Proceeding of NCRIET-2015 & Indian J.Sci.Res. 12(1):155-158, 2015 ISSN: 0976-2876 (Print)
ISSN: 2250-0138 (Online)

SMART DISTANCE MEASUREMENT SYSTEM USING IR SENSOR

PAMPAPATI HUBBALLI[a1], SIDDARUD BANNIKOPPA[b], VEERESH BHAIRI[c] AND RAHUL G JAHAGIRDAR[d]

[abcd]Department of Electronics and Communication Engineering, Basaveshwar Engineering College, Bagalkot Karnataka, India

ABSTRACT

This paper discuss about the Smart Distance Measurement System Using IR Sensor. Infrared sensors find numerous applications in electronic systems. Commonly used as obstacle detector, their output is used in digital form (High & low logic) by employing a comparator. This topic explains a way to use the sensor's output in its original analog form. Thus, along with detecting an obstacle, its exact distance can also be obtained. This is achieved by processing the output of IR sensor through an internal ADC (analog to digital converter). The ADC is calibrated to get almost accurate distance measurement. The measured distance is also displayed on an LCD screen. The ADC and LCD are interfaced with 8051 microcontroller (PIC16F87XA to perform these operations. The major drawback of IR based sensors is their capability of detecting short distance.

KEYWORDS: IR Sensor, Distance, Analog, LCD

An embedded system is a combination of software and hardware which is designed for one specific application in a time domain constraint. Now-a-days the meaning of the embedded system was changed because, it was not designed only for one specific application but, many applications can run with a single embedded system. The best example of an embedded system is a mobile phone which performs the communication, along with the communication one can surf the internet, access the social network sites, play the games and even global positioning system is deployed into such a small device.

Infrared sensors find numerous applications in electronic systems. Commonly used as obstacle detector, their output is used in digital form (high & low logic) by employing a comparator. This topic explains a way to use the sensor's output in its original analog form. Thus, along with detecting an obstacle, its exact distance can also be obtained. This is achieved by processing the output of IR sensor through an ADC. The ADC is calibrated to get almost accurate distance measurement.

The measured distance is also displayed on an LCD screen. The ADC and LCD are interfaced with PIC microcontroller (PIC16F877A) to perform these operations. The major drawback of IR based sensors is their capability of detecting short distances.

IR sensors are almost exclusively used as proximity detectors in mobile robots. However, some IR sensors described in the bibliography are based on the measurement of the phase shift, and offer medium resolution at long ranges (about 5 cm for distances up to 10m), but these are, in general, very expensive. US sensors are widely used for distance measurement purposes. They offer low cost and a precision of less than 1 cm in distance measurements of up to 6m [G. Benet, 1992].

In an unknown environment, it is not possible to make valid assumptions about the nature of the surface properties of objects, and additional information sources are needed to obtain the relevant parameters of the surfaces. More specifically, to interpret sensor output as a distance measurement it is necessary to know how a given surface scatters, reflects, and absorbs IR energy [P.M. Novotny, 1999].

BLOCK DIAGRAM AND DESCRIPTION

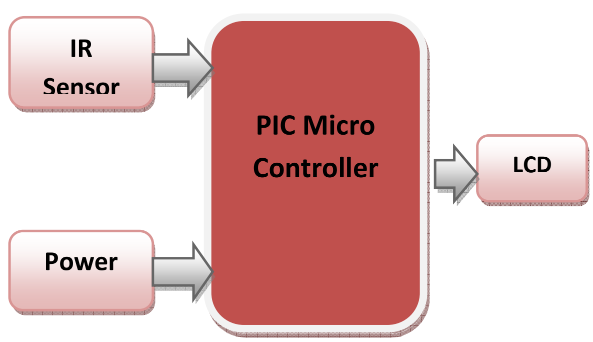

Figure 1: Block Diagram of Distance measurement system

A. **Hardware Requirement**

- PIC Micro Controller
- LCD
- Power Supply Unit

[1]Corresponding author
Organized by Department of E&CE, Bheemanna Khandrre Institute of Technology Bhalki, Bidar, India

B. **Software Requirement**

- Kiel/CCS complier
- Multisim

Micro Controllers

The Heart of the Circuit. In this circuit we are going to use the PIC Microcontrollers are used in automatically controlled products and devices, such as automobile engine control systems, implantable medical devices, remote controls, office machines, appliances, power tools, toys and other embedded systems.PIC as inbuilt ADC which we used in the project for getting ADC values from IR sensor.

LCD (Liquid Crystal Display)

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

WORKING OF SMART DISTANCE MEASURMENT SYSTEM

This work mainly consists of three units: a sensor unit, an ADC which is inbuilt in PIC MUC and the LCD module. The IR receiver detects the IR radiations transmitted by an IR LED. The output voltage level of this IR sensor depends upon the intensity of IR rays received by the receiver. The intensity, in turn, depends on the distance between the sensor module and the obstacle. When the distance between IR pair and obstacle is lesser, more IR radiations fall on the receiver, and vice versa. The receiver along with a resistor forms a voltage divider whose output is supplied as the input for ADC.

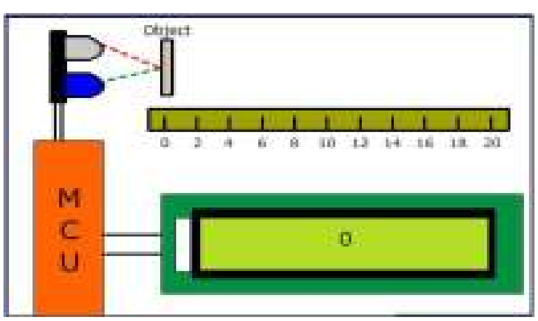

Figure 2: Methodology

When infra-red light rays strikes the object in the front of transmitter the reflected rays are received by the receiver. The reflected ray's angle must be small. There are two conditions for getting maximum efficiency they are

1. If reflected angle is small, the efficiency of receiving light ways is more.
2. If reflected angle is large, the efficiency of receiving light ways is less.

The intensity of the light wave is dependent on the distance between the object

1. If the distance between the object and receiver is small, the intensity is more.
2. If the distance between the object and receiver is more, the intensity is less. Or vice versa.

When reflected light ray received by the receiver, the receiver intern connected to the power amplifier it will boost the signal for the next process. Boosted signal is given to the pic microcontroller. Controller converts the analog signal to digital signal by using inbuilt analogue to digital converter. The A/D converter generates the digital values for analogue signal by using formula given below.

Value = (Vpp)/ $(4.87*10^{-3})$

Here V_{pp} value means intensity of received signal by the receiver.By using these digital values, the module is programmed by using keil compiler and embedded c. the result is shown by using LCD screen in centimeters.

DESIGN OF POWER SUPPLY AND SMART DISTANCE MEASURMENT SYSTEM

A. Design of Rectifier Circuit

Transformer Voltage A transformer's required secondary A.C. voltage varies greatly with the type of rectifier chosen and filters arrangement.Use the formulas below as a guide based on the D.C. voltage you require and the rectifier/filter chosen. All A.C. voltage references are R.M.S. Don'tForget to take into account losses (not included in this guide), especially diode voltage drop. Leave an adequate safety margin for D.C. regulator voltageRequirements and minimum operating line voltage.

Transformer Current Ratings A transformer's A.C. current rating needs to be recalculated from the D.C. load current. The required currentVaries with type of rectifier chosen and filter type. Use the formulas below as a guide, shown for common D.C. supplies. Included in the formulashigher peak to peak capacitor charging current in the filter.

Rectifier Selection Notes When selecting rectifiers remember, average current in a full wave circuit is .5 x I D.C. per diode. In a half wave circuit, average current is equal to I D.C. per diode. A rating at least twice the output current is recommended to cover turn on surge. In full waveCircuits; the reverse voltage rating should be in excess of 1.4 x V A.C. In half wave circuits, the reverse voltage rating should be in excess of 2.8 X V A.C.

Capacitor Selection Notes When choosing capacitor voltage, allowances should be made for D.C. voltage rise due to transformer regulation. Remember, R.M.S. ripple current in a filter capacitor can be 2 to 3 timesD.C. load current. Capacitor life is greatly increased by reducing its temperature via less R.M.S. current or reduced ambient temperature.

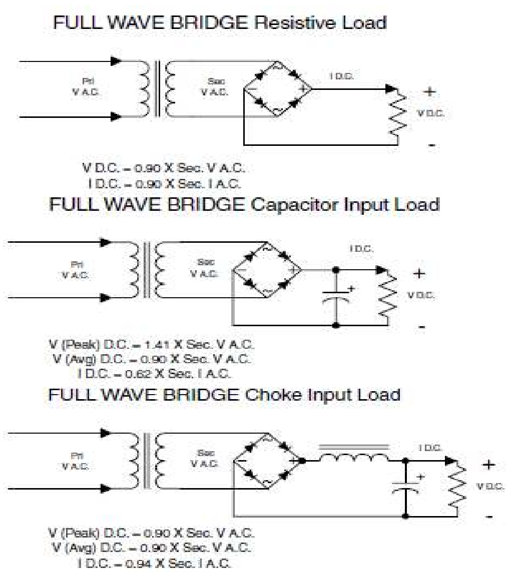

Figure 3: Diagram of Rectifier Design

RESULT AND DISCUSSION

A. Advantages

Infrared sensors are cheaper than the ultrasonic sensors, Infrared sensors are not depends on sound, the sensors with a binary output are only good for detecting the proximity of an obstacle.Building an IR sensor, whether ranging or binary, is incredibly simple.An infrared sensor doesn't property of light scattering and diffraction.

The power consumption of IR sensor is lesser than ultra-sonic sensors.Transmitter and receiver of IR quite simple

Instead of using separate ADC (analogue to digital converter) we used internal,so ADC it reduces the hardware and coding.

B. Disadvantages

Infrared sensors are capable of detecting objects in range of 10 to 15cm.Infrared sensors are not accurate.Infrared sensors can sense the IR radiations from the sun it causes the correctable or non-correctable errors at output. If we use analogue IR sensor, signal losses may occur at amplifier circuit.

C. Applications

This module is used in finding distance of enemy in army.This kit is used by admiral in ship to find the distance of obstacle from the ship. It is used to measure shortest distance between two objects.

CONCLUSIONS

This work developed the "Distances Measurement Using IR" used to measure the shorter distances. In this paper,a new IR sensor based on the light intensity back-scattered from objects and able to measure Distances of up to 20cms has been described.

REFERENCES

G. Benet, J. Albaladejo, A. Rodas, P.J. Gil, An intelligentultrasonic sensor for ranging in an industrial distributedcontrol system, in: Proceedings of the IFAC Symposium on Intelligent Components and Instruments for ControlApplications, Malaga, Spain, May 1992, pp. 299–303.

F. Blanes, G. Benet, J.E. Simó, P. Pérez, Enhancing the real-time response of an ultrasonic sensor for map building tasks, in: Proceedings of the IEEE International Symposium on Industrial Electronics, ISIE'99, Vol. III, Bled, Slovenia, July 1999, pp. 990–995.

V. Colla, A.M. Sabatini, A composite proximity sensor for target location and color estimation, in: Proceedings of the IMEKO Sixth International Symposium on Measurement and Control in Robotics, Brussels, 1996, pp. 134–139.

H.R. Everett, Sensors for Mobile Robots, AK Peters, Ltd., Wellesley, MA, 1995.

A.M. Flynn, Combining sonar and infrared sensors for mobile robot navigation, International Journal of Robotics Research 6 (7) (1988) 5–14.

Glassner, S. Andrew, Principles of Digital Image Synthesis, Vol. II, Morgan-Kaufmann, San Mateo, CA, 1995.

L. Korba, S. Elgazzar,T. Welch, Active infrared sensors for mobile robots, IEEE Transactions on Instrumentation and Measurement 2 (43) (1994) 283–287.

P.M. Novotny, N.J. Ferrier, Using infrared sensors and the Phong illumination model to measure distances, in:

Proceedings of the International Conference on Robotics and Automation, Vol. 2, Detroit, MI, April 1999, pp. 1644–1649.