

# **FINAL YEAR PROJECT REPORT**

## **(IR Based Range Finder Sensing Using PIC)**



Project Advisor  
(Muhammad Bilal)

Submitted by  
(Umer Saeed Pawar - 081120019)  
(Mudassar Mukhtar Pawar - 081120029)  
(Muhammad Arslan Cheema - 081120037)

Department of Electrical Engineering  
School of Science and Technology  
University of Management and Technology

# **(IR Based Range Finder Sensing Using PIC)**

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Department of Electrical Engineering, University of Management and Technology  
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(Umer Saeed Pawar - 081120019)

(Mudassar Mukhtar Pawar - 081120029)

(Muhammad Arslan Cheema - 081120037)

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## **Abstract**

The project report describes the system which is based on Infra red (IR) technology and it can be used in robots or in any static machine to detect an object's position and its distance with respect to the IR sensors. The mechanical structure consists upon a wooden stand which is used to hold the IR sensors. A PIC microcontroller is used to operate the circuit and sensors. A voltage amplifier is used to amplify the voltages of sensors. Serial communication is used to connect the electronic circuit with computer. The interface, which is used to display the results and graph is MATLAB Graphical User Interface (GUI). The code to operate the sensors by PIC microcontroller is written in 'BASIC' language. The main code to do the calculations of distance and object detection is written in MATLAB.

## **Dedication**

Dedicated to our kind teacher

**Sir Muhammad Bilal & Our Parents**

Who enlightened our minds with Knowledge, tried  
To include the spirit of hard work and dedicational us  
So that we could have a BRIGHT FUTURE in terms  
Of being good human and turn out to be competent  
Engineers with powers to take challenging  
ENGINEERING PROBLEMS.

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# Chapter I. Introduction

## 1. Introduction

This project is based on IR technology and uses the IR sensors for object detection and ranging purposes. Generally IR sensors are low cost and have fast response time. They have non-linear behavior, because their output voltages depends upon the intensity of transmitting LED and scattered energy, which is reflected back from the object's surface. This energy scattered also depends upon the reflective coefficient of the reflected surface. These aspects of the IR sensors make them very less precise in measuring accurate distances or respected data. So, they are used just to approximate the distance or position of objects for robots. These are also used in electronic circuits like in Tv remotes or automatic door opening purposes etc. The IR sensor with transmitter and receiver is shown in figure.



**Figure 1: IR sensors**

There are different types of IR sensors for different purposes. These have different ranges also. IR sensors are not used for long range purpose because they are low range sensors. They work efficiently within the range of 60-70 cm. The range can be increased by using different methods or by implementing efficient circuits.

## **1.1.Objective**

The objective of the project is to make IR based system that can detect object's position, can calculate its distance and can detect the slope of its front surface so it can be applied to robots for obstacle avoidance purpose.

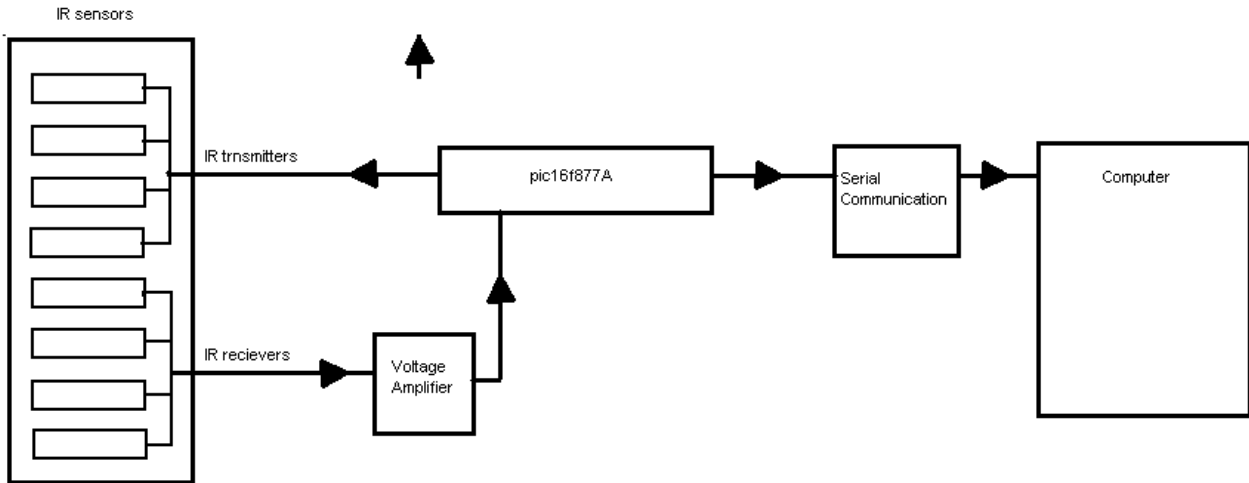
## **1.2.Scope of Work**

The scope of the project is described below.

1. Reading research paper related to IR object detection and distance measurement to get an idea to make the required system.
2. To get the idea of range of the sensors available by conducting experiments using different techniques.
3. To create a mechanical design to support the IR sensors.
4. To design and make the electronics hardware by combining different circuits and components.
  - i. PIC16f877A
  - ii. Voltage amplifier
  - iii. Serial communication
  - iv. IR transmitter and receiver
5. To create logic for programming and to create a code for PIC and MATLAB interface to achieve the objective.

### **1.3. Description of the System**

The block diagram of the system is shown below.



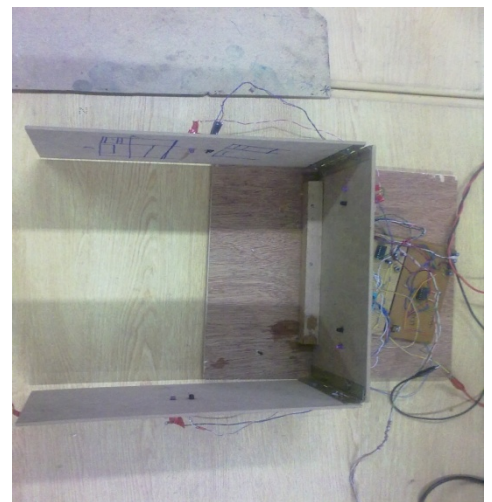
**Figure 2: Block diagram of project**

The project is based upon three main parts.

- i. The mechanical structure
- ii. Electronic circuit
- iii. Coding

#### **1.3.1. Mechanical structure**

The mechanical structure is based upon four wooden pieces. Three are 1\*1/2 ft. dimension and one is of 1\*1 ft dimension. The last square piece is put horizontal on the floor and other three are placed perpendicular and normal to that piece and are connected to each other so that they can move along the horizon. Two sensors are placed in middle wooden piece. One sensor is placed in right wooden piece and the other is placed in left wooden piece.



**Figure 3: mechanical Structure**

The moving ability is given to the structure to get the idea if reflected voltages from objects by adjusting sensors at different angles. The structure is shown in figure above.

### **1.3.2.Electronics Circuit**

The electrical hardware part is further divide in three parts. One is the transmitter part which contains the four transmitters which are connected to the PIC through the resistors. And Light Emitting Diodes (LEDs), transistors and voltage regulator is also used. The second part is receiving part where the voltages from IR receiver are sent to the voltage amplifier to enhance their magnitude to 5 volts at a distance of 12 cm by applying gain from high gain operational amplifier. The range of voltages is up to 0-5v. After receiving these voltages, PIC sends these voltages to the serial communication circuit. This is the third part of hardware, where these voltages are transferred from the circuit to the PC by wire which is called DB9. The effective range of the sensors is 60-70 cm.

### **1.3.3.Programming**

This part contains the software MATLB which is used to operate the voltage data according to our requirement. The code is written in MATLAB high level language, which gives us our required results. The distance and the position of object are displayed in the GUI of MATLAB and the graph.