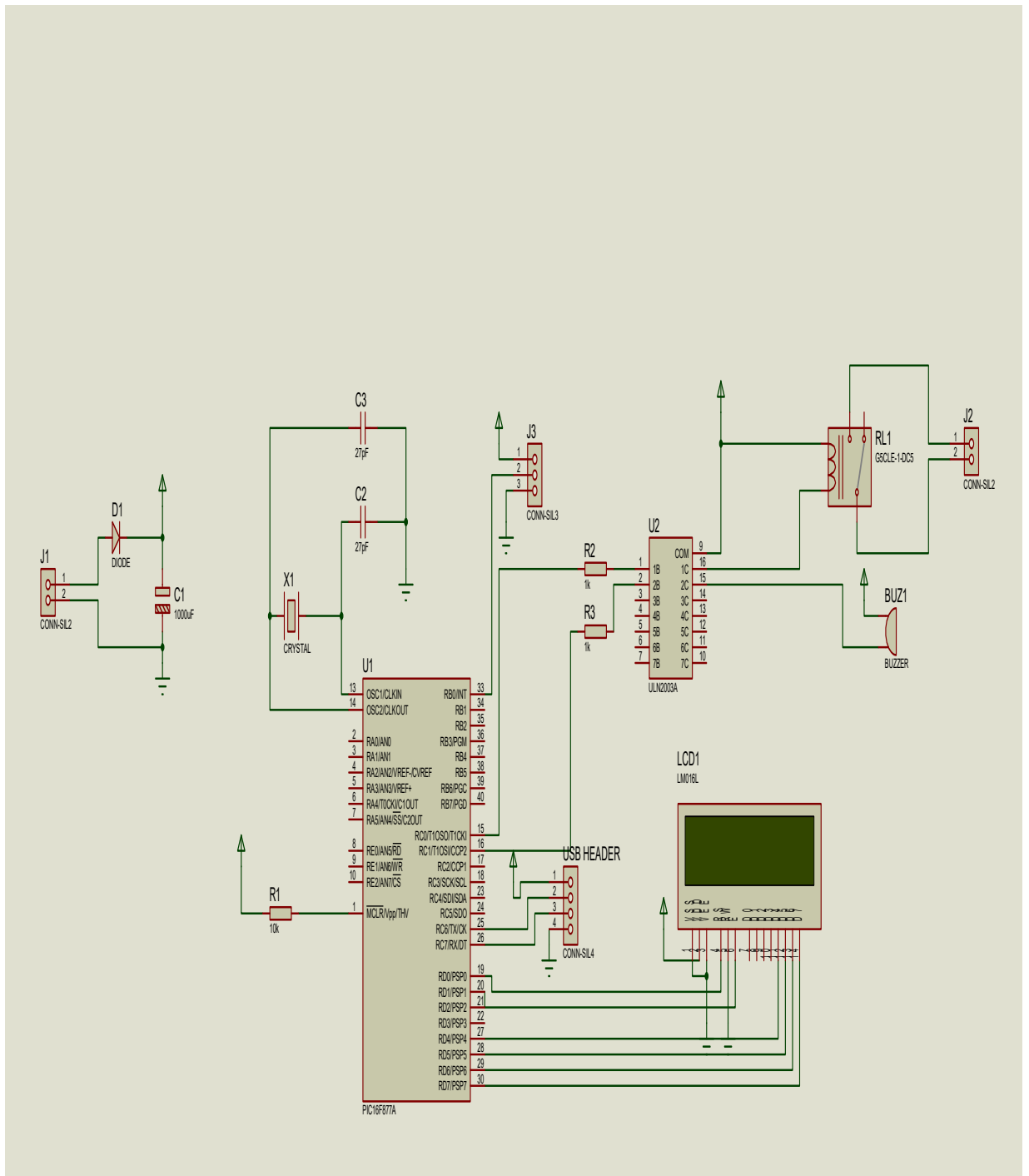


Figure 5.1

System operates at 5V, a capacitor is placed to avoid AC voltage because this system requires DC voltage. MAX232 is for charge pumping from 5V to 12V required for serial port. ULN is for switching relays. Crystal oscillator is providing clock through

generating frequency. LCD is showing system status. Relays are here for switching purpose of mobile phone keypad.

5.2 Working:

This project has a modular design and overall project was developed in different modules after this these modules was interfaced for a complete working.

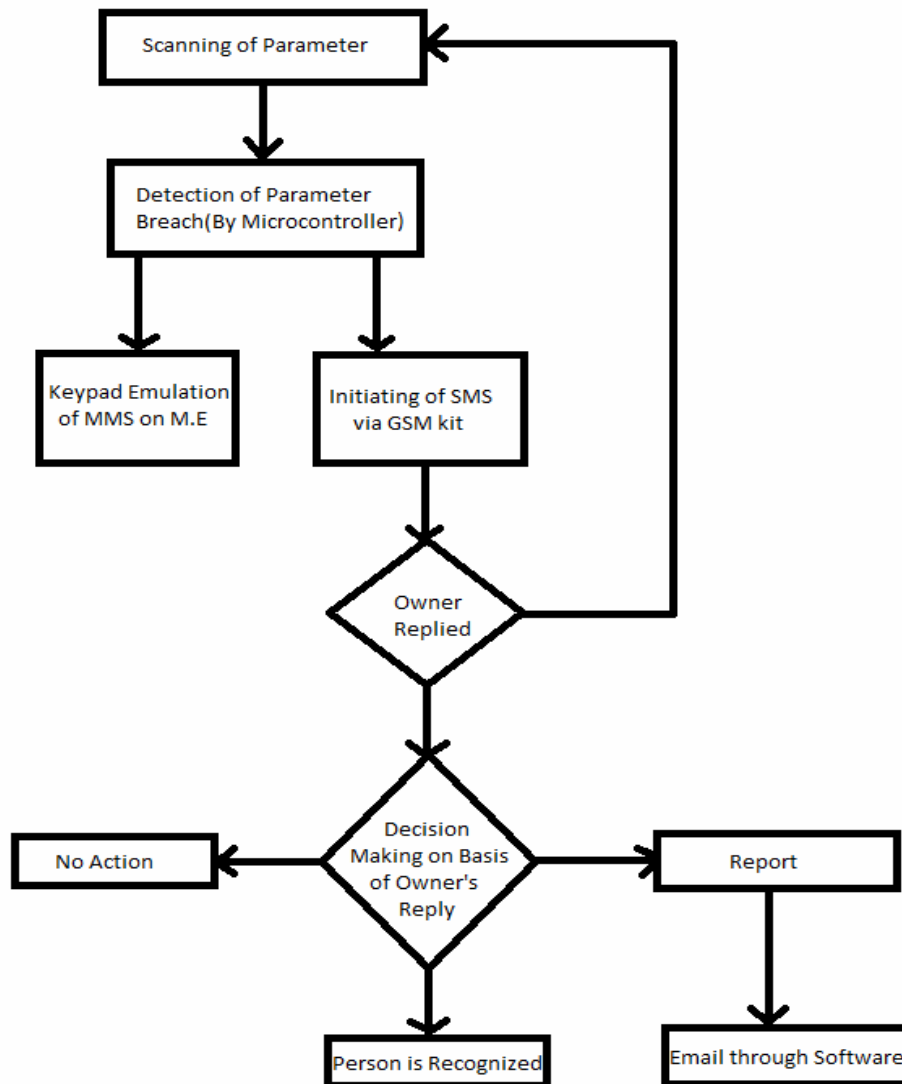


Figure 5.2

5.2.1 Scanning of Parameter

The Parameter is scanned by the infrared sensors operating at the wavelength of $0.75\mu\text{m}$ to $1.4\mu\text{m}$. Principle followed by infrared sensor is the transmission and reception of infrared light. Infrared sensor comprises of two elements, light emitting diode LED and Photo diode PD. Infrared sensors are best choice because they continuously keep eye on the detection area.

5.2.2 Detection of Parameter

As long as there is no movement in the detection area they are in static state. But when there is a parameter in the path of infrared light PD sends an impulse to Microcontroller. When Microcontroller receives an impulse it sends a signal to Relays and GSM modem.

5.2.3 Relays

Microcontroller sends a signal to Relays of certain sequence to perform Keypad emulation(for sending MMS). In relay there is a mechanical switch, which will energizes the coil of the relay and the circuit attached to relay is completed.



Figure 5.3 [10]

5.2.4 GSM Modem

Microcontroller also sends signal to GSM modem to send text message to a number stored in microcontroller. GSM Modem is a modem which send and receives SMS just like mobile phones. IT operate over a subscription of a network by using SIM card. When the GSM modem attaches to a computer it allows the computer to communicate with other mbile network. GSM also provides internet connectivity.



Figure 5.4[11]

5.2.5 Keypad Emulation of MMS on M.E

Microcontroller sends AT commands to mobile phone with the help of relays to press camera key one time, and select key six times to send MMS to owner.

5.2.5.1 SMS message format used by SMS AT commands

When the mobile phone is operating in different modes, input/output format of AT commands are different. In SMS headers, body of SMS and text mode are I/O as separate parameters. In sms PDU mode TPDU's are I/O in hexadecimal format.

Here is an example. To send an SMS message “hello world” to mobile phone number 123456789, following command is used.

```
AT+CMGS="123456789"<CR>hello world<Ctrl+z>.
```

5.2.6 Owner Reply

After receiving the MMS owner reply to the SIM card in GSM modem with different commands for different actions.

5.2.7 Report

Owner reply with \$R* for activating the system to capture another better image through camera attached to Computer and send this image to law enforcement agencies through email sending software installed in the system.

5.2.8 Person is Recognized

If the person is recognized, owner sends command \$O* which means open the door and take no action.

5.2.9 No Action

If owner give no reply to the system, it will take no action and system is ready for Scanning of parameter again.

Chapter # 6

System Testing and Evaluation

6.1 System Started:

When the system is activated there will be an infrared barrier which will act as the security wall between the person and our home. When this barrier is breached then the camera will activated and the picture will be captured of the person. This picture will be send to the owner for further processing. Our system will wait for reply of the owner if owner knows the person he /she reply with yes and the door will be opened. If owner don't know the person he/she reply with no, the system will send indication to computer to take a picture again and generate a report and send it to law enforcement agencies.



Figure 6.1

6.2 Door open:

When the owner identifies the person, he/she send a command for door opening. And the door will opened.

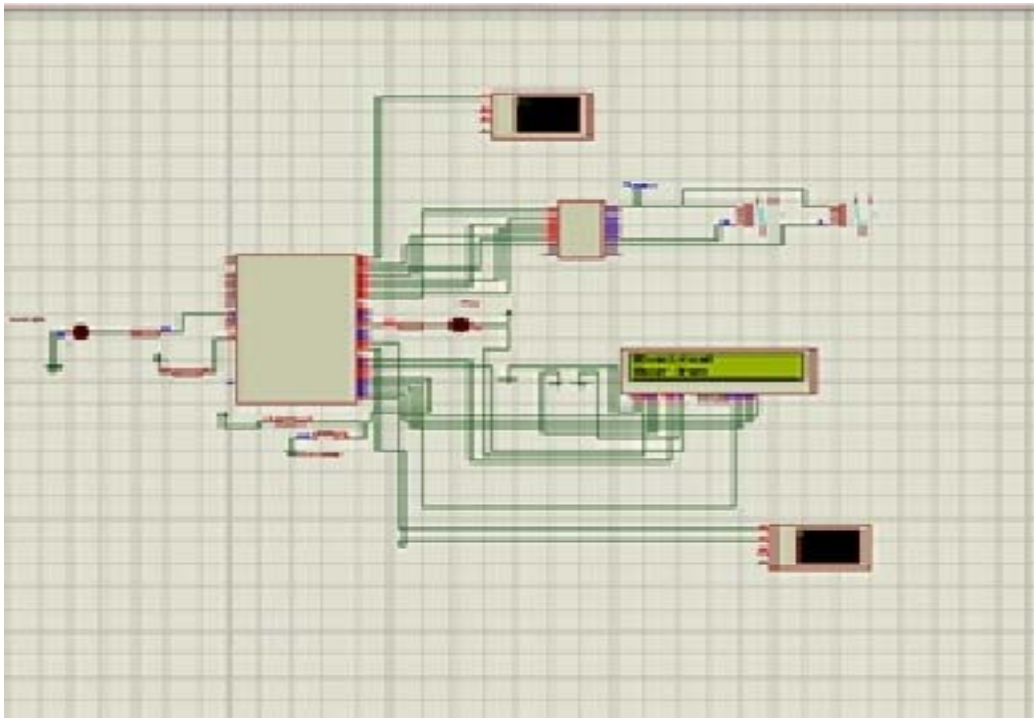


Figure 6.2

6.3 Door closed:

When the owner replied with the command of reporting, system captures another image, generate a report and send this image to law enforcement through e-mail and the door will remain closed.

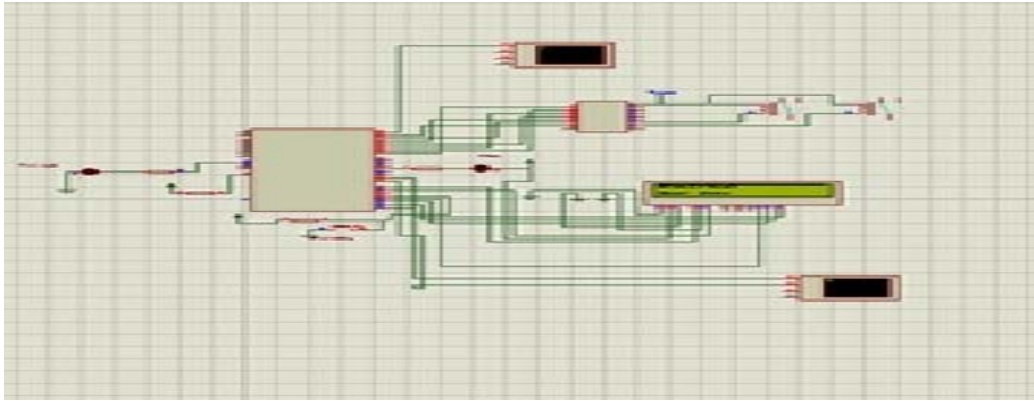


Figure 6.3

6.4 Image Capturing Software

When the microcontroller sends indication through serial port to computer, it will perform print screen and send an e-mail containing that picture.

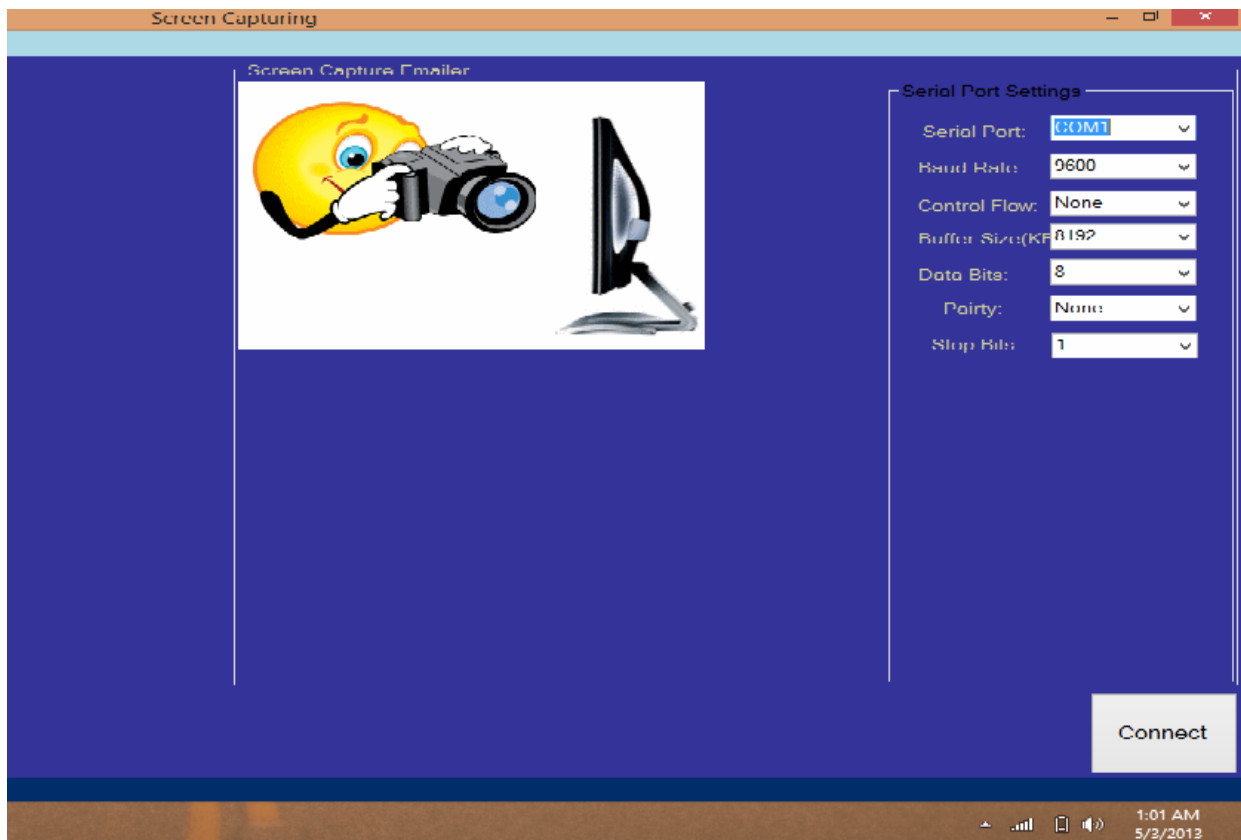


Figure 6.4

6.5 MMS Received

Here is the sample of the MMS I received at the time of testing system, which is installed outside the door of my home.



Figure 6.5

Chapter # 7

CONCLUSION

Conclusion of the project leads to the fact that this security system is of great use. With the increasing ratio of robberies in towns and bad law and order situation in the country. Everyone is worried about his/her home, children and other expensive things.

By observing this problem I came out with the solution of online mms base security system. Which is operated by owner instead of any security company and give owner a peace of mind.

For making the system reliable, I make mobile phone operated system. Because now a days every single person is using mobile phone every time.

This system keep continuous eye on the place of installation. Thus reducing the chances of intrusion to minimum level.

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Date 2.5.2013

APPENDICES

4. 1Pinout Description Table:

Pin Name	DIP Pin#	PLCC Pin#	QFP Pin#	I/O/P Type	Buffer Type	Description
OSC1/CLKIN	13	14	30	I	ST/CMOS ⁽⁴⁾	Oscillator crystal input/external clock source input.
OSC2/CLKOUT	14	15	31	O	—	Oscillator crystal output. Connects to crystal or resonator in crystal oscillator mode. In RC mode, OSC2 pin outputs CLKOUT which has 1/4 the frequency of OSC1, and denotes the instruction cycle rate.
MCLR/VPP/THV	1	2	18	I/P	ST	Master clear (reset) input or programming voltage input or high voltage test mode control. This pin is an active low reset to the device.
RA0/AN0	2	3	19	I/O	TTL	<p>PORTA is a bi-directional I/O port.</p> <p>RA0 can also be analog input0</p> <p>RA1 can also be analog input1</p> <p>RA2 can also be analog input2 or negative analog reference voltage</p> <p>RA3 can also be analog input3 or positive analog reference voltage</p> <p>RA4 can also be the clock input to the Timer0 timer/counter. Output is open drain type.</p> <p>RA5 can also be analog input4 or the slave select for the synchronous serial port.</p>
RA1/AN1	3	4	20	I/O	TTL	
RA2/AN2/VREF-	4	5	21	I/O	TTL	
RA3/AN3/VREF+	5	6	22	I/O	TTL	
RA4/T0CKI	6	7	23	I/O	ST	
RA5/SS/AN4	7	8	24	I/O	TTL	
RB0/INT	33	36	8	I/O	TTL/ST ⁽¹⁾	<p>PORTB is a bi-directional I/O port. PORTB can be software programmed for internal weak pull-up on all inputs.</p> <p>RB0 can also be the external interrupt pin.</p> <p>RB3 can also be the low voltage programming input</p> <p>Interrupt on change pin.</p> <p>Interrupt on change pin.</p> <p>Interrupt on change pin or In-Circuit Debugger pin. Serial programming clock.</p> <p>Interrupt on change pin or In-Circuit Debugger pin. Serial programming data.</p>
RB1	34	37	9	I/O	TTL	
RB2	35	38	10	I/O	TTL	
RB3/PGM	36	39	11	I/O	TTL	
RB4	37	41	14	I/O	TTL	
RB5	38	42	15	I/O	TTL	
RB6/PGC	39	43	16	I/O	TTL/ST ⁽²⁾	
RB7/PGD	40	44	17	I/O	TTL/ST ⁽²⁾	

Continued:

Pin Name	DIP Pin#	PLCC Pin#	QFP Pin#	I/O/P Type	Buffer Type	Description
RC0/T1OSO/T1CKI	15	16	32	I/O	ST	<p>PORTC is a bi-directional I/O port.</p> <p>RC0 can also be the Timer1 oscillator output or a Timer1 clock input.</p> <p>RC1 can also be the Timer1 oscillator input or Capture2 input/Compare2 output/PWM2 output.</p> <p>RC2 can also be the Capture1 input/Compare1 output/PWM1 output.</p> <p>RC3 can also be the synchronous serial clock input/output for both SPI and I²C modes.</p> <p>RC4 can also be the SPI Data In (SPI mode) or data I/O (I²C mode).</p> <p>RC5 can also be the SPI Data Out (SPI mode).</p> <p>RC6 can also be the USART Asynchronous Transmit or Synchronous Clock.</p> <p>RC7 can also be the USART Asynchronous Receive or Synchronous Data.</p>
RC1/T1OSI/CCP2	16	18	35	I/O	ST	
RC2/CCP1	17	19	36	I/O	ST	
RC3/SCK/SCL	18	20	37	I/O	ST	
RC4/SDI/SDA	23	25	42	I/O	ST	
RC5/SDO	24	26	43	I/O	ST	
RC6/TX/CK	25	27	44	I/O	ST	
RC7/RX/DT	26	29	1	I/O	ST	
RD0/PSP0	19	21	38	I/O	ST/TTL ⁽³⁾	<p>PORTD is a bi-directional I/O port or parallel slave port when interfacing to a microprocessor bus.</p>
RD1/PSP1	20	22	39	I/O	ST/TTL ⁽³⁾	
RD2/PSP2	21	23	40	I/O	ST/TTL ⁽³⁾	
RD3/PSP3	22	24	41	I/O	ST/TTL ⁽³⁾	
RD4/PSP4	27	30	2	I/O	ST/TTL ⁽³⁾	
RD5/PSP5	28	31	3	I/O	ST/TTL ⁽³⁾	
RD6/PSP6	29	32	4	I/O	ST/TTL ⁽³⁾	
RD7/PSP7	30	33	5	I/O	ST/TTL ⁽³⁾	
RE0/RD/AN5	8	9	25	I/O	ST/TTL ⁽³⁾	<p>PORTE is a bi-directional I/O port.</p> <p>RE0 can also be read control for the parallel slave port, or analog input5.</p> <p>RE1 can also be write control for the parallel slave port, or analog input6.</p> <p>RE2 can also be select control for the parallel slave port, or analog input7.</p>
RE1/WR/AN6	9	10	26	I/O	ST/TTL ⁽³⁾	
RE2/CS/AN7	10	11	27	I/O	ST/TTL ⁽³⁾	
V _{SS}	12,31	13,34	6,29	P	—	Ground reference for logic and I/O pins.
V _{DD}	11,32	12,35	7,28	P	—	Positive supply for logic and I/O pins.

4.2.10 Data Sheet for ULN 2803APG

Electrical Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Cir-Cuit	Test Condition	Min	Typ.	Max	Unit
Output leakage current ULN2804A	I _{CEX}	1	V _{CE} = 50 V, Ta = 25°C	—	—	50	μA
			V _{CE} = 50 V, Ta = 85°C	—	—	100	
			V _{CE} = 50 V, V _{IN} = 1 V	—	—	500	
Collector-emitter saturation voltage	V _{CE (sat)}	2	I _{OUT} = 350 mA, I _{IN} = 500 μA	—	1.3	1.6	V
			I _{OUT} = 200 mA, I _{IN} = 350 μA	—	1.1	1.3	
			I _{OUT} = 100 mA, I _{IN} = 250 μA	—	0.9	1.1	
Input current ULN2803A ULN2804A	I _{IN (ON)}	2	V _{IN} = 3.85 V	—	0.93	1.35	mA
			V _{IN} = 5 V	—	0.35	0.5	
			V _{IN} = 12 V	—	1.0	1.45	
	I _{IN (OFF)}	4	I _{OUT} = 500 μA, Ta = 85°C	50	65	—	μA
Input voltage (Output on) ULN2803A ULN2804A	V _{IN (ON)}	5	V _{CE} = 2 V, I _{OUT} = 200 mA	—	—	2.4	V
			V _{CE} = 2 V, I _{OUT} = 250 mA	—	—	2.7	
			V _{CE} = 2 V, I _{OUT} = 300 mA	—	—	3.0	
			V _{CE} = 2 V, I _{OUT} = 125 mA	—	—	5.0	
			V _{CE} = 2 V, I _{OUT} = 200 mA	—	—	6.0	
			V _{CE} = 2 V, I _{OUT} = 275 mA	—	—	7.0	
			V _{CE} = 2 V, I _{OUT} = 350 mA	—	—	8.0	
DC current transfer ratio	h _{FE}	2	V _{CE} = 2 V, I _{OUT} = 350 mA	1000	—	—	
Clamp diode reverse current	I _R	6	Ta = 25°C (Note)	—	—	50	μA
			Ta = 85°C (Note)	—	—	100	
Clamp diode forward voltage	V _F	7	I _F = 350 mA	—	—	2.0	V
Input capacitance	C _{IN}	—		—	15	—	pF
Turn-on delay	t _{ON}	8	R _L = 125 Ω, V _{OUT} = 50 V	—	0.1	—	μs
Turn-off delay	t _{OFF}		R _L = 125 Ω, V _{OUT} = 50 V	—	0.2	—	

Note: V_R = V_R (max)

User Manual

How to Install the System

The system consist of a camera which should be placed properly outside the door the system must be provided with constant power. The Mobile should be connected to the system and the circuit board should also be connected to the computer through com port.

Precautions

- The Infrared barrier is of 5 feet and the space between the infrared sender and receiver must be kept clear otherwise it will consider as a breach and will send indication.
- System is bit delicate so it should be handle with care and input power should be in limits.