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Development of Embedded System for Detection of Angle and Distance of Random Sensors

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Abstract

The IR sensor works on the principle of range of distances and intensity of light. IR sensor can detect the objects, persons which are in motion and non-motion. Based on this we are developing the wireless sensor node for the detection of the distance of the slave sensors which are kept at the random distances. The accelerometer is used for the detection of the angles of the slave sensors.

Index term- AT89S52 microcontrollers, wlpro software, IR sensor, RIDE to write the code, accelerometer.

I. INTRODUCTION

The IR sensor works on the principle of the intensity of light and the range of distances. The IR sensor detects the object which are in motion and non-motion. IR rays means the Infra-red region[1]. IR rays will ranges from 700nm to 1 mm, and the frequency range up to 430 THZ to 300GHZ. Here we are using the IR led which emits the light in short range distances. The IR receiver is capable of receiving the IR light from the short distance also[2]. The IR receiver what we are using here consists of three pins and it operates with a voltage level of 3 to 5 volts.The IR receiver mainly consists of the three pins.

I. Vcc
II. Gnd
III. Vout

The supply voltage of 3v is given to the Vcc of the IR receiver pins, and the Gnd is connected to the common ground from the bread board connections. The output voltage is taken from the 3rd pin of the IR receiver. Based on the distance the Vout varies. The maximum distance that the IR receiver receives from the IR module is 3cm.

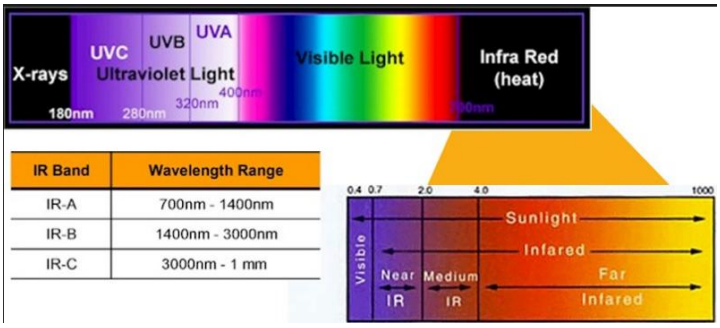


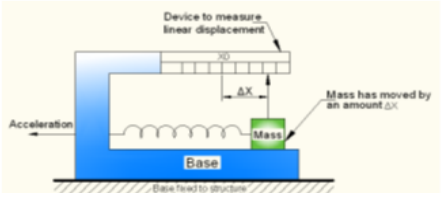
Figure 1.Wavelength Spectrum

II. 3D ACCELEROMETER

The Accelerometer is a device which can detects the acceleration and distances. The distance is detected by mean of the shortest path and the acceleration is detected by means of the rate of change of velocity[3]. Basically the accelerometer is classified into different types based on their output drop. The types of the accelerometers are piezoelectric, piezoresistive, capacitor, Hall Effect, magneto resistive.

- **Basic Accelerometer**
  - Newton's law
  - Hooke's law
  - $F = k\Delta x = ma$

$$a = \frac{k}{m}\Delta x$$



The accelerometer series what we are using here is MMA7361. It is the 3-Axis accelerometer. The accelerometer consists of the 3 pins x, y, z axis[4]. And the two separate pins that are using here is 5volts and ground. These five pins are connected to the Arduino board. The accelerometer mainly works here based on the Arduino platform it works on the digital

output. The Arduino program is dumped in to the Arduino microcontroller and based on the directions it will show the readings.
The accelerometer is interfaced to the Arduino and from that it is given to the LCD to show the readings[5].

Figure 2.Accelerometer sensor

ACCELEROMETER READINGS

S.no	X	Y	Z
1	167	191	124
2	198	209	204
3	211	218	238
4	217	234	303
5	235	266	374
6	274	278	402
7	307	318	433

Accelerometer setup

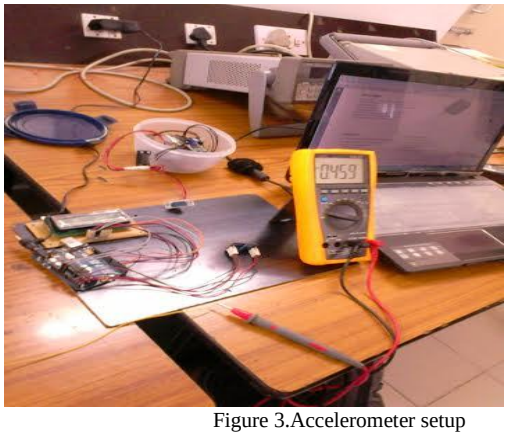


Figure 3.Accelerometer setup

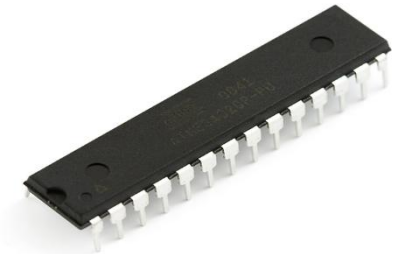
III. ARDUINO BOARD

The Arduino board analog pins, power pins and digital pins. The accelerometer is connected to the analog pins from A1, A2, A3, A4, A5 and the LCD pins are connected to the Digital port pins[6]. The RS and the EN pins are connected to the power pin of the Arduino board. The RS and EN pins are connected to the 5V and GND.

The Program is dumped into the Arduino chip of the board. The power supply of 230AC is given to the Arduino power socket port[7]. The board consists of the regulator and the crystal oscillator. The regulator provides the constant of 5V power supply to the chip.

Figure 4.Arduino Board

a. ATEML MICROCONTROLLER



This Atmel microcontroller is based upon the RISC architecture. It is high performance and low power consumption microcontroller. And this microcontroller is based upon the fully static operation[8]. It is 28pins IC divided into four ports they are port A, port B, port C, port D. And it consists of two grounds and two power supply. And two pins for the crystal oscillator. It consists of 128Kbytes of Flash program memory and 4Kbytes of EEPROM, 4Kbytes of internal Ram. These ports are the bidirectional port. The pins which are use used here is 5^{th}, 6^{th}, 10, 11, 12, 13, 14 for the RS and EN, analog pins from A1, A2, A3, A4, A5. The digital pins are connected to the data lines of the LCD.

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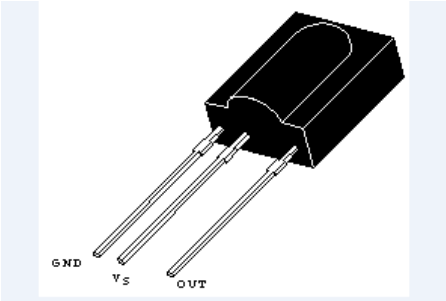
b. LIQUID CRYSTAL DISPLAY (16 x 2)

The LCD used here mainly consists of 16 pins and among the 16 pins we are using 2 pins as gnd, Vcc. And the 3 pins are control pins. Whereas the remaining 9 pins are date pins from D0 to D7. The pins used here is supply and gnd pin. The data pins used here is D4 to D7. And the RS pin and EN pins are also used here.

IV. IR RECEIVER



The IR receiver mainly operates with the very low AC current. The characteristic is that it consists of the photo detector and the preamplifier in one package.The operating voltage of this module is 2.5v to the 5.5v. This IR receiver pin operate at maximum distance of 45meters and with 36 KHz speed. The IR receiver is well suited for the remote sensing devices in the TV stations by IR remote device. The 1st pin of the IR receiver is gnd and the second pin is for the power supply and the third pin is for the output voltage. This IR pins are mainly used here as a slave sensors. When the IR receiver receives the IR signal from the transmitter it will send the command to the ZigBee and the ZigBee transfers the value from the slave mode to master mode. It will update the values as per the requirements. The accelerometer is connected to the DC motor which rotates 360 degrees continuously and when the IR signal receives the dc motor stops and the corresponding angle can be noted based on the x, y, and z axis directions.

IR Receiver Readings

DISTANCE	VOUT
1 cm	0.8000v
2cm	1.056v
2.5cm	1.046v
3cm	1.104v
3.5cm	1.106v
3.7cm	1.116v
4cm	1.126v
4.5cm	1.320v

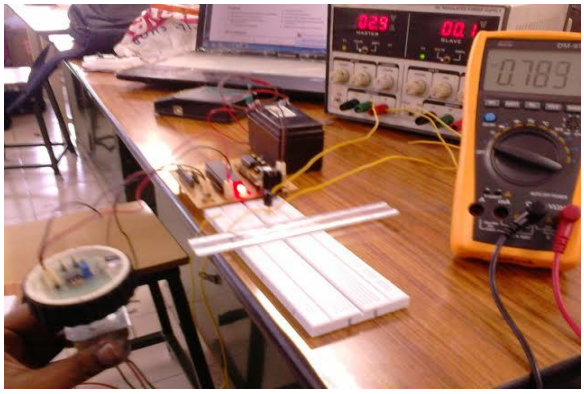
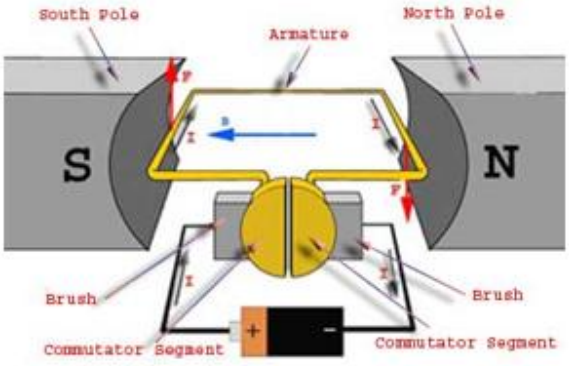


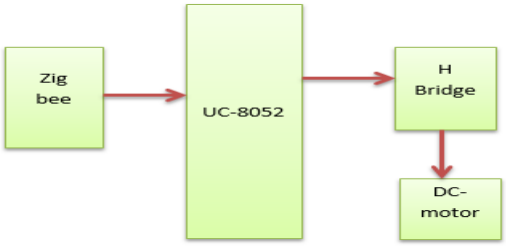
Figure 5. Experimental setup of IR Reading

V DC TO DC MOTOR

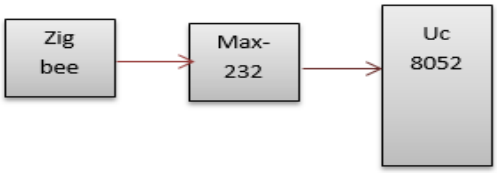


The DC motor works on the principle of the Flemings left hand rules, where the fore finger indicates the direction of the magnetic field and the thumb indicates the direction of the motion of mechanical strength and the middle finger indicates electric field direction. The speed of the DC motor is 60rpm. The dc motor converts the electric field to mechanical field.The dc motor is connected to the H-Drive IC chip which is L29 3Driver, the main purpose of this drive is drive the motor based on the logic levels that is given to it.

- The H-bridge drive can drive the two motors at a time; the motors are connected to the H-bridge drive the coding is dumped in to the uc.
- The dc-motor receives the command from zig bee which is present in the control station to the zig bee connected to the uc.
- The dc motor mainly consists of two inputs and it can handle the two inputs at a time.



VI ZIGBEE



Here the zig bee we are using is Tarang P20 and the zig bee is connected to the max 232 to microcontroller. The maximum range of the zig bee is 100 meter i.e. the range of Tarang P20.the main purpose of using the Max 232 is for the voltage conversions.

DISCUSSIONS

When the slave sensors receives the IR rays it will send the command to the controller and the accelerometer which is connected to the dc motor shows the angle, where the slave sensor drops the output voltage which gives the distance from the point of the master sensor.

CONCLUSION

The proposed position identification has been done by IR sensor through wireless sensor nodes.The wireless sensor nodes are used to detect the distance of random sensor nodes and angle was successfully measured by accelerometer.The proposed project work is mainly applicable in,

- In Navigation systems
- Missile tracking
- Range detection of Hill stations
- Indoor Positioning system

REFERENCE

- [1] I. F. Akyildiz, W. Su, Y. Sankarasubramaniam, and E. Cayirci.Wireless Sensor Networks: A Survey. *Computer Networks*,
- [2] P. Bahl and V. N. Padmanabhan. RADAR: An In-Building Based User Location and Tracking System.
- [3] J. Beutel. Geolocation in a Pico Radio Environment. Master's thesis.
- [4] L. Nyberg, Y. Gustafson, Patient falls in stroke rehabilitation: a challenge to rehabilitation strategies, Stroke 26 (2008)
- [5] P.-T. Cheng, M.-Y. Liaw, M.-K. Wong, F.-T. Tang, M.-Y. Lee, P.-S. Lin, The sit-to-stand movement in stroke patients and its correlation with falling, Arch. Phys.Med. Rehabil. 79 (2008) 1043-1046.
- [6] A.J. Manson, P. Brown, J.D. O'Sullivan, P. Asselman, D. Buckwell, A.J. Lees, An ambulatory dyskinesia monitor, J. Neurol. Neurosurg. Psychiatry 68 (2000) 196–201.
- [7] N. Giladi, A. Nieuwboer, Understanding and treating freezing of gait in parkinsonism, proposed working definition, and setting the stage., Mov.Disord. 23 (1998) 423–425.
- [8] H. Zhou, H. Hu, Human motion tracking for rehabilitation—a survey, Biomed. Signal Process. Control 3 (1995) 1–18.

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