
Distance Measurement Using Ultrasonic Sensor

Introduction

A simple Distance Measurement system can be build with an analog ultrasonic sensor and EAB ([Embedded Application Board](#)).

This project consists of three basic sections. These are....

- Sensing
- Processing
- Displaying

To sense the distance we have used a Ultrasonic sensor. The analog data of sensor is processed by the on-board microcontroller (PIC18F26K22) of EAB. The processed result is transferred from EAB to Laptop through UART channel. You may use any HyperTerminal software to get the results.

Ultrasonic Sensor

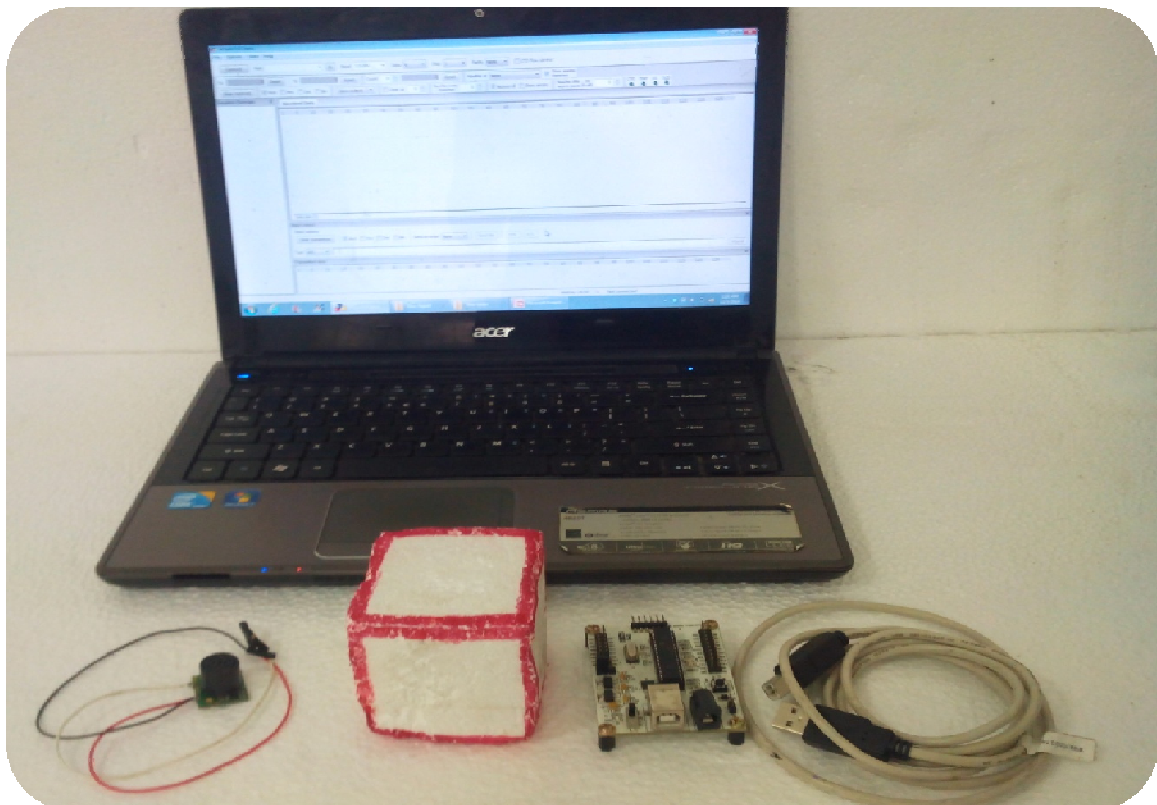
Ultrasonic sensors work on a principle similar to radar or sonar which evaluate attributes of a target by interpreting the echoes from radio or sound waves respectively. Ultrasonic sensors generate high frequency sound waves

and evaluate the echo which is received back by the sensor. An analog Ultrasonic Sensor produces analog signal according to the distance from the object.

Components

The Components required for building the Wall follower Robot are:

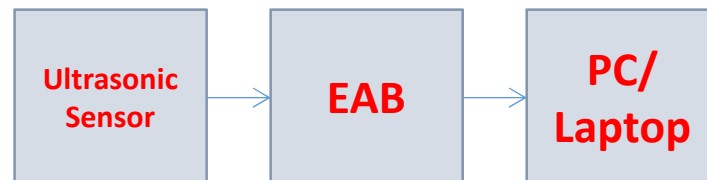
- Embedded Application Board
- Analog Ultrasonic Sensor (1 nos)
- USB Cable
- PC/Laptop



Application Notes

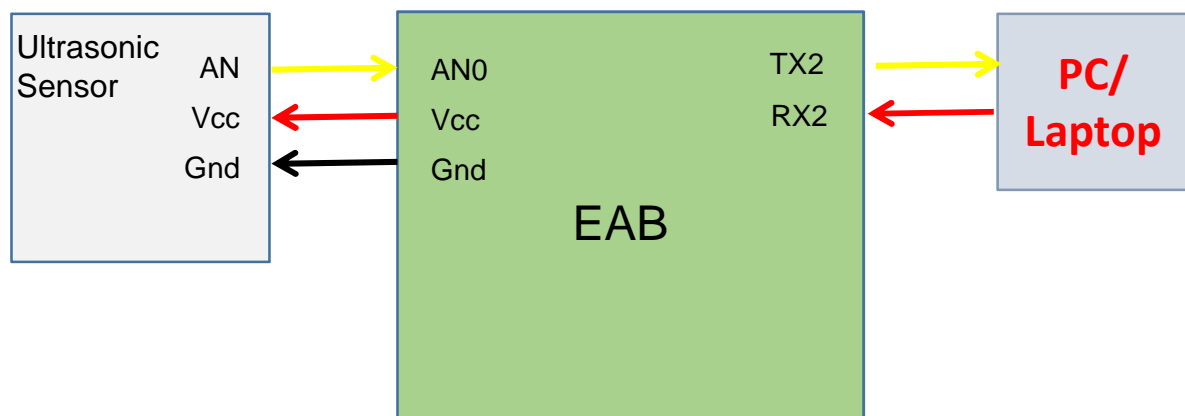
Block Diagram

Block level representation of the different blocks of the Distance Measurement project.



Schematic Diagram

The Schematic diagram illustrates the circuit connections for designing the application.

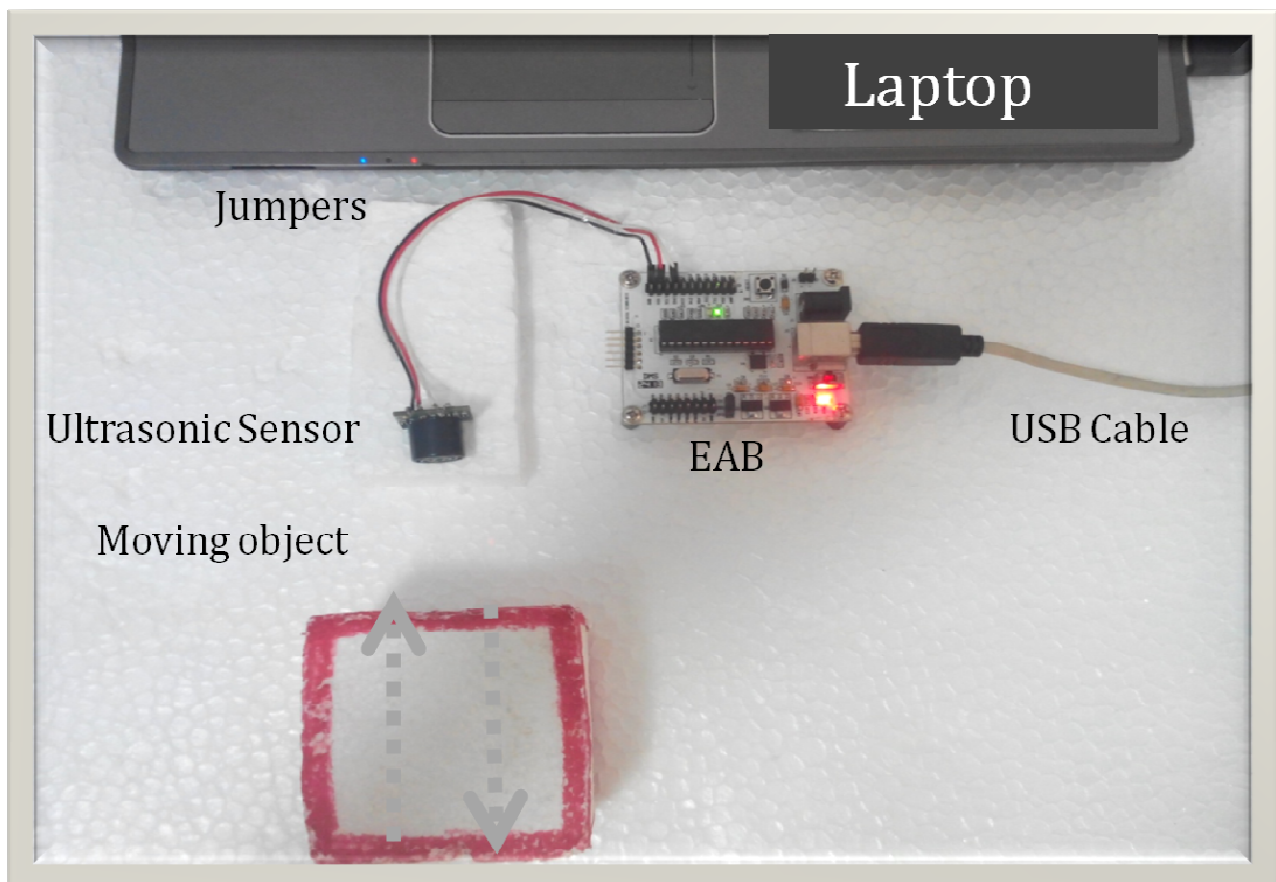


Application Notes

Connection Description

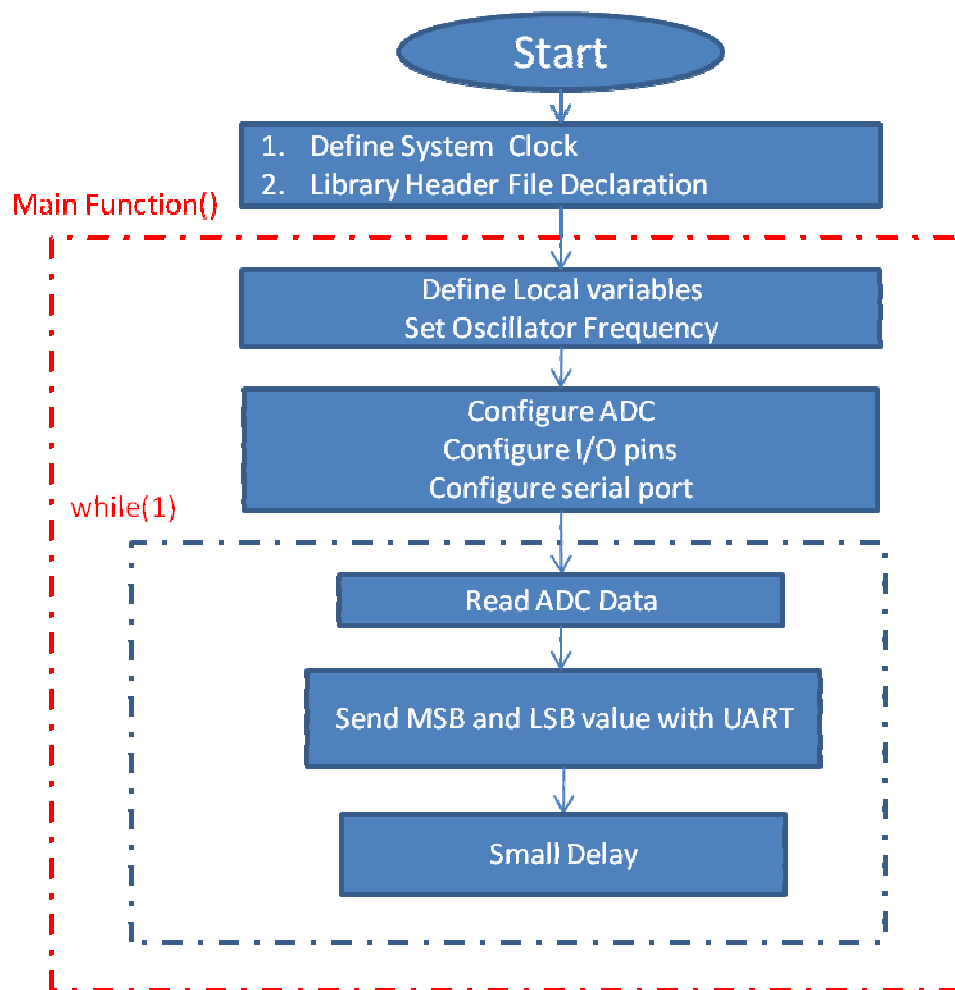
In this project we have used one Ultrasonic Sensor module as distance detector. This module has 3-pins, as GND, VCC and DATA. The GND and VCC pins are connected to the GND and VCC pins of an EAB. The Analog DATA pin of the sensor is connected to the AN0 pin of the EAB.

The EAB's UART2 pins are connected to PC, through a USB Cable. The final output can be available at HyperTerminal.



Application Notes

Code Flow Chart



Application Notes

Source Code

The Source code shown below is the firmware to be flashed in the microcontroller of the Embedded Application Board. The Source code is commented for better understanding of the user.

Refer to the EAB User Guide and the EAB Programming Guide for more details on how to Flash(burn) program(Source Code) in the microcontroller of Embedded Application Board.

```
#define SYS_CLK 8000000          // Required for delay macro functions
                                // Default 1MHZ, else change as per configuration
/** INCLUDE STANDARD HEADERS & LIBRARY **/
#include <stdio.h>
#include <stdlib.h>
#include "EAB_Library.h"

/*-----*/
void main(void)
{
    /** LOCAL VARIABLES **/
    uchar MSB=0, LSB=0;
    short ADCvalue;

    /** INTITALIZE OSCILLATOR, PERIPHERAL & HARDWARE **/
    Oscillator.SetFreq_8MHZ();           // Select system clock at 8 MHz
    Timer2.SetPeriod(Timer2.config.PRESCALER_16,Timer2.config.POSTSCALER_16,255);
    Serial2.Open(9600);                  // Open Serial port with 9600 baudrate

    /** OPEN ADC **/
    PinAnalogIn(AN0);                    // AN0 as analog input
    ADC.SetChannel(CHANNEL_AN0);         // Select channel 0
    ADC.Open();                           // Open ADC

    /** PLACE THE REPETITIVE TASKS IN THIS LOOP **/
    while(1)
    {
        /** READ ADC VALUE AND SEND DATA ON SERIAL PORT **/
        ADCvalue = ADC.ReadData();
        MSB = ADCvalue>>8;
        LSB = ADCvalue;
        Serial2.SendByte(MSB);           // Send higher byte via UART
        Serial2.SendByte(LSB);           // Send lower byte via UART
        Timer2_Flag=0;
        while(!Timer2_Flag);
    }
}
```

Application Notes

How to Operate

Follow the steps mentioned below in order to operate the project...

- Flash the code into the microcontroller.
- Connect each and every part properly.
- Power the EAB, Sensor Board. Carefully check the polarities and then connect .
- Switch ON the EAB.

Now you bring any obstacle in front of the sensor and check the output at Hyper Terminal. The results are in cm (centimetre).



More Projects

Various other applications can be built using Wall follower Robot.

Some of such applications are given below:

- Industrial Automation
- Security System
- Wall following Robot
- Obstacle Avoider