TITLE **:OBJECT DETECTION USING ULTRASONIC SENSOR**

ABSTRACT

The ultrasonic motion detector is a project that uses an ultrasonic sensor as its base to detect movement or moving object in small places. “It is design to be a low-cost ultrasonic motion detector. A motion detector is a kind of security system that uses sensing ability in the form of sensors to detect movement and this usually triggers an alarm, or sometimes activate another circuit. However, motion detectors are normally used to protect indoor areas, in this, conditions can then be controlled more closely. Detectors for use in homes for security purpose usually detect movement in a closed space area of little feet-by-feet. Detectors for large range warehouses can protect areas with dimensions as large as 24mx37m (80ft by120ft).

The project uses ultrasonic motion sensor to detect the object from a range of distance. It ensures high reliability and excellent long-term stability. This work is implemented using a programmed Arduino board for providing The Required motion range at various times the project is achieved by using c programming language

LED light automatically glow when it detects an object at a particular range of distance. LED light does not glow when the range of distance of the” object is far or if there is no object

Chapter 1

Introduction

The ultrasonic motion detector is a project that uses an ultrasonic sensor as its base to detect movement or moving object in small places. “It is design to be a low-cost ultrasonic motion detector. A motion detector is a kind of security system that uses sensing ability in the form of sensors to detect movement and this usually triggers an alarm, or sometimes activate another circuit. However, motion detectors are normally used to protect indoor areas, in this, conditions can then be controlled more closely. Detectors for use in homes for security purpose usually detect movement in a closed space area of little feet-by-feet. Detectors for large range warehouses can protect areas with dimensions as large as 24mx37m (80ft by120ft).

The motion detector is normally useful in places like museums where important assets are located. As such, motion detectors can detect break-in at vulnerable points. Such points include walls, doors windows and other openings. Special motion detectors can protect the inside of exhibit cases where items such as diamonds arc placed. Others can be focused on a narrow area of coverage, somewhat like a curtain, that projected in front of a painting to detect even the slightest touch.

Human, animal or anything can produce sound. This sound is creating by the physical movement whether the movement is fast or slow depends on the medium that create the sound. Eventually these movements can be detected by using an ultrasound sensor. Ultrasonic sound waves are sound waves that are above the range of human hearing and, thus, have a frequency above about 20,000 hertz. Any frequency above 20,000 hertz may be considered ultrasonic.

An ultrasonic sensor typically comprises at least one ultrasonic transducer which transforms electrical energy into sound and, in reverse, sound into electrical energy, a housing enclosing the ultrasonic transducer or transducers, an electrical connection and, optionally, an electronic circuit for signal processing also enclosed in the housing.

Home automation refers to the use of computer and information technology to control home appliances and features (such as windows or lighting). Systems can range from simple remote control of lighting through to complex computer/micro-controller based networks with varying degrees of intelligence and automation.

Home automation is adopted for reasons of ease, security and energy efficiency". This project argues that home automation can make a difference regarding better energy management and usage of

renewable energy sources. People are more sensible to the need of using energy and other resources more rationally but do very little to that end on their daily lives at home. The implementation and design of this project done by using three methods, motion sensor

technology, RF remote control and Wi-Fi Router hand held to control of the selective home devices. The software consists of assembly language for programming microcontroller and visual basic language that use to communicate between transmitter and receiver model. The system is low cost and flexible with the “increasing variety of devices to be controlled.

1.1 Purpose of Study

Putting lights on a motion sensor is a very simple and effective – not to mention inexpensive way to secure your property. You can place flood lights, garden lights, your front entrance light, and other outdoor lighting on motion sensors. Many indoor/outdoor motion sensor lights can be easily installed on your own (DIY).

Motion-sensing lights provide several benefits:

- **Reduce Crime**: Statistics show that well-lit communities have lower crime rates than neighborhoods with poor lighting.
- **No Place to Hide**: When the exterior of your home is well lit, would-be burglars have no place to lurk or hide.
- **Warning Signs**: If your flood lights suddenly go on, it’ll give you the chance to investigate or call the police.

- This low cost system with minimum requirements takes care of both home security as well as home automation.

• This home security system does not use any smartphone application or any type of user interface instead uses digits from the keypad on the phone, the system is platform independent and hence can be accessed from a wide range of phones with different operating systems.

• To operate home security system the user need not have data connection enabled in his phone. The system runs fine with the launchpad connected to wifi

at home/office.

• The optional smart phone application takes care of the fact that the user may also wish to control his home appliances without sensors being triggered.

• To operate home security system the user need not have data connection enabled in his phone. The system runs ne with the launchpad connected to wi at home.

1.2 Problem Statement

- Cannot work in a vacuum

Because ultrasonic sensors operate using sound, they are completely nonfunctional in a vacuum as there is no air for the sound to travel through.

- Not designed for underwater use

Our sensors have not been properly tested in this environment, so underwater use voids our warranty. This being said, we do supply documentation for customers who would still like to test our sensors underwater. If you are interested in underwater applications with ultrasonic, check out our articles on Water Depth Sensing with Ultrasonic and Underwater Ranging for more information.

- Sensing accuracy affected by soft materials

Objects covered in a very soft fabric absorb more sound waves making it hard for the sensor to see the target.

- Have a limited detection range

At the moment, our longest range sensors have a maximum range of 10 meters. While this is a disadvantage in certain applications, our sensors have great mid-range capabilities and are still suited for many applications.

During the information stage main problem statements for current systems are as below:

a) A common property of successful inventions is the abilities to make life easier. For example Washing Machine, making washing less burdensome.

b) Tragedies happen such as thefts especially late at night when the users are not at home. This is because home does not provide any secure system.

1.1 Motivation

Ultrasonic sensor works on a principle similar to radar or sonar which evaluate

attributes of a target by interrupting the echoes from radio or sound waves respectively. Ultrasonic

sensors generate high frequency sound waves and evaluate the echo which is received back by the sensor. Sensors calculate the time interval between sending the signal and receiving the echo to determine the distance to an object.

The motivation is in recent developments a function smart motion detection can be done without human intervention. And the system would be an alternative for expensive security systems being used in the present day. The raspberry pi has proved to be ideal as the core of such a system. This system has to enhance the capabilities of technologies, integrating them, to introduce the 'Motion Detection' system and contribute to the current security system. Besides, the system fully automatic by increase the efficiency of the system drastically.

1.4 Methodology

"ON state:" When an object passes within the range of 10cm the ultrasonic sensor gets detected and the LED glows.
OFF state: When an object passes after the range of 10cm the ultrasonic sensor doesn't gets detected and LED does not glow.

The goal of this paper is to make a smart surveillance system which can be monitored by user remotely through android application. As it is connected with the system with IOT. The overall achievement from this system is a raspberry pi was used as the core of the system it receives inputs whenever the motion is detected through PIR sensor. The image is captured through camera and stored in the raspberry pi module, which producing the output to monitor a security system from a location away from the surveillance area through android device. In addition, used Raspbian wheezy operating system as our operating system with the suitable software python programming language.

The block of smart motion system shown in Fig. 1, in this system when the PIR sensor senses motion it gives a signal to the raspberry pi to take the image through USB camera and then send the image to email sever via the internet, so that the user can see the image that was taken. The system materials consist two parts: The hardware material part, and the software materials part.

In order to complete this project smoothly, a lot of research work on flood monitoring systems was required such as going through reference books, journals, internet resources and

components datasheets so that will assist in the success of the project. The system consists of

hardware and software parts. Hardware part consists of some components such as:

1) The Ultrasonic ranging module HC - SR04.

2) Arduino(Microcontroller)

3)The Liquid Crystal Display (LCD).

4) The Light Emitting Diodes (LEDs) and the buzzer.

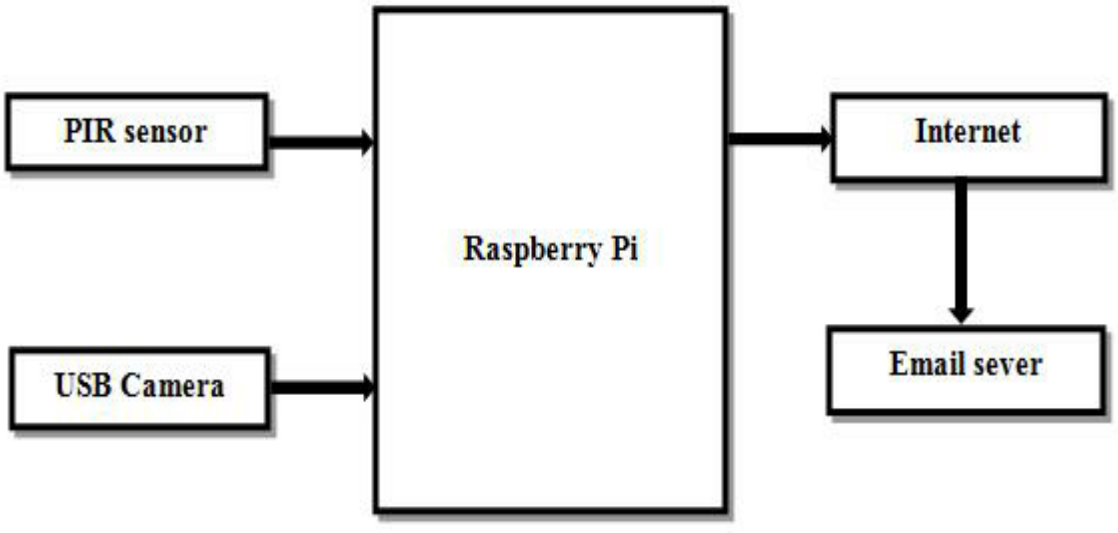
Arduino is the “brain” of the whole system It receives the input signals from the sensor and displays the water level on the Liquid Crystal Display (LCD), controls Light Emitting Diodes (LEDs) and the buzzer. All these processes will be done according to the program.

Software part consists of the programming needed for the arduino to perform its task. Algorithms are written to set how the arduino works and reacts according to the different scenarios such as reading the input signal from the sensor and flashing of LEDs and activating

of the buzzer when alarm happens. For the software application, either C-programming or Assembly Language can be selected to be the main software used for the micro-controller. In

order to achieve these goals, a lot of hard work is required to program the software. In the process of completing the project, tasks like circuit designing, finding components, constructing prototype, checking the simulation and testing the functionality” of the prototype

will be performed, followed by circuit fault diagnoses and troubleshooting.”



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Chapter 2

System requirements and Language used

2.1 Hardware and Software configuration

Hardware System Configuration:

Arduino UNO

LDR sensor

Resistor 10kOhm

Led bulb

Software System Configuration:

Operating System - windows

Programming Language - C

Software - Arduino

2.2 About the language

C is an imperative procedural language." It was designed to be compiled using a relatively straightforward compiler, to provide level access to memory, to provide language constructs that map efficiently to machine instructions, and to require minimal run-time support. Despite its low-level capabilities, the language was designed to encourage cross-platform programming. A standards-compliant C program that is written with portability in mind can be compiled for a very wide variety of computer platforms and operating systems with few changes to its source code. The language has become available on a very wide range of platforms, from embedded microcontrollers to supercomputers.

To make a good understandable program we need to follow:

- Reliability: This enables a code to handle its own generated errors while running.
- Solidity: This provides a frame to anticipate problems on the user side(wrong inputs).
- Ergonomics: This helps to intuitively be able to use it with ease.
- Portability: This is the designing of a program for a wide range of platforms.

- Maintainability: This is the ease of modifying it even if you didn't code it yourself.

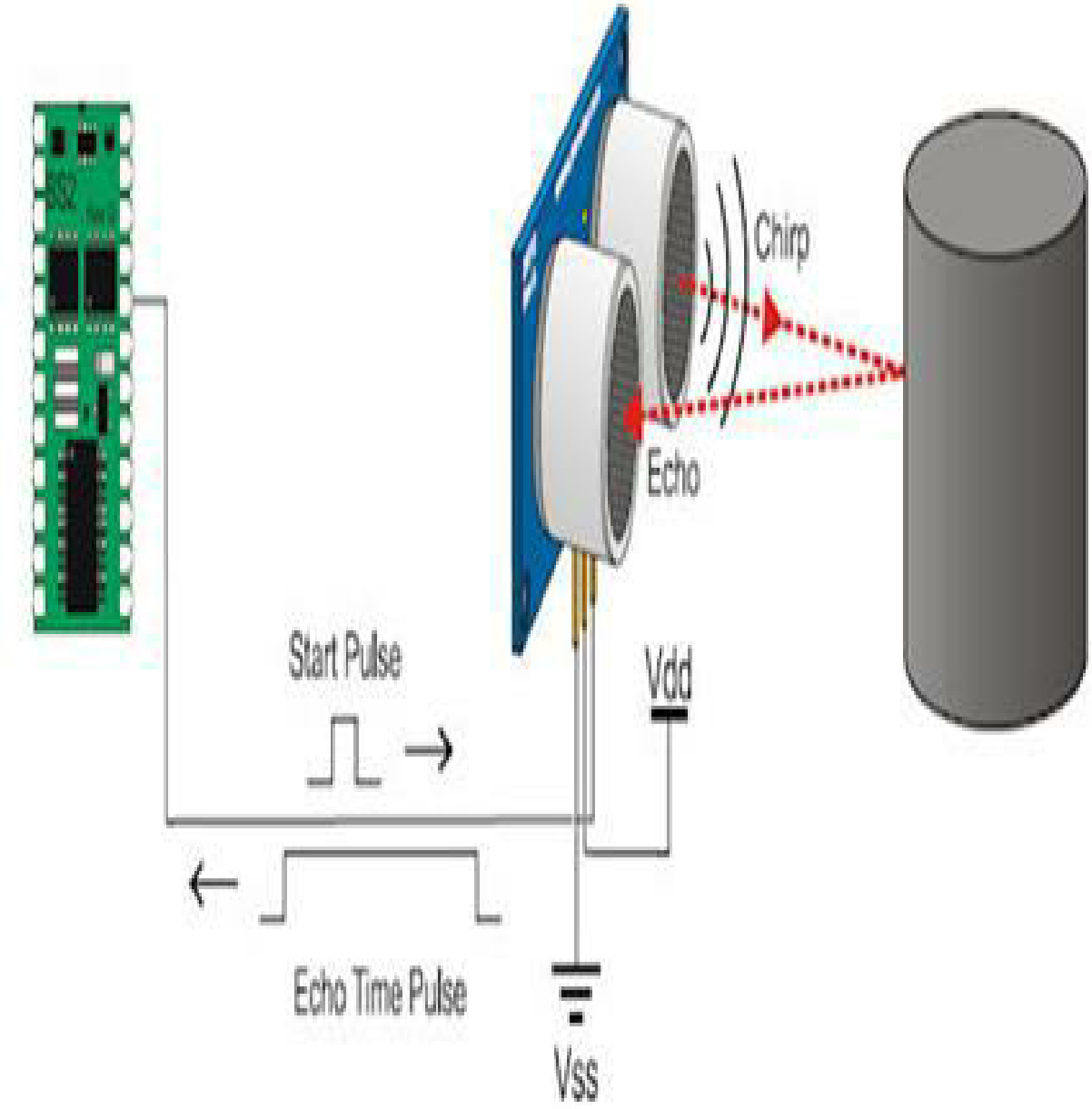
- Efficiency: This indicates that a program runs very smoothly without consuming”

  a lot of resources.

Chapter 3

System Design

3.1 Architecture



3.2 Algorithm

Step1: Start

Step2: Take choice as input

Step3: Check range of the object

if distance<=10cm

turn digital wire high

else

if distance>=10cm

turn digital wire low

break

Step4: End

3.3 Flow Diagram

The process flow begins with detecting a ultrasonic sensor range, then if the object is within 10cm LED glows else if it is after 10cm it doesn't glow as it is shown in the below flow diagram 3.3.1

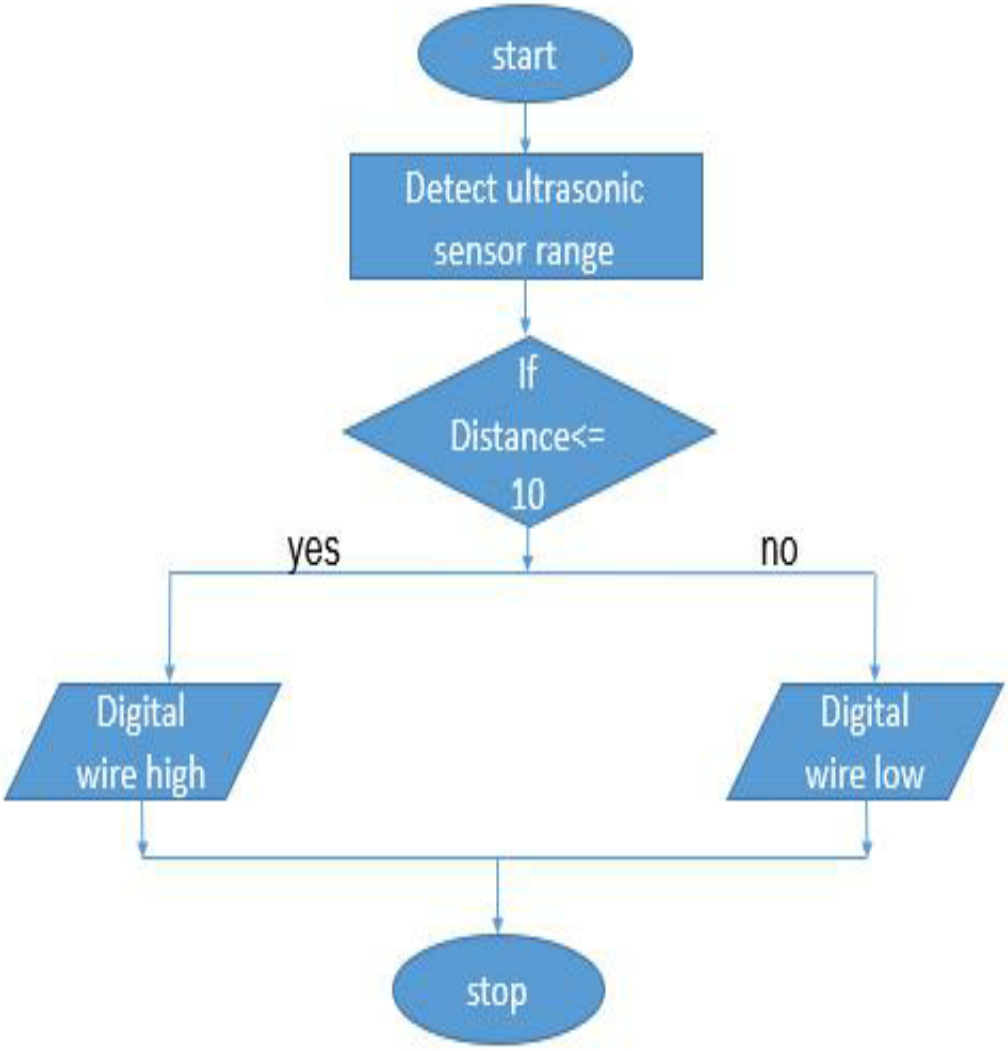


Figure 3.3.1: Flowchart Ultrasonic motion sensor

“3.4 CODE AND IMPLEMENTATION

```
int trigPin = 9;

int echoPin = 10;

int led = 7;

void setup() {

Serial.begin(9600);

pinMode(led, OUTPUT);

pinMode(trigPin, OUTPUT);

pinMode(echoPin, INPUT);

/  put your setup code here, to run once:

}

void loop() {

long duration, distance;

digitalWrite(trigPin,HIGH);

delayMicroseconds(1000);

digitalWrite(trigPin, LOW);

duration=pulseIn(echoPin, HIGH);

distance =(duration/2)/29.1;

Serial.print(distance);

Serial.println("CM");


  delay(10);

if((distance<=10))

{
```

digitalWrite(led, HIGH);

}

else if(distance>10)

{

digitalWrite(led, LOW);

}

}”

Chapter 4

Results and Discussions

4.1 Summary of result obtained

The result of this project is as if any object passes or comes within the range of 10cm the ultrasonic sensor gets detected and the LED glows. If the object does not passes within the range of 10cm the LED doesn't glow.

4.2 SNAP SHOTS

The components used in the mini project is displayed in the below snapshot.

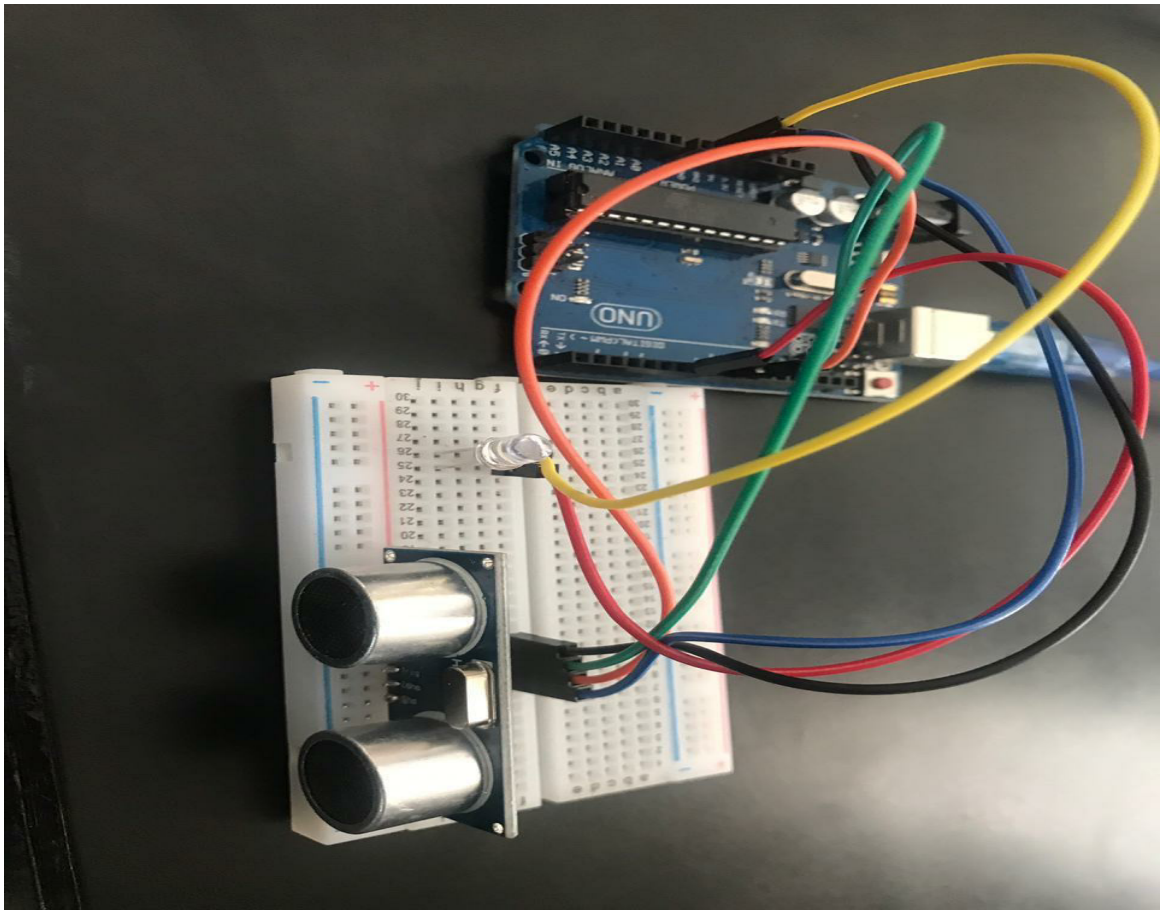


Fig 4.2.1 View of all the components i.e. connected to the software

The below snapshot displays that if any object is within 10cm the ultrasonic sensor gets detected and the LED glows automatically.

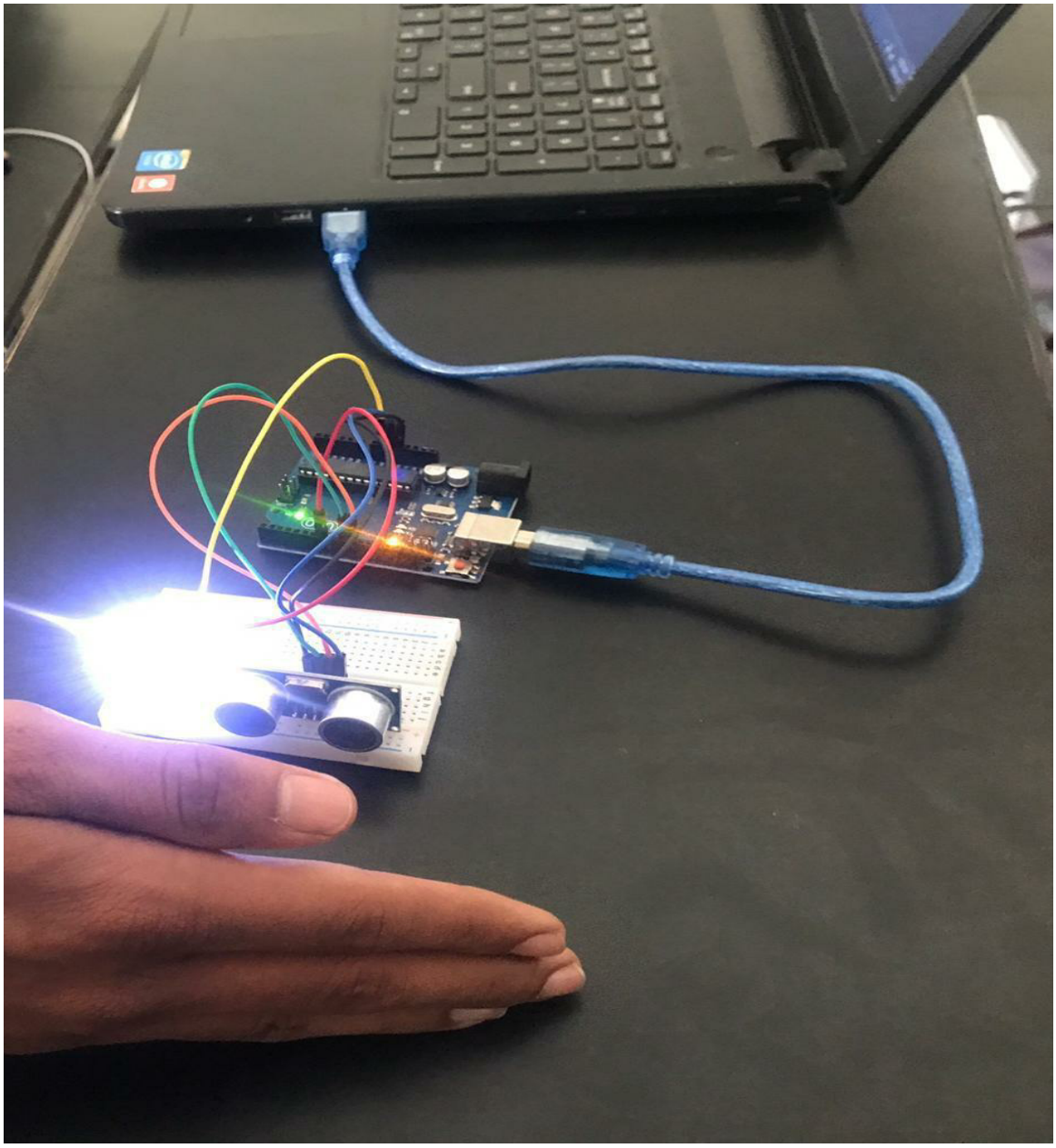


Fig 4.2.2 When the object is in 10cm

The below snapshot displays that if any object is within 10cm the ultrasonic sensor gets detected and the LED glows automatically.

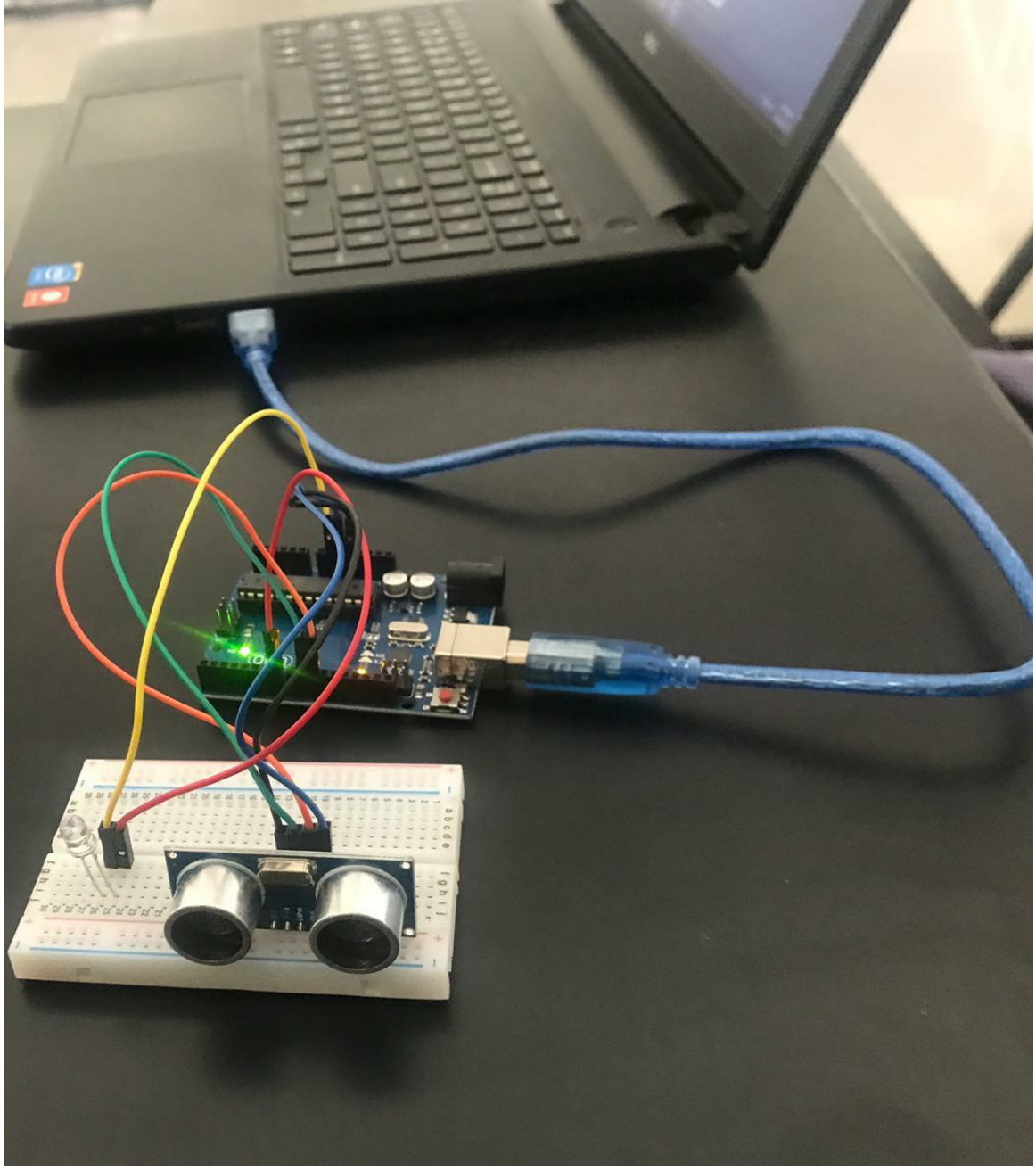


Fig 4.2.3 When the object is far

Chapter 5

Conclusion

It could be deduced from the foregoing design analysis that the design of ultrasonic motion detecto”r like any other electronic need careful planning and implementation. This work is mainly a design and construction of a system that has the ability to sense motion through movement of humans or any target, to design a low cost and portable motion detector system, and the design of a system that can be used to trigger another circuit which can trigger ON or OFF the circuit depending on the circuit attached to it. Generally, the design is made to detect movement or moving object in an enclosed area. In this work, a transmitter transducer generates a signal at a frequency of 40khz, and when the signal is blocked by any moving object, the receiver will be notified and the led glows.

The System of the Water Level Detection has been tested and reasonably good performance is shown based on the test results. One of the main contributions of this project is the ultrasonic sensor calibration by adjusting calculations of distance based on actual data.

Testing need to be carried out for the real fluctuated water surface condition to get “the system

performance in the real circumstances.

The water level data is successfully displayed locally, therefore this prototype can be used as part of the bigger system, such as river flow management system which controls the stream

to minimize the flood.

The hardware part of the project gave us a chance to understand arduino, ultrasonic sensors,. We also had the chance to practice and exercise on circuit designing, electronic prototyping, PCB designing, application of I.C. (its pin diagram), mounting of electrical components using soldering process and interfacing of the hardware circuit with the computer.

Sof”tware part helped us to have a better understanding about the embedded system programming and C programming language, circuit designing, troubleshooting and project management skills which are vital in my vocational career. This prototype is developed and tested with satisfactory working condition and all in all it works correctly for what it was designed for.

We have completed the project on time and matched the project objectives. It helps us to improve my hardware design skills, programming skills and planning skills. We are sure that
the experience that we have obtained from this project will help me throughout my future career.

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