CSE 316 Microcontroller project

Detect Object From a Rotating Sonar Sensor and Map the Position of Object on Dot Matrix

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Contents

1 Introduction

This project is based on the measuring of distance by a **Ultrasonic Sensor**. The sensor will set up on a servo motor and the motor will rotate 360 degree by 45 degree delay. At Different position the sensor will detect object from the sensor and show the distance on the **LCD display** and map the position on the **Dot Matrix**. As a result we can show the existence of the obstacles.

2 Hardware Requirements

Hardware : **List of hardwares and cost**

Equipment	Cost(Tk)
AVR Burner	300
Atmega32 micro-controller	180
Ultrasonic Sensor	70
Servo Motor	120
Breadboard	70
8x8 Bi color Dot Matrix	50
16x2 LCD Display	120
Potentiometre	15

3 Software Requirements

List of **Softwares used**

- ATmel Studio 7 (to compile .c code and build .hex and .eep file).
- eXtreme Burner - AVR (to load .hex and .eep file onto ATmega32)
- Proteus 8 Professional (for circuit design)

4 Flowchart

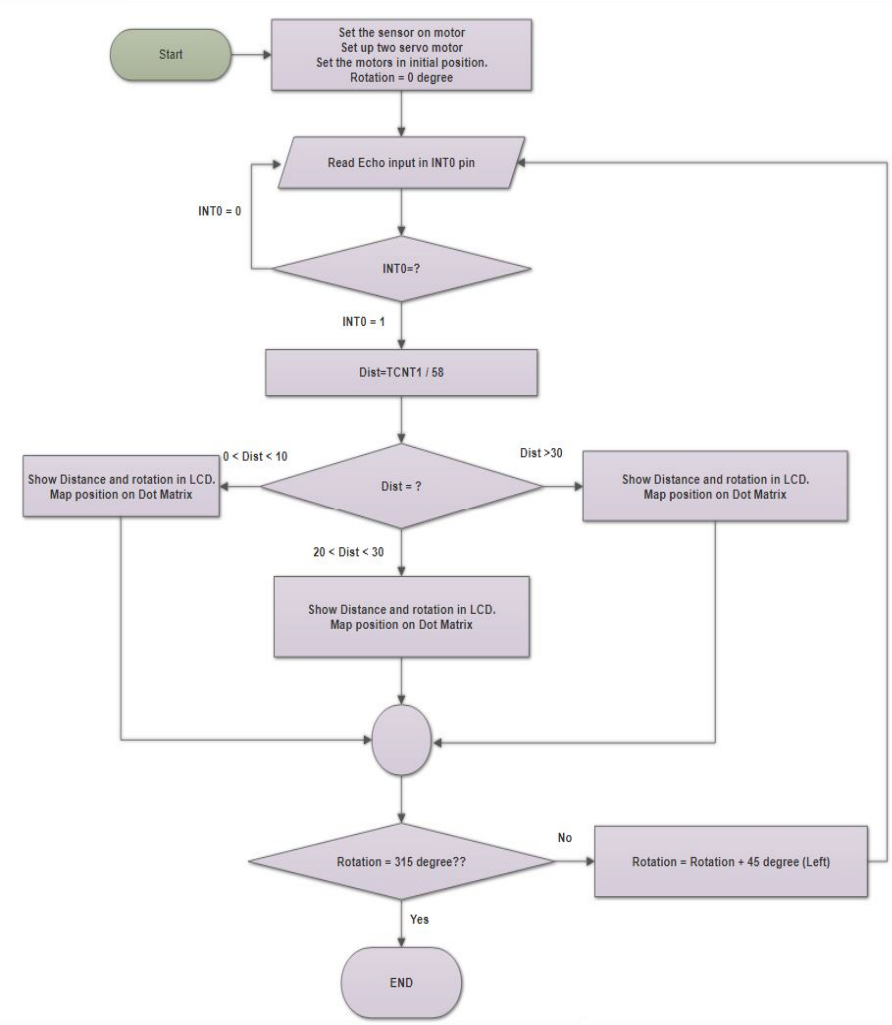

Figure 1: **Flowchart**

5 Block Diagram

showing **Input & output**

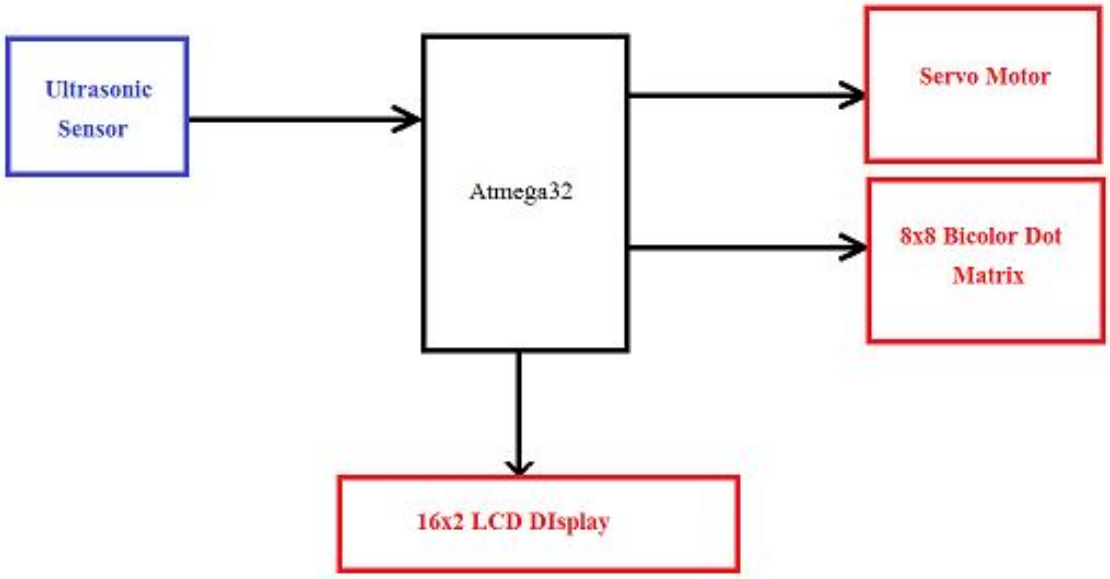

Figure 2: **Block Diagram**

6 Circuit Diagram

Showing **Complete Connection**

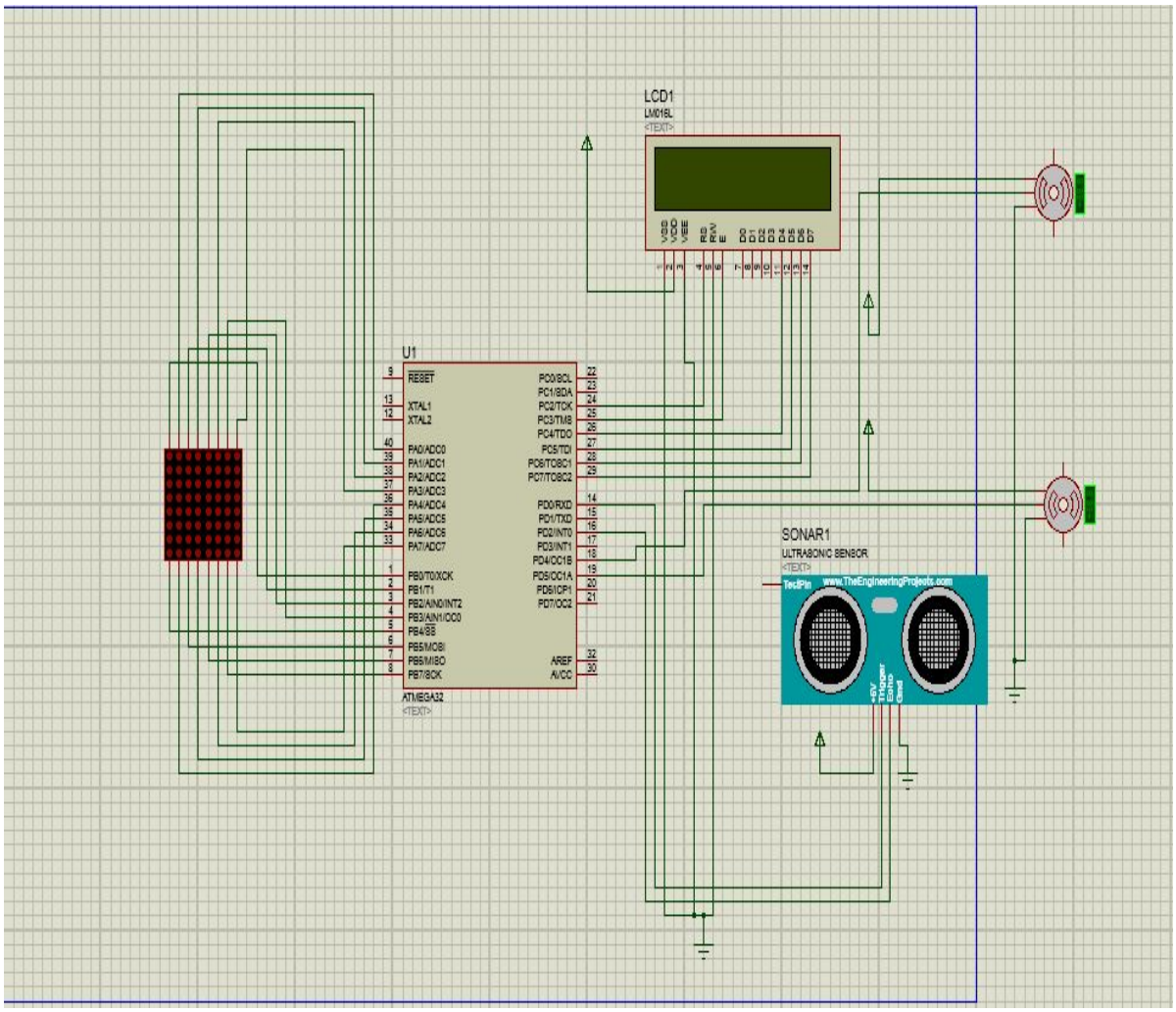

Figure 3: **Circuit Diagram**

7 Actual Circuit

Snapshot **of the working circuit.**

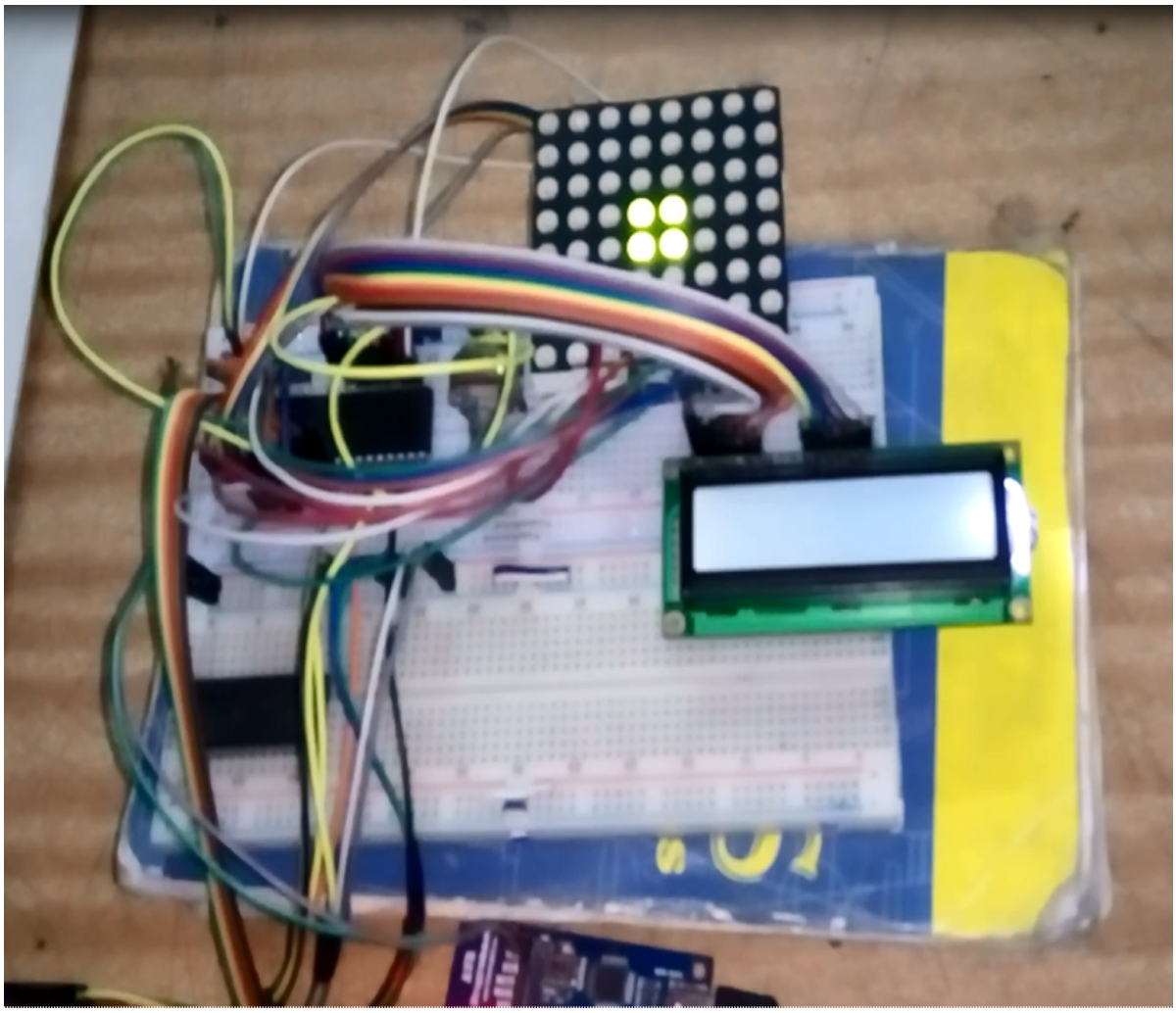

Figure 4: **Circuit Diagram**

7.1 USB ASP Programmer

Figure 5: **USB ASP Programmer**

USBasp is a USB in-circuit programmer for Atmel AVR controllers. It simply consists of an ATMega88 or an ATMega8 and a couple of passive components. The programmer uses a firmware-only USB driver, no special USB controller is needed.

8 Description of Modules Used Libraries

Describing **all the hardware parts and their connections.**

8.1 Ultrasonic Sensor HC-SR04

Figure 6: **Ultrasonic Sensor HC-SR04**

Ultrasonic sensor is used for object detection. We can also measure the distance of the object from the sensor. The sensor creates a frequency and accepts the echo. By Accepting this return frequency, the sensor detects the existence of an object. The distance of the object can also be measured by know the time needed for return back and the speed of that wave.

Ultrasonic Sensor Connnections:

- **Trigger Pin** to **PD0** (Pin 14 on Atmega32)
- **Echo Pin** to **PD2** (Pin 16 on Atmega32)
- **Vcc pin** to **Vcc**(5 Volt)
- **Gnd pin** to **gnd**

8.2 Micro Servo Motor SG90 9g

Servo motor is used for the rotation of the sonar sensor. We use two servo motors. Because SG90 9g Micro servo motor is 180 rotatable. So for the full 360 rotation we use two servo motor.

Figure 7: **SG90 9g Micro Servo Motor**

Servo Motor Connnections:

- **Control Pin**(Upper motor) to **PD4** (Pin 18 in Atmega32)
- **Control Pin**(Down Motor) to **PD5** (Pin 19 in Atmega32)
- **Vcc pin** to **Vcc**(5 Volt)
- **Gnd pin** to **gnd**

8.3 16x2 LCD Alphanumeric Display

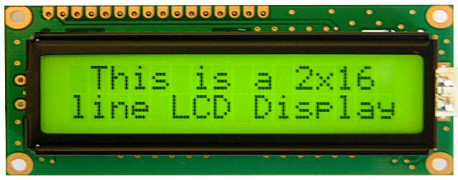

Figure 8: **16x2 LCD Alphanumeric Display**

LCD display is used to show condition of the rotating ultrasonic sensor and to show the distance of the object in cm.

LCD DIsplay Connnections:

- **LCD 1**(GND Pin) to **Gnd**

- **LCD 2**(VCC Pin) to **5 Volt**
- **LCD 3**(Contrast Pin) to **Gnd**
- **LCD 4**(RS) to **PC2** (Pin 24 in Atmega32)
- **LCD 5**(RW) to **Gnd**
- **LCD 6**(Enable) to **PC3**(Pin 25 in Atmega32)
- **LCD 7,8,9,10 No need to connect**
- **LCD 11**(D4 Pin) to **PC4** (Pin 26 in Atmega32)
- **LCD 12**(D5 Pin) to **PC5** (Pin 27 in Atmega32)
- **LCD 13**(D6 Pin) to **PC6** (Pin 28 in Atmega32)
- **LCD 14**(D7 Pin) to **PC7** (Pin 29 in Atmega32)
- **LCD 15**(BackLight Pin) to **5 Volt**
- **LCD 16**(BackLight Pin) to **Gnd**

8.4 8x8 Bicolor Dot Matrix

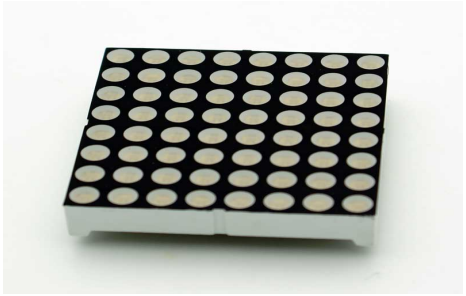

Figure 9: **8x8 Bicolor Dot Matrix**

Dot matrix is user to map the position of the object from the rotating ultrasonic sensor.

Dot MAtrix Connnections:

- **ROW Pins** to **PortA** serially
- **RED Color Pins** to **PortB** serially
- **GREEN Color 4th and 5th Pin** to **PC0** & **PC1**

9 Problems Faced

Describing **the practical issues and observations made while putting the project together.**

- At the time of using PortC specially for using PC2 to PC5 pins, we have to set **MCUCSR = (1≪JTD)** double after initializing the port.
- We measure the ISR1 (Top) using F_CPU. Then we set different valuse of OCR1A ad OCR1B for different rotation of the servo motor. But ISR1, OCR1A,OCR1B values are fraction. As we neglect the fraction, so there should some fluctuate in rotation.
- LCD pin-3 or the contrast pin is not directly connected to ground. We use a 10k potentiometer for the contrast pin. As a result we can set the brightness of the LCD also.

10 Acknowledgments

These are the sites that helped us to set up the project.

For basic interfacing with ATmega32 :

- http://maxembedded.com/
- http://www.avrfreaks.net/
- http://avrprojects.info/
- http://extremeelectronics.co.in/

For interfacing Ultrasonic Sensor :

- http://circuitdigest.com/

For rotating Servo Motor :

- https://www.newbiehack.com/

11 Conclusion

In our project, the sensor is continuously rotating on the servo motor. This logic is same as the radar concept. By detecting object and showing the position map on the dot matrix, we can call our project **Object Radar**.