"ULTRASONIC ROBOT"

A Major Project Report

Submitted By

Samarth Cherian	**0206EC101092**
Srishti Pathak	**0206EC101112**
Sumit Shivhare	**0206EC101113**
Vinil Gohil	**0206EC101128**
Vishesh Kulhare	**0206EC101129**

In partial fulfillment for the award of the degree

of

Bachelor of Engineering

in

Electronics and Communication Engineering

Department of Electronics and Communication

Gyan Ganga Institute of Technology & Sciences

Jabalpur (M.P.)

Rajiv Gandhi Proudyogiki Vishwavidyalaya,

Bhopal (M.P.)

GYAN GANGA INSTITUTE OF TECHNOLOGY & SCIENCE, JABALPUR (MP)

Approved by AICTE New Delhi & Govt. of M.P.

(Affiliated to Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal)

BONAFIDE CERTIFICATE

This is to certify that the Major Project report entitled **"ULTRASONIC ROBOT"** submitted by **Samarth Cherian, Srishti Pathak, Sumit Shivhare, Vinil Gohil** and **Vishesh Kulhare** is approved for submission towards partial fulfillment of the requirement for the award of the degree of **Bachelor of Engineering in Electronics and Communication** from Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal (M.P)

Dr. Vinod Kapse	**Mr. Mrs. Vandana Roy**
Head of Department, ECE **GGITS, Jabalpur**	**Asst. Prof, ECE Department**

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INTERNAL EXAMINER: **EXTERNAL EXAMINER:**

DATE…………………. **DATE……………………**

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DECLARATION

We hereby declare that Major Project report entitled **ULTRASONIC ROBOT** which is being submitted in partial fulfillment of the requirement for the award of the degree of **Bachelor of Engineering** in **Electronics and Communication** from **Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal (M.P)** is an authentic record of our own work done under the guidance of **Mrs. Vandana Roy**, Department of Electronics and Communication Engineering, Gyan Ganga Institute of Technology and Sciences, Jabalpur.

The matter reported in this project has not been submitted earlier for the award of any other degree.

Samarth Cherian

Srishti Pathak

Sumit Shivhare

Vinil Gohil

Vishesh Kulhare

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Samarth Cherian
Srishti Pathak
Sumit Shivhare
Vinil Gohil
Vishesh Kulhare

ABSTRCT

This ultrasonic ranging system has two most components including the transmitter and the receiver. The ultrasonic ranging method was concluded, and ultrasonic ranging system generally calculates distance using the time-of-flight method, and the sound velocity must adjust by temperature compensation method when the precision of the ranging is a little high.
The signal of 40 kHz was generated by the single chip microprocessor, and amplified and transmitted by the amplifying circuit and the ultrasonic transmitter respectively.
The ultrasonic signal was amplified by the amplifying circuit after the ultrasonic receiver received the signal, and detected by the phase lock loop circuit, and the time t was measured by the interrupt program of the single chip microprocessor, finally, the distance was calculated by software discriminate.

Ultrasonic ranging system software module structure mainly included main program module, the ultrasonic transmitting module, the interrupt service module of the comparator, the compensation module at room temperature.

List of Figures

Table of Contents

1.Introduction

The title of the project is “**ULTRASONIC ROBOT**”.

Ultrasonic sensors have been used for many purposes in agriculture for more than 40 years. The distance measuring system must be equipped in order to make mobile robots walk automatically on the station of the obstacle, which can achieve timely the distance and the direction of the obstacle.

Recognizing environments is the functions of mobile robots, which are required to find unpredictable obstacles and paths through which the robots can pass.

The range sensors can measure a distance to objects, and ultrasonic sensor is more commonly used with mobile robots because it is small, inexpensive and easy to calculate distances.

Ultrasonic ranging system is one of the most popular kinds of application on the ranging program between the combination of the sensor technology and the auto-control technology that is widely used in the security, the parking-assistance system, the construction site and other industrial fields.

Ultrasonic wave has the advantages including the strong directional characteristics, slow energy consumption characteristics, far distance transmission characteristics, so often used for the measurement of the distance

BLOCK DIAGRAM

This ultrasonic ranging system has two most components including the transmitter and the receiver.

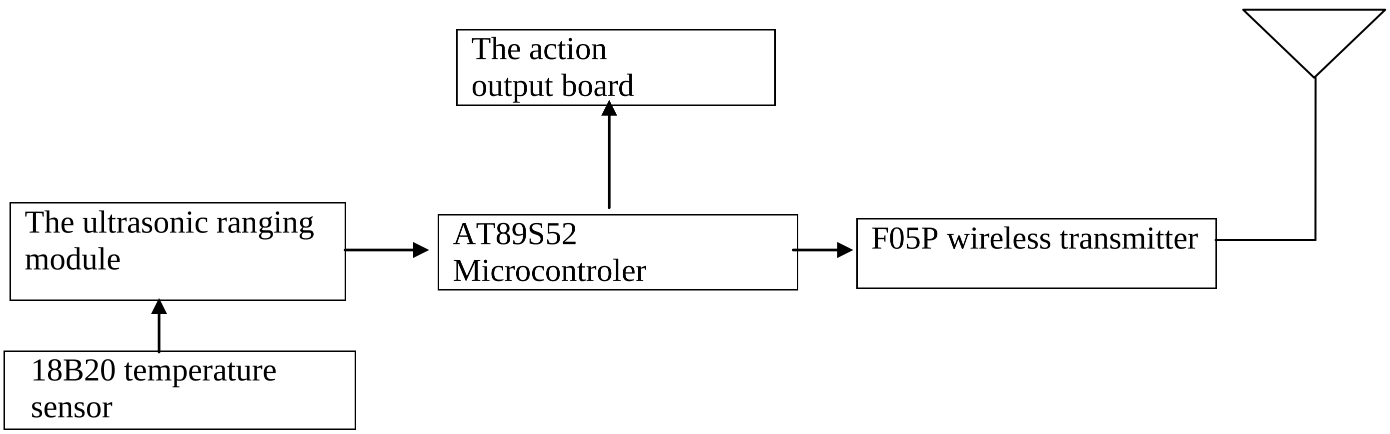
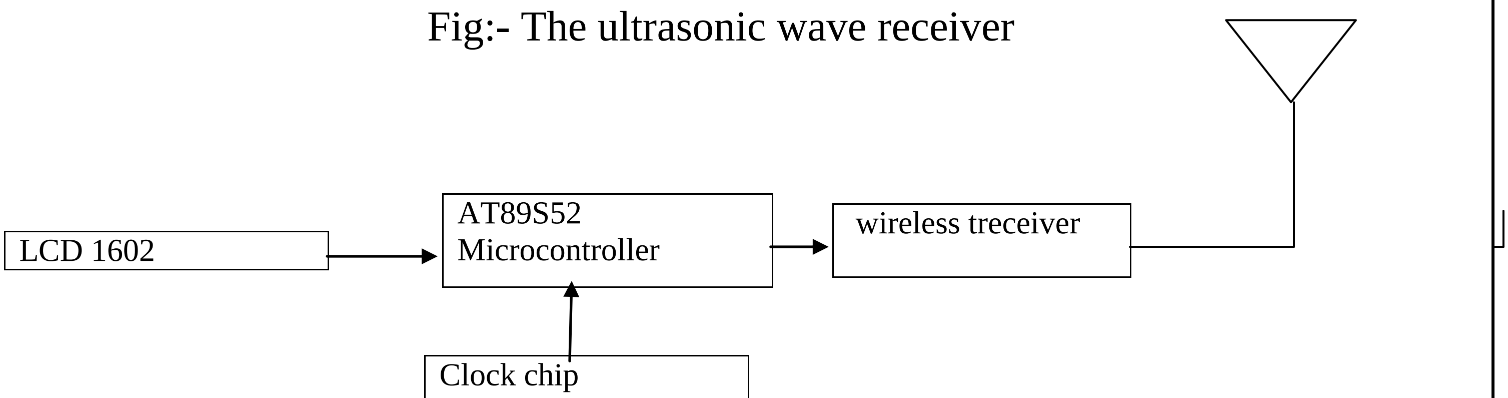


Fig:-The ultrasonic wave transmitter

Fig:- The ultrasonic wave receiver



3. Block Diagram Description

The basic block diagram of **ULTRASONIC ROBOT** is shown in the above figure. It consists of the following parts:

1. **Power Supply :** It is an arrangement that supply required power to the whole circuit to make the circuit working. In this, we have diodes and capacitor to rectify and filter the AC current into DC current. Thus this arrangement supply a power of (5-12)v. The voltage regulator used in this unit to provide a constant voltage.

2. **Microcontroller(AT89S52):** AT89S52 microcontroller is a great family supports Intel MCS-51 . Is created by Atmel AT89S52, as indicated by the initials "AT". This microcontroller has a low consumption, but CMOS 8-bit gives high performance with an internal flash memory of 8K Bytes. This is done using the technology and high density non-volatile memory belonging to the standard and is compatible with Atmel 80C51. Chip Flash allows the internal memory to be reprogrammed or programmed by a non-volatile memory. By combining an 8-bit CPU with Flash memory programmable monolithic kernel, the Atmel AT89S52 is very powerful microcontroller which has high flexibility and is therefore the perfect solution for many embedded applications.

   In this circuit the microcontroller directly communicates with the sensors and the relays and control them according to our needs.

3. **Bluetooth:** It is a wireless technology standard for exchanging data over short distances (using short-wavelength UHF radio waves in the ISM band from 2.4 to 2.485 GHz) from fixed and mobile devices, and building personal area networks (PANs). Invented by telecom vendor Ericsson in 1994, it was originally conceived as a wireless alternative to RS-232 data cables. It can connect several devices, overcoming problems of synchronization.

   Here Bluetooth is used for serial communication between microcontroller and android phone.

4. **L293D DC Motor**: The L293D is high quality DC motor used for the movement Of Robot.

4. Technology Used

1. **Embedded system:** Embedded Systems are inseparable part of our life. Whether we are at home or office or on the move, we are always surrounded by embedded systems. Starting from home appliances like TV, washing machine and systems like printer and elevator in workplace to the automobiles and automatic traffic control system are all examples of embedded systems. All kinds of magazines and journals regularly dish out details about latest technologies, new devices; fast applications which make us believe that our basic survival is controlled by these embedded products.

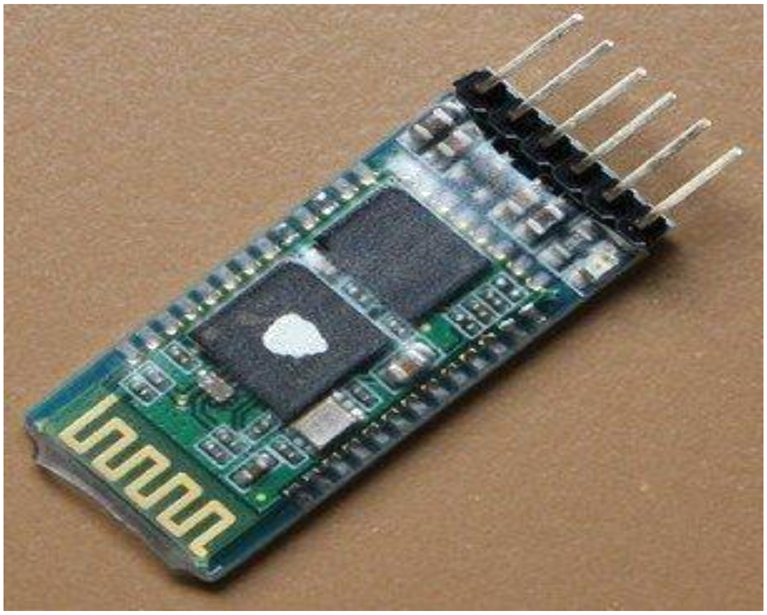
Component in an embedded system are as:

Hardware

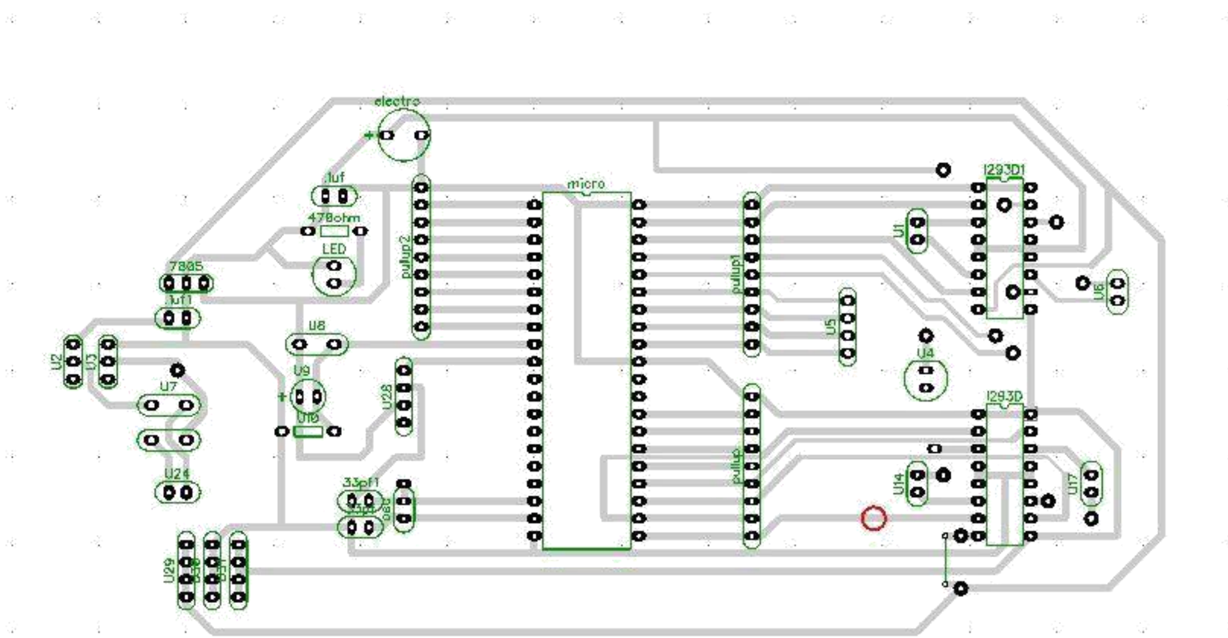
Input & Output

Software

2. **Bluetooth:** It is a wireless technology standard for exchanging data over short distances (using short-wavelength UHF radio waves in the ISM band from 2.4 to 2.485 GHz) from fixed and mobile devices, and building personal area networks (PANs). Invented by telecom vendor Ericsson in 1994, it was originally conceived as a wireless alternative to RS-232 data cables. It can connect several devices, overcoming problems of synchronization.



5.Circuit Diagram



Circuit Diagarm of ULTRASONIC ROBOT

6.Description and Working

The above diagram is the functional block diagram of the entire system. The Main Controller will trigger the Servo Controller, receive the distance values, run the collision avoidance algorithm and control the Stepper motors. The Servo Controller controls the sonar sensor and servo motor while providing the readings from the sonar sensor to the Main Controller.

The app **Bluetooth SPP pro** of android establishes the connection between the phone Bluetooth and HC-06. Thus whenever the user wants to control any electrical devices, they just to press a virtual button on a mobile screen which sends a serial data from mobile Bluetooth to HC-06. This received data gives command to the micro-controller and thus the microcontroller performs the task according to the programming done in it.

In this circuit, the motor is connected to the microcontroller and is driven as per the data received through Bluetooth. Thus, the movement of Robot can be easily controlled via a Android powered smartphone.

7.List of Components

- 8051 Microcontroller
- Voltage Regulator (7805)
- D.C. motor
- Max 232
- Proximity Sensor
- RELAY
- TRANSISTORS
- DB9 Connector
- RADIO FREQUANCY TRANSMITTER:RECEIVER
- Rectifiers

8.Description of Components Used

Microcontroller:

The 89S52 has 4 different ports, each one having 8 Input/output lines providing a total of 32 I/O lines. Those ports can be used to output DATA and orders do other devices, or to read the state of a sensor, or a switch. Most of the ports of the 89S52 have 'dual function' meaning that they can be used for two different functions.

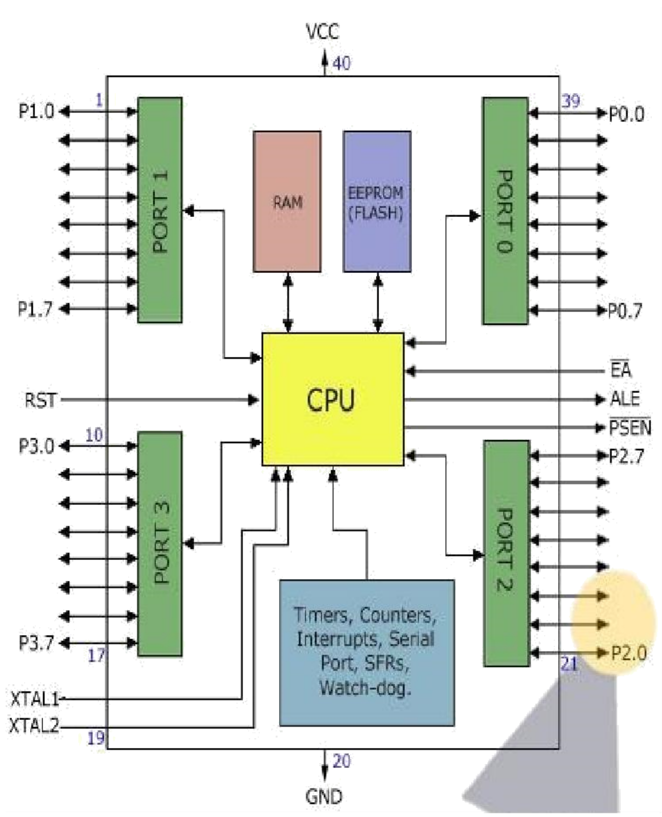


Fig.(a) Block diagram of AT89s52

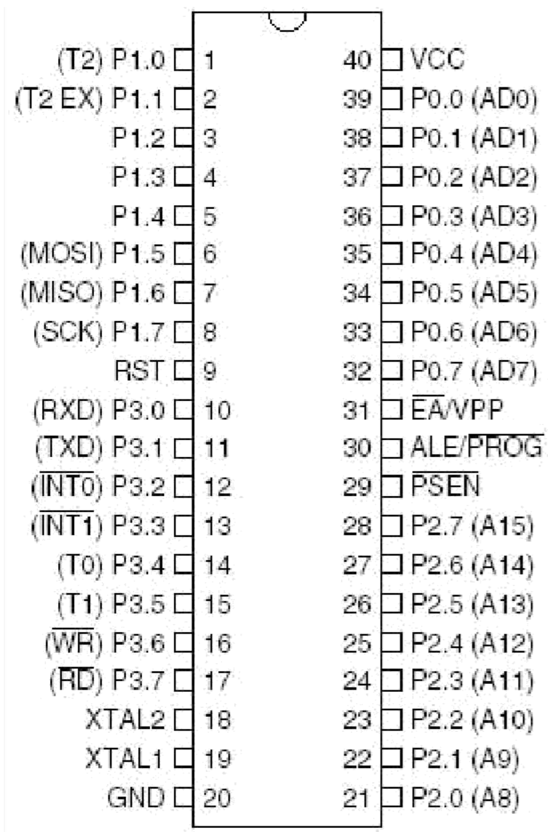
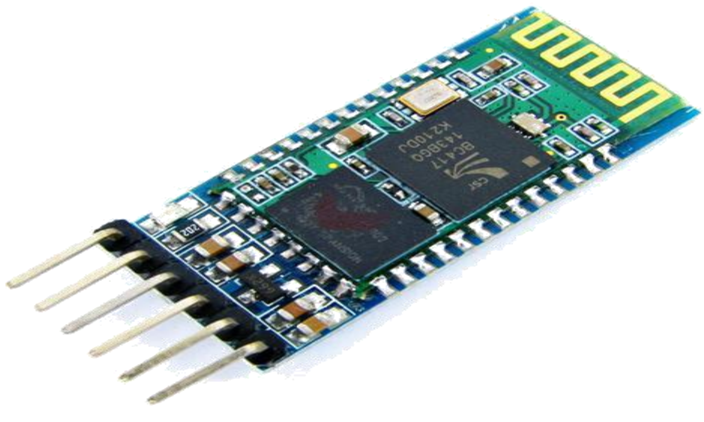


Fig.(b) Pin diagram of AT89s52

There are two different memory types: **RAM** and **EEPROM**. Shortly, RAM is used to store variable during program execution, while the EEPROM memory is used to store the program itself, that's why it is often referred to as the 'program memory'. It is clear that the CPU (Central Processing Unit) is the heart of the micro controllers. It is the CPU that will Read the program from the FLASH memory and execute it by interacting with the different peripherals

Bluetooth:

These small size Bluetooth TTL transceiver modules are designed for serial communication (SPP - serial port profile). It allows your target device to both send or receive TTL data via Bluetooth technology without connecting a serial cable to your computer.



The modules with the **HC-04** and **HC-06** firmware are the modules which are factory set to be Master or Slave modules. Master and slave mode cannot be switched from the factory setting. HC-04 is an industrial grade product, HC-06 is a commercial grade product.

Resistor:

A **resistor** is a two-terminal electronic component that produces a voltage across its terminals that is proportional to the electric current through it in accordance with Ohm's law:

$$V=IR$$

Each color corresponds to a certain digit, progressing from darker to lighter colors, as shown in the chart below.

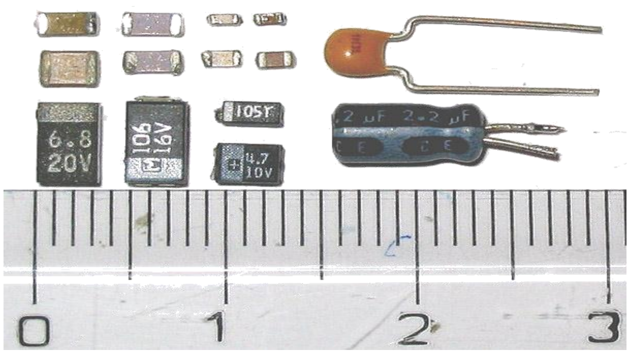
Color	1st band	2nd band	3rd band (multiplier)	4th band (tolerance)	Temp. Coefficient
Black	0	0	$\times 10^0$		
Brown	1	1	$\times 10^1$	±1% (F)	100 ppm
Red	2	2	$\times 10^2$	±2% (G)	50 ppm
Orange	3	3	$\times 10^3$		15 ppm
Yellow	4	4	$\times 10^4$		25 ppm
Green	5	5	$\times 10^5$	±0.5% (D)	
Blue	6	6	$\times 10^6$	±0.25% (C)	
Violet	7	7	$\times 10^7$	±0.1% (B)	
Gray	8	8	$\times 10^8$	±0.05% (A)	
White	9	9	$\times 10^9$		
Gold			$\times 10^{-1}$	±5% (J)	
Silver			$\times 10^{-2}$	**±10% (K)**	
None				±20% (M)	

CAPACITOR:

Capacitor passive electronic component consisting of a pair of conductors separated by a dielectric. When a voltage potential difference exists between the conductors, an electric field is present in the dielectric. This field stores energy and produces a mechanical force between the plates.

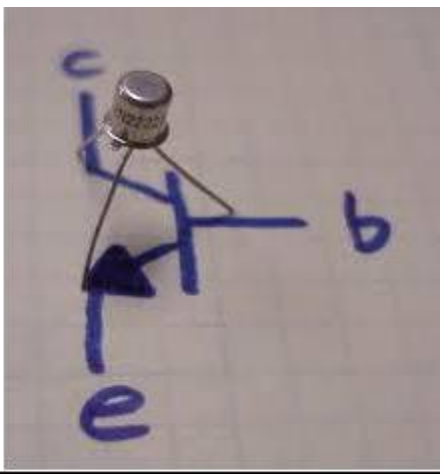
An ideal capacitor is characterized by a single constant value, capacitance, which is measured in farads.

$$C = Q / V$$



TRANSISTOR:

In electronics, a **transistor** is a semiconductor device commonly used to amplify or switch electronic signals. A transistor is made of a solid piece of a semiconductor material, with at least three terminals for connection to an external circuit. The **bipolar junction transistor** (BJT) was the first type of transistor to be mass-produced. Bipolar transistors are so named because they conduct by using both majority and minority carriers. The three terminals of the BJT are named *emitter*, *base*, and *collector*. The BJT consists of two p-n junctions: the base–emitter junction and the base–collector junction, separated by a thin region of semiconductor known as the base region.



Max 232:-

Now that we have the 8 bit value in the 8051, we want to send that value to the PC. The 8051 has a built in serial port that makes it very easy to communicate with the PC's serial port but the 8051 outputs are 0 and 5 volts and we need +10 and -10 volts to meet the RS232 serial port standard. The easiest way to get these values is to use the MAX232. The MAX232 acts as a buffer driver for the processor. It accepts the standard digital logic values of 0 and 5 volts and converts them to the RS232 standard of +10 and -10 volts. It also helps protect the processor from possible damage from static that may come from people handling the serial port connectors

The MAX232 requires 5 external 1uF capacitors. These are used by the internal charge pump to create +10 volts and -10 volts.

For the first capacitor, the negative leg goes to ground and the positive leg goes to pin 16.

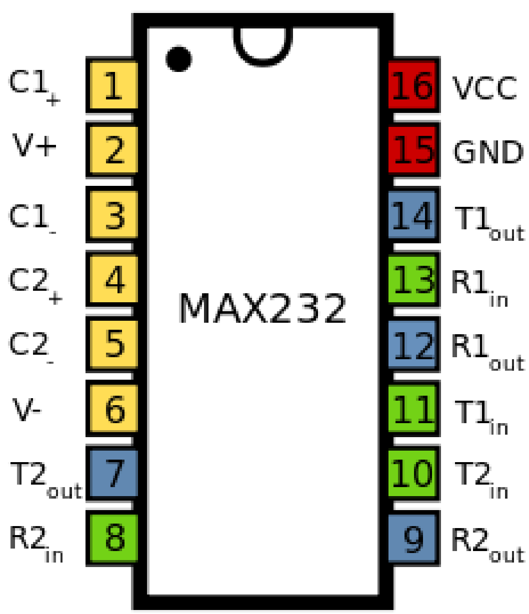
For the second capacitor, the negative leg goes to 5 volts and the positive leg goes to pin 2.

For the third capacitor, the negative leg goes to pin 3 and the positive leg goes to pin 1.

For the fourth capacitor, the negative leg goes to pin 5 and the positive leg goes to pin 4.

For the fifth capacitor, the negative leg goes to pin 6 and the positive leg goes to ground.

The MAX232 includes 2 receivers and 2 transmitters so two serial ports can be used with a single chip. We will only use one transmitter for this project. The only connection that must be made to the 2051 is one jumper from pin 3 of the 2051 to pin 11 of the MAX232



Proximity Sensor:-

Proximity sensors are sensors able to detect the presence of nearby objects without any physical contact. A proximity sensor often emits an electromagnetic or electrostatic field, or a beam of electromagnetic radiation (infrared, for instance), and looks for changes in the field or return signal. The object being sensed is often referred to as the proximity sensor's target. Different proximity sensor targets demand different sensors. For example, a capacitive or photoelectric sensor might be suitable for a plastic target; an inductive proximity sensor requires a metal target. The maximum distance that this sensor can detect is defined "nominal range". Some sensors have adjustments of the nominal range or means to report a graduated detection distance.

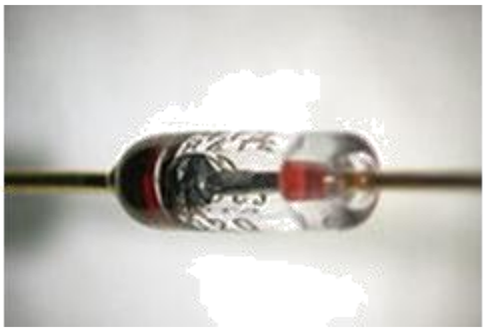
RELAY :-

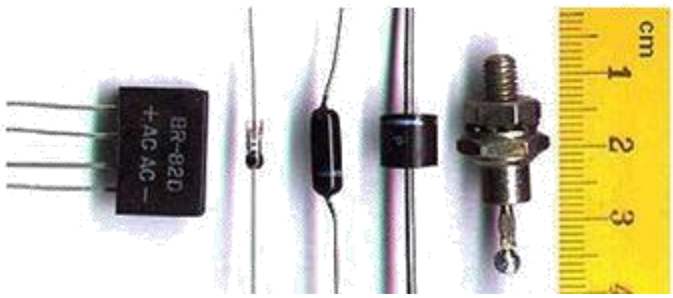
A relay is really a remotely controlled switch. In the diagram above, a power circuit contains a switch which is opened and closed by operation of a relay. The relay is activated by a magnetic core which is energised when a controlling switch is closed. As the core is energised, it lifts and closes a pair of contacts in a second circuit - usually a power circuit. The current required for the relay is usually much lower than that used for the power circuit so it can be provided by a battery.

DIODE :

In electronics, a **diode** is a two-terminal device. Diodes have two active electrodes between which the signal of interest may flow, and most are used for their unidirectional electric current proper.

The most common function of a diode is to allow an electric current to pass in one direction (called the forward biased condition) and to block the current in the opposite direction (the reverse biased condition).





LIGHT EMITTING DIODE:

A **light-emitting diode (LED)** is a semiconductor diode that emits light when an electrical current is applied in the forward direction of the device. LEDs are widely used as indicator lights on electronic devices and increasingly in higher power applications such as flashlights and area lighting

LM7805 (VOLTAGE REGULATOR):

LM7805

The KA78XX/KA78XXA series of three-terminal positive regulator are available in the TO-220/D-PAK package and with several fixed output voltages, making them useful in a wide range of applications. Each type employs internal current limiting, thermal shut down and safe operating area protection, making it essentially indestructible. If adequate heat sinking is provided, they can deliver over 1A output current. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltages and currents.

Features:

- Output Current up to 1A
- Output Voltages of 5, 6, 8, 9, 10, 12, 15, 18, 24V
- Thermal Overload Protection
- Short Circuit Protection
- Output Transistor Safe Operating Area Protection

L293D DC Motor:
An electric motor is a machine which converts electrical energy into mechanical energy.

Principle:

It is based on the principle that when a current-carrying conductor is placed in a magnetic field, it experiences a mechanical force whose direction is given by Fleming's Left-hand rule and whose magnitude is given by

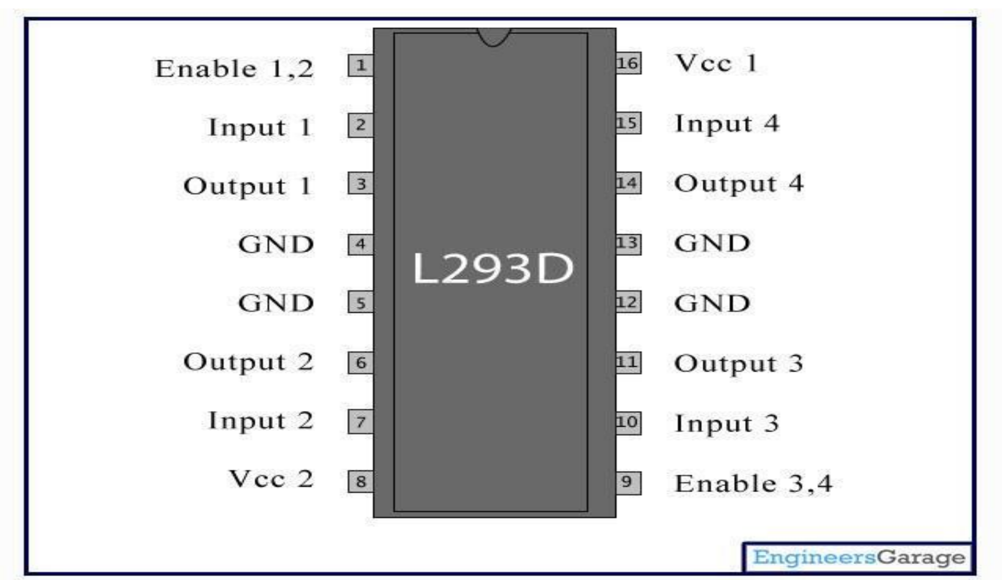
Force, F = B I l newton

Where B is the magnetic field in weber/m^2.

I is the current in amperes and

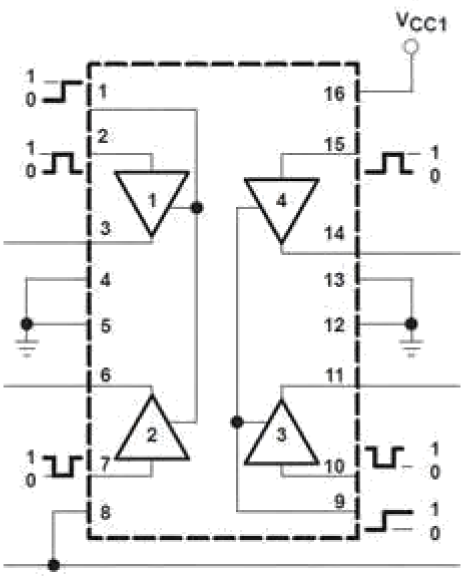
l is the length of the coil in meter.

The force, current and the magnetic field are all in different directions. If an Electric current flows through two copper wires that are between the poles of a magnet, an upward force will move one wire up and a downward force will move the other wire down. **L293D Motor Driver IC**



L293D is a dual H-bridge motor driver integrated circuit (IC). Motor drivers act as current amplifiers since they take a low-current control signal and provide a higher-current signal. This higher current signal is used to drive the motors.

L293D contains two inbuilt H-bridge driver circuits. In its common mode of operation, two DC motors can be driven simultaneously, both in forward and reverse direction. The motor operations of two motors can be controlled by input logic at pins 2 & 7 and 10 & 15. Input logic 00 or 11 will stop the corresponding motor. Logic 01 and 10 will rotate it in clockwise and anticlockwise directions, respectively.



Enable pins 1 and 9 (corresponding to the two motors) must be high for motors to start operating. When an enable input is high, the associated driver gets enabled. As a result, the outputs become active and work in phase with their inputs. Similarly, when the enable input is low, that driver is disabled, and their outputs are off and in the high-impedance state.

Pin No	Function	Name
1	Enable pin for Motor 1; active high	Enable 1,2
2	Input 1 for Motor 1	Input 1
3	Output 1 for Motor 1	Output 1
4	Ground (0V)	Ground
5	Ground (0V)	Ground
6	Output 2 for Motor 1	Output 2
7	Input 2 for Motor 1	Input 2
8	Supply voltage for Motors; 9-12V (up to 36V)	V_{cc2}
9	Enable pin for Motor 2; active high	Enable 3,4
10	Input 1 for Motor 1	Input 3
11	Output 1 for Motor 1	Output 3
12	Ground (0V)	Ground
13	Ground (0V)	Ground
14	Output 2 for Motor 1	Output 4
15	Input2 for Motor 1	Input 4
16	Supply voltage; 5V (up to 36V)	V_{cc1}

9.Software Platform Used

µVision3 Overview:-

The µVision3 IDE is a Windows-based software development platform that combines a robust editor, project manager, and make facility. µVision3 integrates all tools including the C compiler, macro assembler, linker/locator, and HEX file generator. µVision3 helps expedite the development process of your embedded applications by providing the following:

- Full-featured source code editor,
- Device database for configuring the development tool setting,
- Project manager for creating and maintaining your projects,
- Integrated make facility for assembling, compiling, and linking your embedded applications
- Dialogs for all development tool settings,
- True integrated source-level Debugger with high-speed CPU and peripheral simulator,
- Advanced GDI interface for software debugging in the target hardware and for connection to Keil ULINK,
- Flash programming utility for downloading the application program into Flash ROM,
- Links to development tools manuals, device datasheets & user's guides.

The µVision3 IDE offers numerous features and advantages that help you quickly and successfully develop embedded applications. They are easy to use and are guaranteed to help you achieve your design goals.

The **µVision3 IDE and Debugger** is the central part of the Keil development toolchain. µVision3 offers a **Build Mode** and a **Debug Mode**.

In the µVision3 **Build Mode** you maintain the project files and generate the application.

In the µVision3 **Debug Mode** you verify your program either with a powerful CPU and peripheral simulator or with the **Keil ULINK USB-JTAG Adapter** (or other AGDI drivers) that connect the debugger to the target system. The ULINK allows you also to download your application into Flash ROM of your target system.

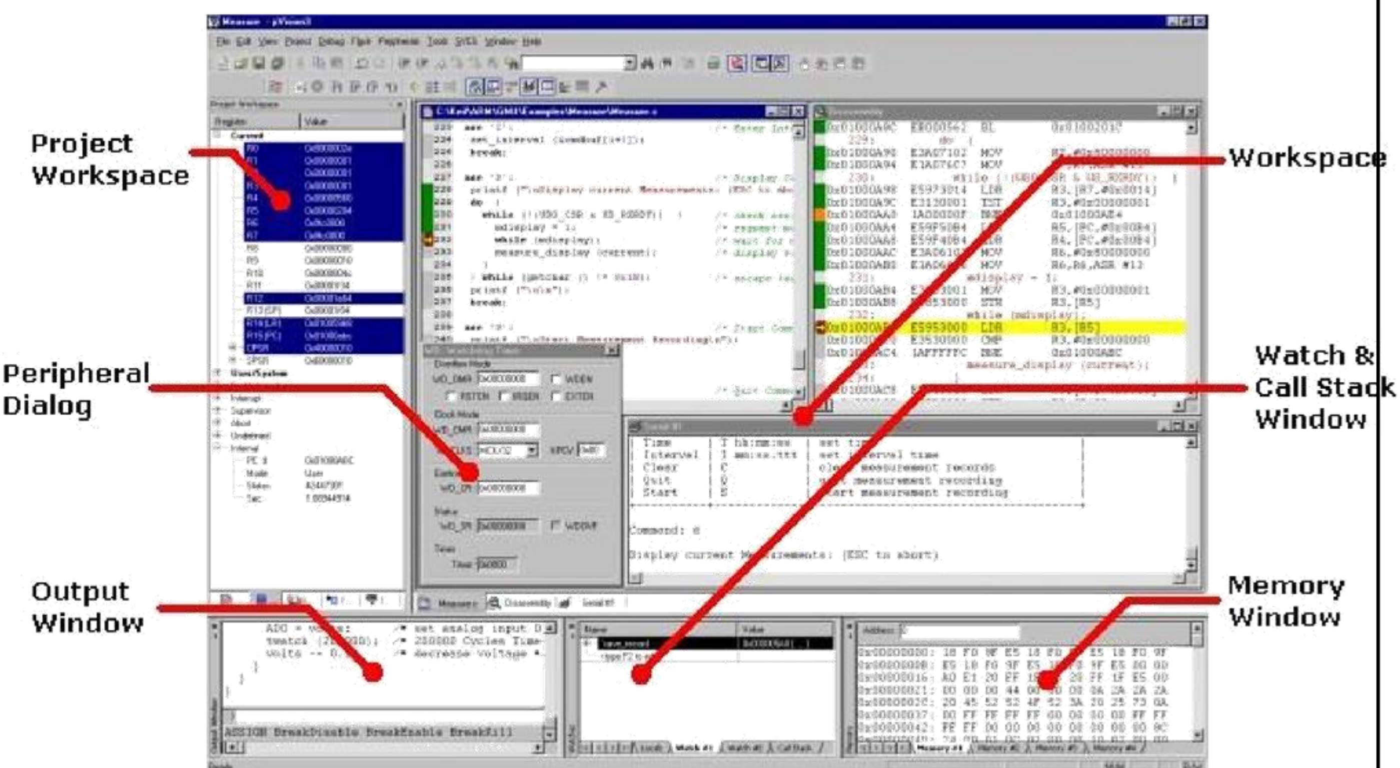
About the Environment

The µVision3 screen provides you with a menu bar for command entry, a tool bar where you can rapidly select command buttons, and windows for source files, dialog boxes, and information displays. µVision3 lets you simultaneously open and view multiple source files.

µVision3 has two operating modes:

- **Build Mode:** Allows you to translate all the application files and to generate executable programs. The features of the Build Mode are described under Creating Applications.
- **Debug Mode:** Provides you with a powerful debugger for testing your application. The Debug Mode is described in Testing Programs.

In both operating modes you may use the source editor of µVision3 to modify your source code. The Debug mode adds additional windows and stores an own screen layout. The following picture shows a typical configuration of µVision3 in the Debug Mode.

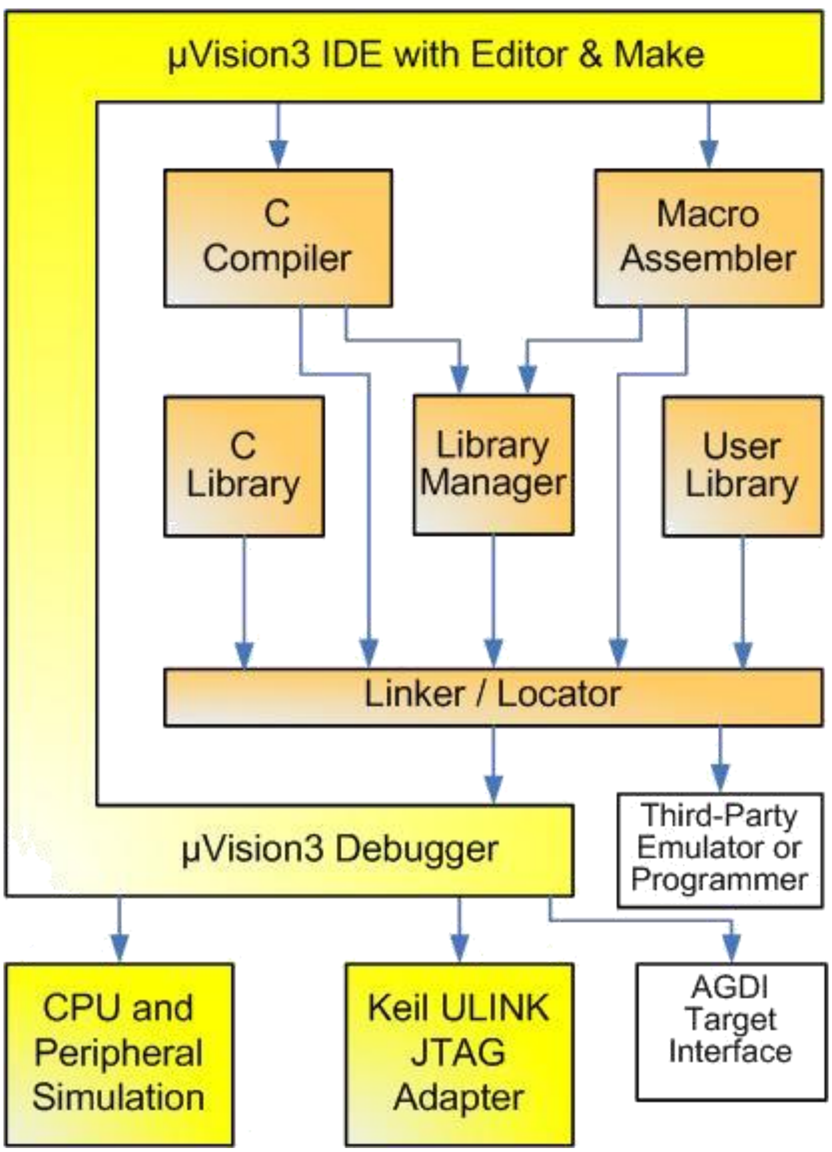


Software Development Cycle

When you use the Keil µVision, the project development cycle is roughly the same as it is for any other software development project.

1. Create a project, select the target chip from the device database, and configure the tool settings.
2. Create source files in C or assembly.
3. Build your application with the project manager.
4. Correct errors in source files.
5. Test the linked application.

The following block diagram illustrates the complete µVision/ARM software development cycle. Each component is described below.



µVision IDE

The µVision IDE combines project management, a rich-featured editor with interactive error correction, option setup, make facility, and on-line help. Use µVision to create your source files and organize them into a project that defines your target application. µVision automatically compiles, assembles, and links your embedded application and provides a single focal point for your development efforts.

DIP TRACE:-

Introduction

DipTrace is a software application for creating schematics and printed circuit boards (PCB) [1]. This document will walk the user through creating and using pattern libraries and schematics layouts in DipTrace. These are two of the four steps needed to create a PCB design using this software. The four steps needed are Component design, Pattern Library design, Schematics Layout and the PCB layout. Throughout this paper there is the assumption that the components layout have already been created and that the user is familiar with the procedure. There are some references and appendix information at the end of this document that can help if further assistance is needed with the techniques not focused on in this paper.

Objective

The objective of this manuscript is to create the libraries and schematics for the PCB that will hold and interface the PSoC First Touch Kit and Arduino Shield. This PCB will allow easy access to both components, in addition, the entire final product will be easy to package. This final product includes the PSoC, the Arduino Shield and the PCB. The communication between the PSoC and Arduino Shield will transpire without further hardware interaction. After the two components are added to the PCB the only changes needed for flexibility in application will be based on software design instead of hardware.

Steps

Schematic Capture:

To start the schematic's design, choose Schematic Capture when opening DipTrace as shown in

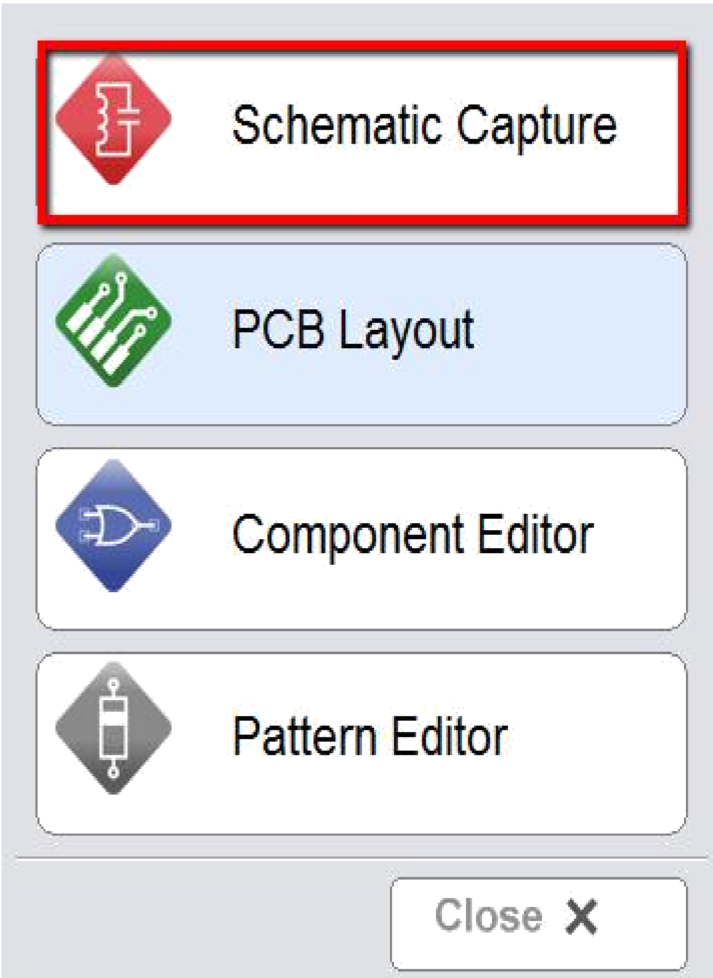
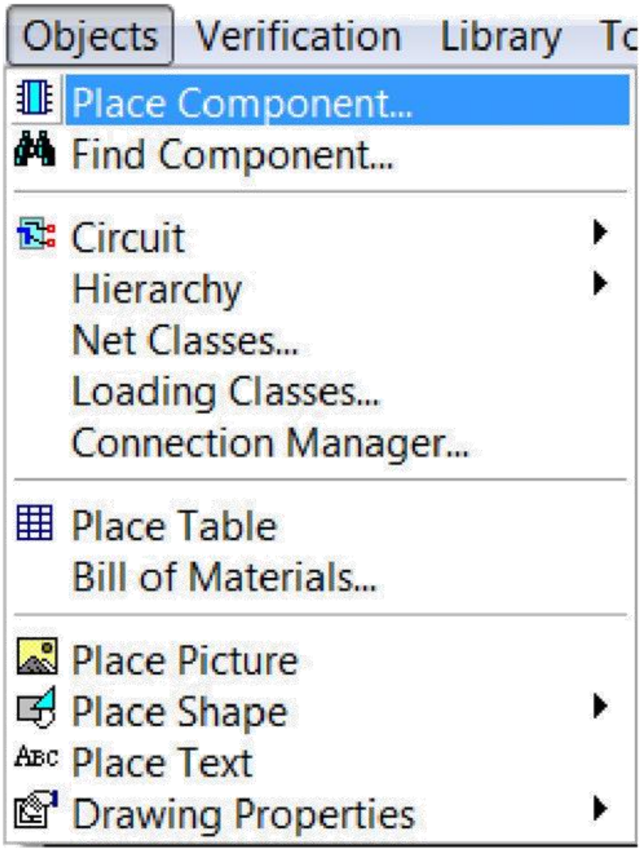
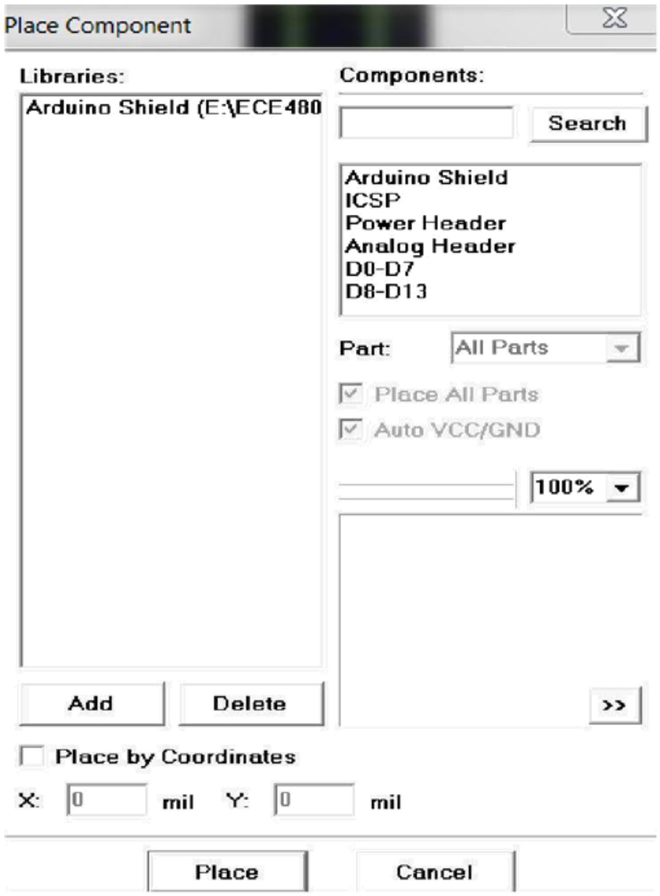


Figure 7.

To begin the schematic access to already designed components is needed. These files have an extension *.eli. To add components click on Objects on the Menu bar at the top of the screen and select Place Component as shown in Figure



. A pop up window will appear as shown in Figure 9. In this window if your library is selected as shown the desired component will be chosen. In this case the component is the Arduino Shield, select it and click Place. The component will now appear on the DipTrace Window and by moving the mouse it can be placed anywhere in the window.



In order to add the PSoC First Touch Kit we follow the same procedure as above with a minor modification. The difference is that the component library needs to be added to the list and then PSoC can be chosen from the list of components within the library. Again, click place and the component will be placed wherever desired in the window, in this particular case the components are 2440 mils from each other. After the steps above are followed the schematics should look as shown in Figure 10 below. The last step of the schematics is to attach the pattern to the components. In order to attach the pattern on each component, right click on the component and choose Attached Pattern as shown in Figure T

he window shown in Figure 12 will pop up, on this window the right pattern library needs to be chosen. If the needed library is not shown in the list, click add and select the correct library. Remember pattern libraries have a file extension of *.lib. After the correct library is selected click ok. Proceed to repeat the same steps to attach the pattern to the Arduino Shield.The final step of the schematic capture is to wire the pins. The wiring configuration is shown in the appendix on this document. Following this configuration choose a pin, for example pin P0_0 of the PSoC connects to Pin D13. Click on on the toolbar at the top of the screen. Next select pin P0_0 and move the mouse to pin D13, click on it and the two pins are now connected. Follow these steps for all the pin connections. At the end of this task, all pins are attached as shown in the schematics layout in Figure 13 below. To confirm the right connections are being made, however over a line connector or a particular pin and either the entire line will change color or the pin that it is attached to will be highlighted. This is the best way to confirm all the connections. This concludes the schematic capture. The next step to the PCB design is to have the PCB layout and the pins routed according to the schematic capture.

10.Design and Implementation

PCB DESIGNING

The main purpose of printed circuit is in the routing of electric currents and signal through a thin copper layer that is bounded firmly to an insulating base material sometimes called the substrate. This base is manufactured with an integrally bounded layer of thin copper foil, which has to be partly etched or removed to arrive at a pre-designed pattern to suit the circuit connections, or other applications as required. Now the petrol washes out the paint and the copper layout on PCB is rubbed with a smooth sand paper slowly and lightly such that only the oxide layers over the Cu are removed. Now the holes are drilled at the respective places according to component layout.

LAYOUT DESIGN

When designing the layout one should observe the minimum size (component body length and weight). Before starting to design the layout we need all the required components in hand so that an accurate assessment of space can be made. Other space considerations might also be included from case to case of mounted components over the printed circuit board or to access path of present components.

It might be necessary to turn some components around to a different angular position so that terminals are closer to the connections of the components. The scale can be checked by positioning the components on the squared paper. If any connection crosses, then one can reroute to avoid such condition.

All common or earth lines should ideally be connected to a common line routed around the perimeter of the layout. This will act as the ground plane.

There are basically two ways of copper interconnection patterns underside the board. The first is the removal of only the amount of copper necessary to isolate the junctions of the components to one another. The second is to make the interconnection pattern looking more like conventional point wiring by routing uniform width of copper from component to component.

ETCHING PROCESS

Etching process requires the use of chemicals. Acid resistant dishes and running water supply. Ferric chloride is mostly used solution but other etching materials such as ammonium per sulphate can be used. Nitric acid can be used but in general it is not used due to poisonous fumes.

The pattern prepared is glued to the copper surface of the board using a latex type of adhesive that can be cubed after use. The pattern is laid firmly on the copper using a very sharp knife to cut round the pattern carefully to remove the paper corresponding to the required copper pattern areas. Then apply the resistant solution, which can be a kind of ink solution for the purpose of maintaining smooth clean outlines as far as possible. While the board is drying, test all the components.Drilling is one of those operations that call for great care. For most purposes a 0.5mm drill is used. Drill all holes with this size first those that need to be larger can be easily drilled again with the appropriate larger size.

SOLDERING

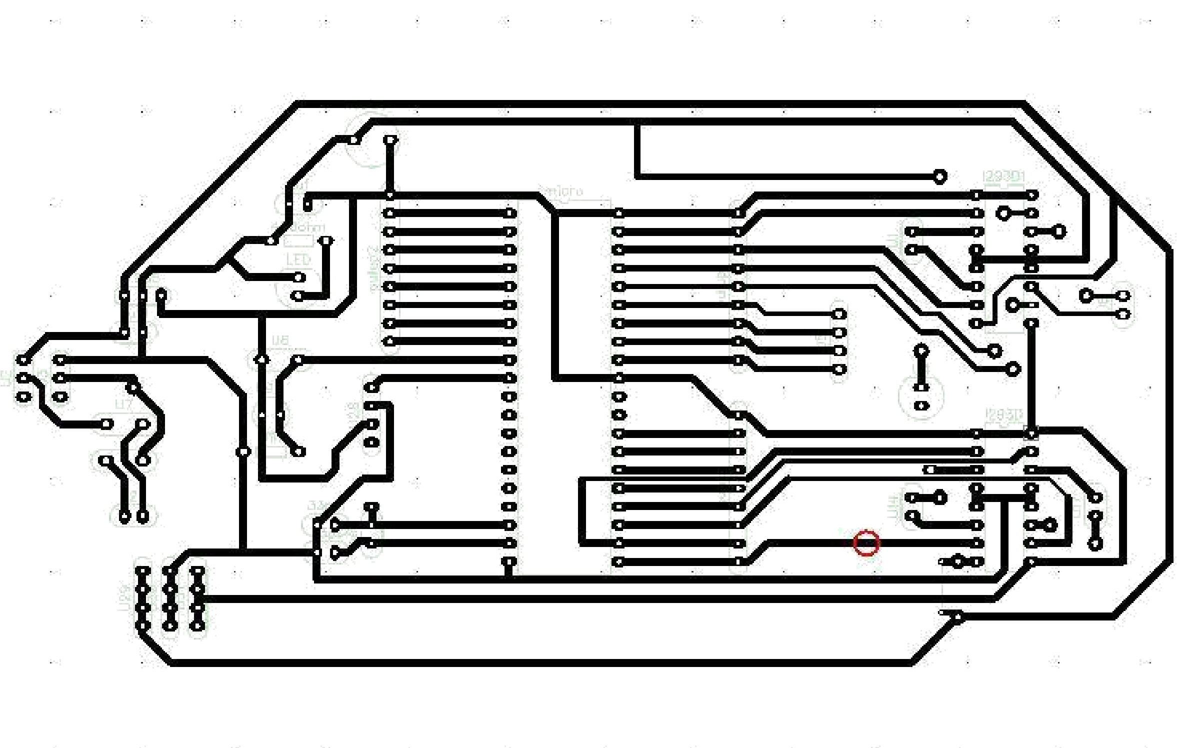
This is the operation of joining the components with PCB after this operation the circuit will be ready to use to avoid any damage or fault during this operation following care must be taken.

1. A longer duration contact between soldering iron bit & components lead can exceed the temperature rating of device & cause partial or total damage of the device. Hence before soldering we must carefully read the maximum soldering temperature & soldering time for device.
2. The wattage of soldering iron should be selected as minimum as permissible for that soldering place.
3. To protect the devices by leakage current of iron its bit should be earthed properly.
4. We should select the soldering wire with proper ratio of Pb&Tn to provide the suitable melting temperature.
5. Proper amount of good quality flux must be applied on the soldering point to avoid dry soldering.

SILK PRINTING

Silk printing is normally used on the component side to identify components, test points, PCB and PCBA part numbers, warning symbols, company logos and manufacturer marks. It isn't uncommon to have silkscreen required for the solder side as well but if you are price sensitive, you need to know the work required to produce two silk-screens is simply twice as much as one. An advantage of drilling the holes first, is when you lay the PCB over the glossy paper silk screen, you can line up the holes. Silk-screening requires specially formulated inks. Standard colours are Black, white and .yellow. Non-standard colours can be requested but will impact your cost and your lead-time.

PCB Layout



11. Program

```
#include<reg51.h>

void display(unsigned char *y);   //lcd functions

 void lcdcmd(unsigned char x);

 void Timer(void);//lcd functions

sfr16 DPTR =0x82;

sbit trig=P3^5; // conect with trigger pin

sbit echo=P3^2; // connect with echo pin

sbit obs=P3^0;

  sbit rs=P2^2;

 sbit rw=P2^1;

 sbit en=P2^0;

 sfr lcddata=0x80; // P0 port data port

unsigned int a,b,c,d,e;

 float rfl, dis;

    void main()

    {

      P1=0xFF; // Port 2 as input port

             obs=0;

 lcdcmd(0x01);//clear display screen

TMOD=0x19; // T1 register as a timer and T0 as a external intrupt timer

while(1)

{

do
```

```
{
            TH0=0;
            TL0=0;
            TR0=1; // T0 intiallization
            for(b=0; b<6000; b++)
             Timer();
trig=1;
for(a=0; a<10; a++)
            Timer();
trig=0;
            while(INT0==0);
                        while(INT0==1); // when echo pin recieve the echo sound or
reflacted sound T0 will be stop
            DPH=TH0; // shifting the value of TH0 in DPH
            DPL=TL0; // shifting the value of TH0 in DPL
             if(DPTR<35000)//actually you need to use 38000 but the sensor may
not work at higher levels
 rfl=DPTR/64;  // for meausring distance in cm, where rfl is actual distance
from the sensor
            lcdcmd(0x38); // 2 line 5x7 Matrix
     lcdcmd(0x0C); // Display on Cursor OfF
   lcdcmd(0x60); //incriment cursor right
   lcdcmd(0x80); // force cursor 1st Line
  // a basic test program
             if(rfl<=50)
             {
```

```
obs=1;
display("Distance  = 50cm");
  lcdcmd(0xC0);
  display("Danger      ");
           }
 else
 if(rfl>=50 && rfl<=60)
           {
                   obs=0;
                    display("Distance <= 60cm");
  lcdcmd(0xC0);
  display("Caution     ");
           }
                     else if(rfl>=60 && rfl<=70)
           {
                   obs=0;
                    display("Distance <= 70cm");
  lcdcmd(0xC0);
  display("Caution     ");
           }
                     else if(rfl>=70 && rfl<=80)
           {                obs=0;
                    display("Distance <= 80cm");
  lcdcmd(0xC0);
  display("Caution     ");
           }
```

```
else if(rfl>=90 && rfl<=100)
            {
                        obs=0;
                         display("Distance <=100cm");
  lcdcmd(0xC0);
  display("Caution     ");
            }

             else if(rfl>=100 && rfl<=110)
            {
                        obs=0;
                         display("Distance <=110cm");
  lcdcmd(0xC0);
  display("Obj Detected");
            }

            else if(rfl>=120)
            {
                        obs=0;
                         display("Distance =>120cm");
  lcdcmd(0xC0);
  display("Okay        ");
            }
 }
while (TF0==0);
```

```
TR0=0;
TF0=0;
}
    }
void lcdcmd(unsigned char x)
{
lcddata=x;
rs=0;
rw=0;
en=0;
        for(a=0; a<=500; a++)
Timer();
en=1;
}
void display(unsigned char *y)
{
while(*y)
{
lcddata=*y++;
rs=1;
rw=0;
en=0;

for(a=0; a<=500; a++)
Timer();
en=1;
```

```
 }
}
void Timer(void)
{
  TH1=0xFF;
  TL1=0xFE;
  TR1=1;
  while(TF1==0);
  TR1=0;
  TF1=0;
}
```

12. Cost Analysis

S.NO	Components Required	Quantity	Approximate Cost(Rupee)
1	Bluetooth	1	800
2	Pull Up Resistor	2	180
3.	DC Motor	2	240
4.	Sensors	1	400
5.	Regulator (7805)	1	20
6.	Relay	8	400
7.	PCB Boards	2	150
8.	Battery	2	100
9.	Connecting Cords/wires	5 mts	100
10.	Radio frequency transmitter and receiver	1	250
11	DB9 Connector	10	100
11.	Wheels	4	200
12.	Resistors	10	10
13.	Transistors	5	10
14.	Other Expenditure		1500
	TOTAL COST		4150

13. Conclusion

Here by we come to the end of our project “ULTRASONIC ROBOT”
After creating the mobile robot, implementing the collision avoidance algorithm on the
Microcontroller, testing and with modifications we were able to achieve our project goal. That is to
design a collision avoidance robot. Our final version of the mobile robot was able to avoid collisions

Future Expansion

There are several limitations that exist in the current system which should be addressed in further developments.

The mobile robot has information only about its local environment and does not localize itself in a global environment. Thus it is impossible to introduce a define goal to the mobile robot to reach in global environment
.
The robot scans through the sonar sensor only in five predefined directions. This effect can be minimized by incorporating probabilistic models to the system which is somewhat difficult in a microcontroller.

14. Bibliography

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