HAND & HEAD MOUNTED HAPTIC FEEDBACK SONAR OBSTACLE AVOIDANCE DEVICE

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Abstract

This is a project I am calling Tacit. No, I did not bother making an awkward synonym for it, it just seemed like an appropriate name that is a lot shorter (though less descriptive) than "Hand & Head Mounted Haptic Feedback Sonar Obstacle Avoidance Device". It measures the distance to things and translates that into pressure on the wrist. It is wrist & head mounted and senses objects from about 1 inch (2 cm) to 5 feet. It has generally fast response time (fractions of a second) to quickly navigate complex environments. It is designed to help a vision impaired person to navigate complex environments. It is not perfect, but it works, and it can be better. For example it could easily be made about half the size, and the replaceable batteries should be replaced by rechargeable with a blind-friendly charging method, either wireless or magnetically-aligning power plug. After some testing I decided to use some small vibration with cushions on the ends, these can be quickly and precisely positioned in a lot of positions and give higher fidelity.

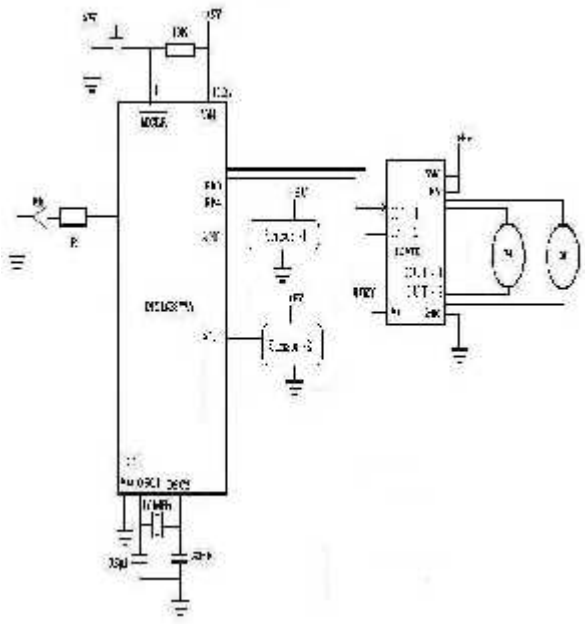
Keywords

PIC microcontroller (PIC16F877A), Arduino Mini Pro 5v (I also use a FTDI 5v basic adapter to program the Arduino but any 5v FTDI cable should work). Shape Lock, Ultra Sonic Sensor, Vibration Motor.

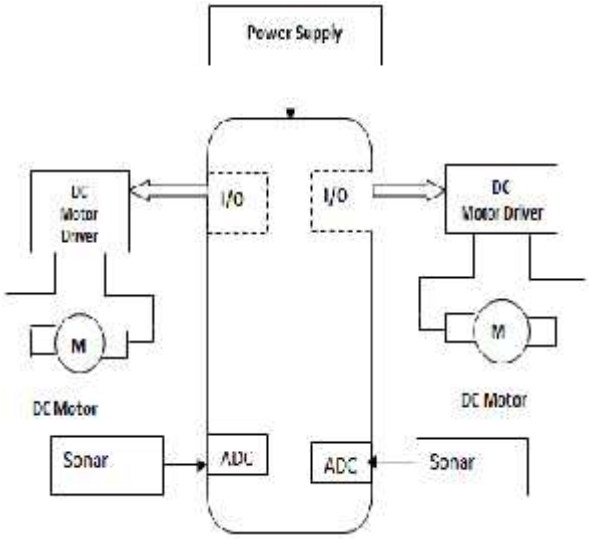
Introduction

In this project an ultra Sonic wave will be generated by crystal frequency generator and Ultra Sonic Sensor in Ultra Sonic range, which is beyond the range of human hearing. The echo will generate and received by Ultra Sonic Sensor, that signal is given to microcontroller, It will process the signal and give to motor driver circuit so that vibration motor will start vibrating.

Circuit Diagram

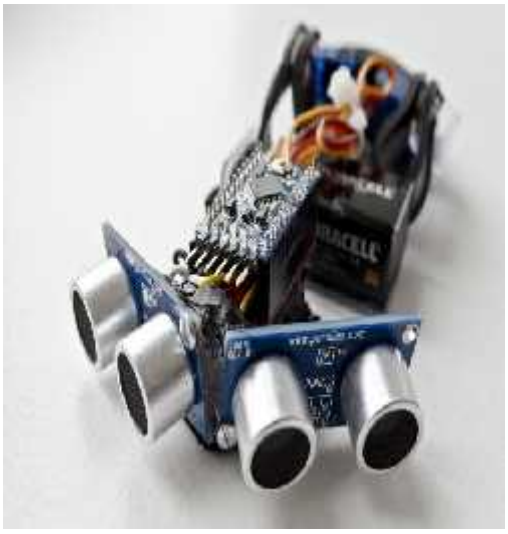


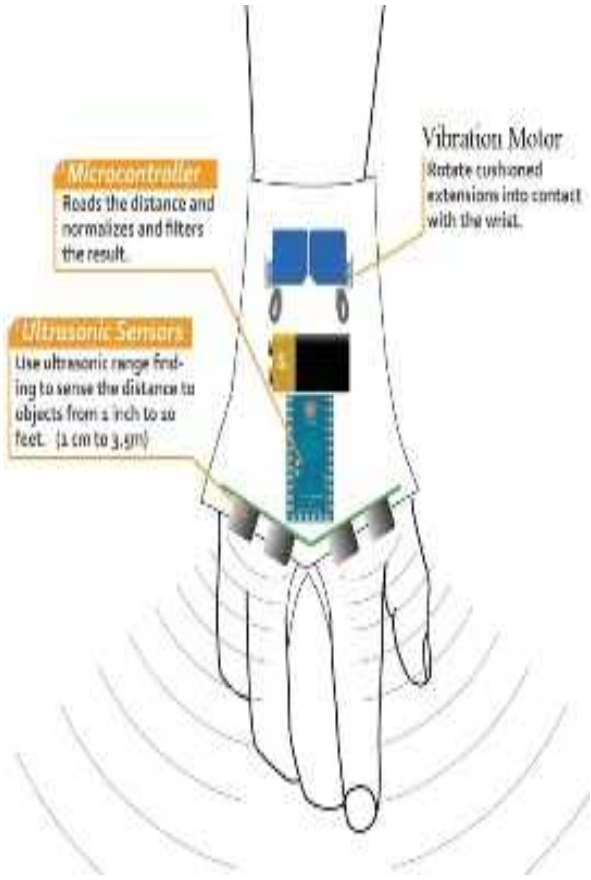
Block Diagram



Specification

- The first module of the block diagram is the node-1 of transmission section called as ADMINE BLOCK, which contains MICROCONTROLLER (16F877A) I2CSerial EEPROMs.
- This module is used to received the signal and store it in PIC MICROCONTROLLER.
- The second module of the block diagram is called MOTOR DRIVER BLOCK. It will control the vibration of motor.





Project kit

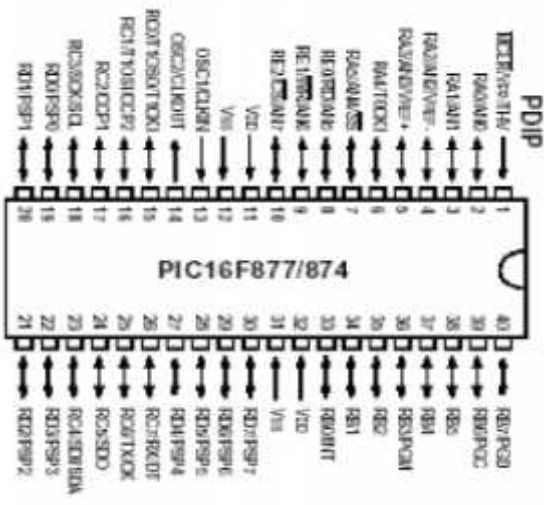
Hardware Requirement

1. PIC Microcontroller (16F877A)
2. Regulator (LM7805)
3. Rectifier
4. Crustal Oscillator
5. Motor Driver IC (L293D)
6. Power supply

Description

PIC Microcontroller (16F877A)

- The 16F877A PIC microcontroller is the main component of this project. 16F877A PIC Micro controller is a 10-bit microcontroller with 72 Kbytes of programming memory. The microcontroller interfaced with the accelerometer records the physical activity and prepares the profile of the user which can be analyzed.



Pin Diagram

- It is a High performance of RISC CPU with 35 single word instructions, All single cycle instruction except for program branches with two cycle.

Code

```
{#include<pic.h>
#include"delay.c"

#include"adc_driver.c"
 __CONFIG(0x1932);
void main()
TRISC = 0x00;
PORTC = 0x00;
TRISB = 0xFF;
PORTB = 0x00;
unsigned char adc1,adc2;
adc_init();
while(1)
{
adc_channel(0);
adc1 = adc_res();
adc1 = adc1/2;
adc_channel(1);
adc2 = adc_res();
adc2 = adc2/2;
if(adc1 > 150)
{
RC0 = 1;
RC1 = 0;
}
if(adc2 > 150)
{
RC2 = 1;
RC3 = 0;
}
if(adc1 < 150)
{
RC0 = 0;
RC1 = 0;
}
if(adc2 < 150)
{
RC2 = 0;
RC3 = 0;
}
if(adc2 > 150 && adc1 > 150)
{
RC0 = 1;
RC1 = 0;
RC2 = 1;
RC3 = 0;
}
else
{
RC0 = 0;
RC1 = 0;
RC2 = 0;
RC3 = 0;
}
}
 }
```

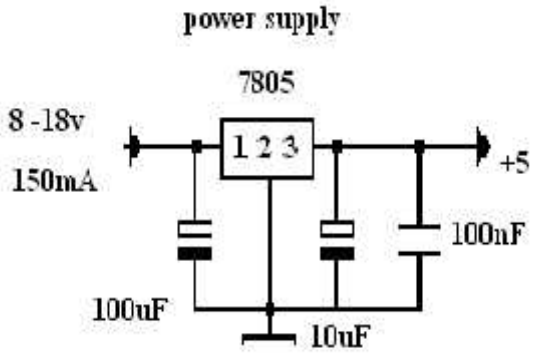
Interface

In this project we are using two circuit, first one is main circuit and second one is motor circuit. In main circuit we are using rectifier for AC supply, Regulator for converting power supply from 9V to 5V, Crystal Oscillator for generating frequency, Capacitor for removing noise signal and reset button for refreshing the circuit. Sensors are connected with the main circuit.

The motor circuit consist of two vibration motor and power supply.

Power supply

This circuit is a small +5V power supply, which is useful when experimenting with digital electronics. Small inexpensive wall transformers with variable output voltage are available from any electronics shop and supermarket. Those transformers are easily available, but usually their voltage regulation is very poor, which makes then not very usable for digital circuit experimenter unless a better regulation can be achieved in some way. The following circuit is the answer to the problem. This circuit can give +5V output at about 150 mA current, but it can be increased to 1 A when good cooling is added to 7805 regulator chip. The circuit has over overload and terminal protection.



Application

- The device has simple structure with good precision and efficient to transform signals towards receivers.
- The device is designed to implement anywhere.
- This model can be used any one and use any number of times.

Conclusion

In this model, I made the project using real time embedded system for blind person with Ultrasonic Sensor, Vibration Motor and Motor Driver Circuit. As we know that blind person walking by the help of stick holding in the hand. But by the help this device he can go at any place with free hand and not only that he can do any other work because his hand is not engaged.

Reference

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