

```
#include "fix_fft.h" // Header file for fast fourier transform for converting
time domain signal to frequency domain.
```

```
char im[128], data[128]; //Arrays for imaginary and real part of fft analysis as
the output of fft is a complex number
```

```
int i = 0, val; //Variable used for temporary data handling in code
```

```
//Declation of functions/sub-routines used in code
```

```
void pinConfig(void);
```

```
void ledTesting(void);
```

```
void clearLed(void);
```

```
void ledDispC1(int);
```

```
void ledDispC2(int);
```

```
void ledDispC3(int);
```

```
//Setup function runs only once when arduino starts. The pin configuration and
led testing is done here.
```

```
void setup()
```

```
{
```

```
    Serial.begin(9600); //Serial moniter is used for debugging code and
refining logic. runs once
```

```
    analogReference(DEFAULT);
```

```
    pinConfig(); //which pins for outputs and inputs
```

```
    ledTesting(); //turns on leds for one second
```

```
    clearLed(); //turns all of
```

```
}
```

```
//This function runs indefinitely. Takes analog readings of audio signal,
processes it and controls leds.
```

```
void loop()
```

```
{
```

```
    while(1) {
```

```
    // Serial.println("looping");
```

```
    int min=1024, max=0;
```

```
    //Looping 128 times to take 128 samples of input audio signal and saving in
data array.
```

```
    for (i = 0; i < 128; i++) {
```

```
        val = analogRead(A0);
```

```
        //Serial.print("val= ");
```

```
        //Serial.println(int(val));
```

```
        data[i] = val / 4 - 128;
```

```
        im[i] = 0;
```

```
        if(val>max) max=val;
```

```
        if(val<min) min=val;
```

```
    }
```

```

//The data array is pass through FFT transform with 2^7 bins.
fix_fft(data, im, 7, 0);
int dat=0,dat_current=0;
int freq_avg[3];
//The below mentioned while loops scale 128 frequency bands into 3 different
bands.
i=1;
while(i<=20){
    dat+=sqrt(data[i] * data[i] + im[i] * im[i]);
    i+=1;
}
freq_avg[0]=dat;
dat=0;
while(i<=50){
    dat+=sqrt(data[i] * data[i] + im[i] * im[i]);
    i+=1;
}
freq_avg[1]=dat;
dat=0;
while(i<=127){
    dat+=sqrt(data[i] * data[i] + im[i] * im[i]);
    i+=1;
}
freq_avg[2]=dat;
// for(int i=0;i<3;i++){
//     Serial.println(freq_avg[i]);
// }

//The signal strength value for all bands is given to led display functions for
all 3 bands.
    ledDispC1(freq_avg[0]);
    ledDispC2(freq_avg[1]);
    ledDispC3(freq_avg[2]);
    clearLed();
delay(10);    //delay of 10ms is added to allow better visualization on
leds
}}

//This function sets pin direction as the pins can be both configured as output
and input.
void pinConfig(void){
    pinMode(2,OUTPUT);
    pinMode(3,OUTPUT);
    pinMode(4,OUTPUT);

```

```

pinMode(5,OUTPUT);

pinMode(6,OUTPUT);
pinMode(7,OUTPUT);
pinMode(8,OUTPUT);
pinMode(9,OUTPUT);

pinMode(10,OUTPUT);
pinMode(11,OUTPUT);
pinMode(12,OUTPUT);
pinMode(13,OUTPUT);

pinMode(A0,INPUT);
}
void ledTesting(void){
    for(int i=2;i<=13;i++){
        digitalWrite(i,HIGH);
    }
    delay(1000);
    for(int i=2;i<=13;i++){
        digitalWrite(i,LOW);
    }
}
//This function clears all leds by setting them to low
void clearLed(void){
    for(int i=2;i<=13;i++){
        digitalWrite(i,LOW);
    }
}
//This function takes first (lowest) band amplitude value and controls state of
first band leds
void ledDispC1(int amp){
    // Serial.print("First bin value is:");
    // Serial.println(amp);
    int temp;
    if(amp>25)
        temp=4;
    else if(amp>17)
        temp=3;
    else if(amp>12)
        temp=2;
    else if(amp>2)
        temp=1;
    for(int i=2;i<2+temp;i++){
        digitalWrite(i,HIGH);
    }
}

```

```

    }
    for(int i=2+temp;i<=5;i++){
        digitalWrite(i,LOW);
    }
}
//This function takes 2nd (middle) band amplitude value and controls state of 2nd
band leds
void ledDispC2(int amp){
    // Serial.print("2nd bin value is:");
    // Serial.println(amp);
    int temp;
    if(amp>25)
        temp=4;
    else if(amp>17)
        temp=3;
    else if(amp>12)
        temp=2;
    else if(amp>2)
        temp=1;
    for(int i=6;i<6+temp;i++){
        digitalWrite(i,HIGH);
    }
    for(int i=6+temp;i<=9;i++){
        digitalWrite(i,LOW);
    }
}
//This function takes 3rd (Highest) band amplitude value and controls state of
3rd band leds
void ledDispC3(int amp){
    // Serial.print("3rd bin value is:");
    // Serial.println(amp);
    int temp;
    if(amp>25)
        temp=4;
    else if(amp>17)
        temp=3;
    else if(amp>12)
        temp=2;
    else if(amp>2)
        temp=1;
    for(int i=10;i<10+temp;i++){
        digitalWrite(i,HIGH);
    }
    for(int i=10+temp;i<=13;i++){
        digitalWrite(i,LOW);
    }
}

```

}
}