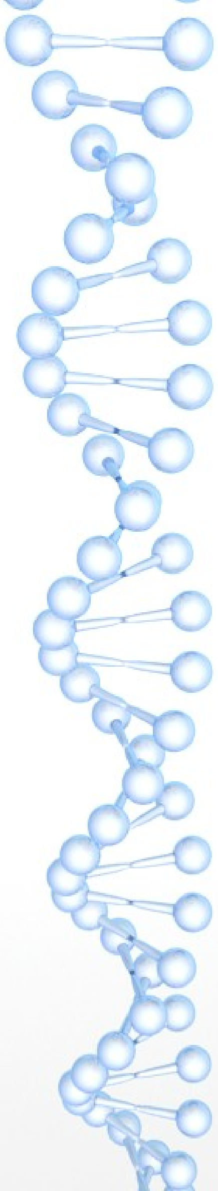

Interfacing Sensors with ARM Mbed
Assignment-3 (SM5033)

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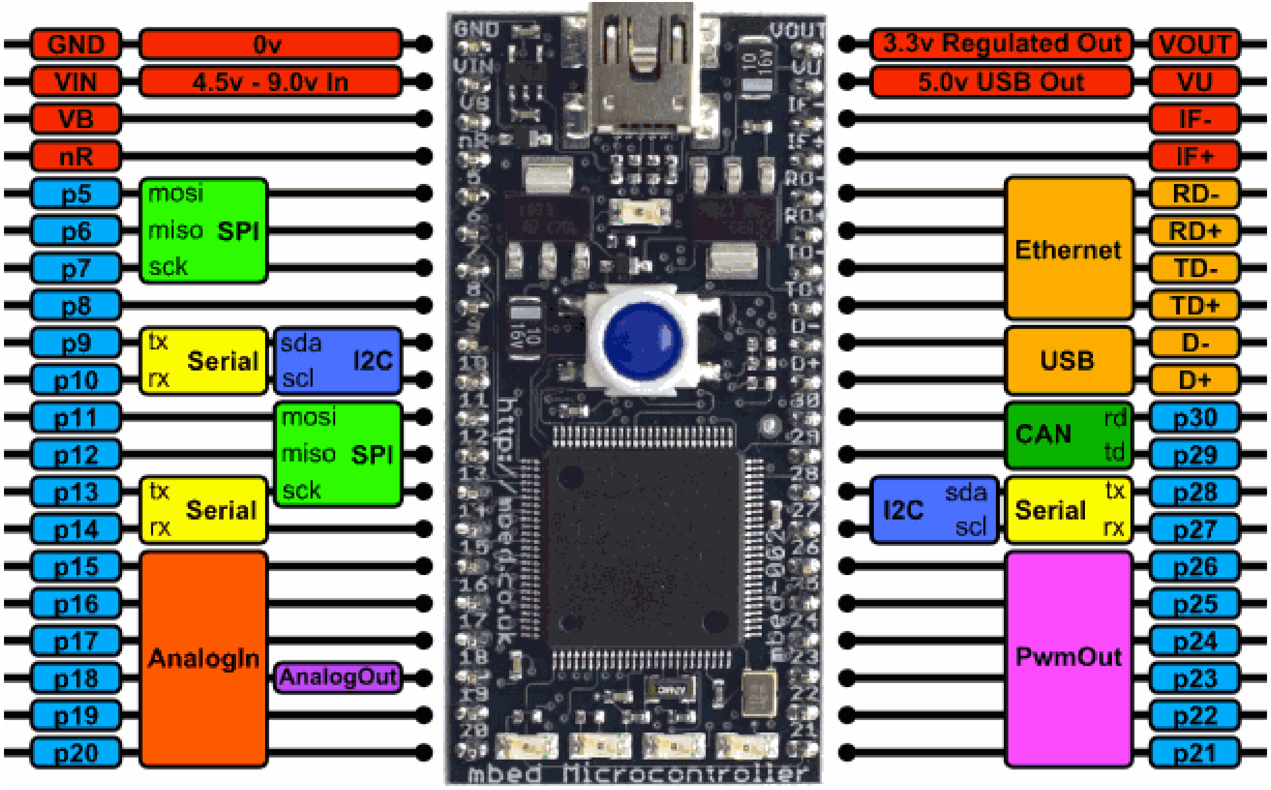
Outline

- Sensors
- Components
- Stimulation Snap and Video
- Code
- Explanation
- References

Components

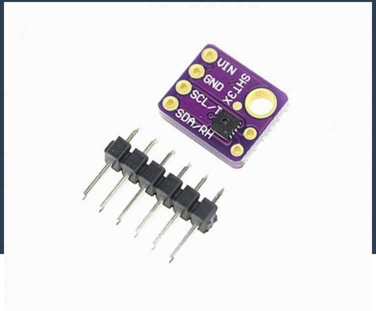
- **ARM Mbed Microcontroller**
- **White, Red, Blue, Yellow LED**
- **Sensor SHT31 (Temprature, Humidity)**
- **Speaker**
- **Bread Board**
- **Jumper Wires**
- **Potentiometer**
- **Interrupt Switch**

ARM Mbed



os.mbed.com

Sensor: SHT31

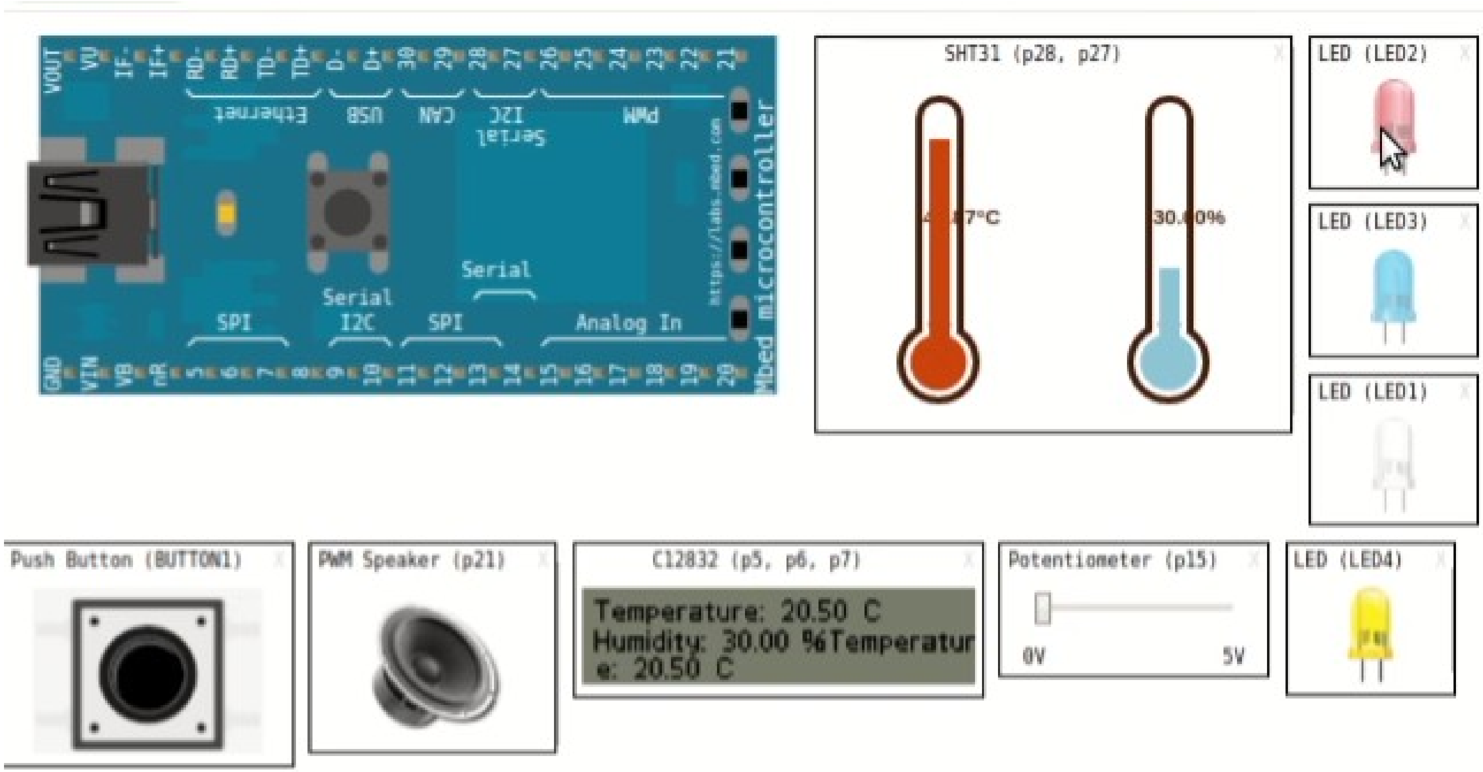


The SHT31-DIS-B is a Humidity and Temperature Sensor builds on a new CMOSens® sensor chip that is at the heart of Sensirions new humidity and temperature platform. It has increased intelligence, reliability and improved accuracy specifications compared to its predecessor. Its functionality includes enhanced signal processing, two distinctive and user selectable I²C addresses and communication speeds of up to 1MHz.

QUALITIES:

- Highly reliable, accurate(±2%RH and ±0.3°C) and quick response time.
- Grove compatible and easy to use.
- Well calibrated, linearized, compensated for digital output.
- Highly abstracted development library.
- Low signal-to-noise ratio.

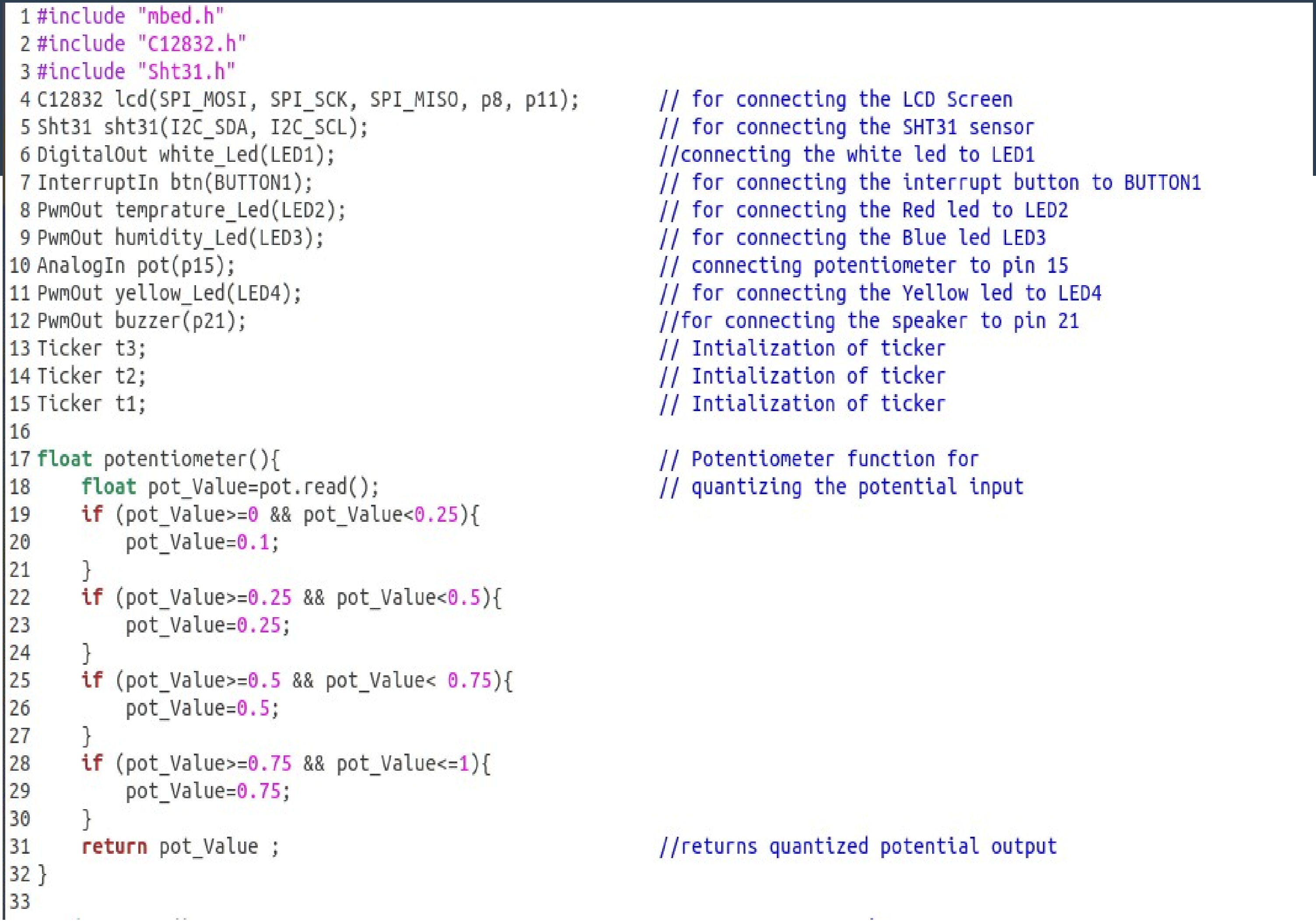
Stimulation Snap



```
Temperature: 20.50 C
Humidity: 30.00 %Temperatur
e: 20.50 C
```

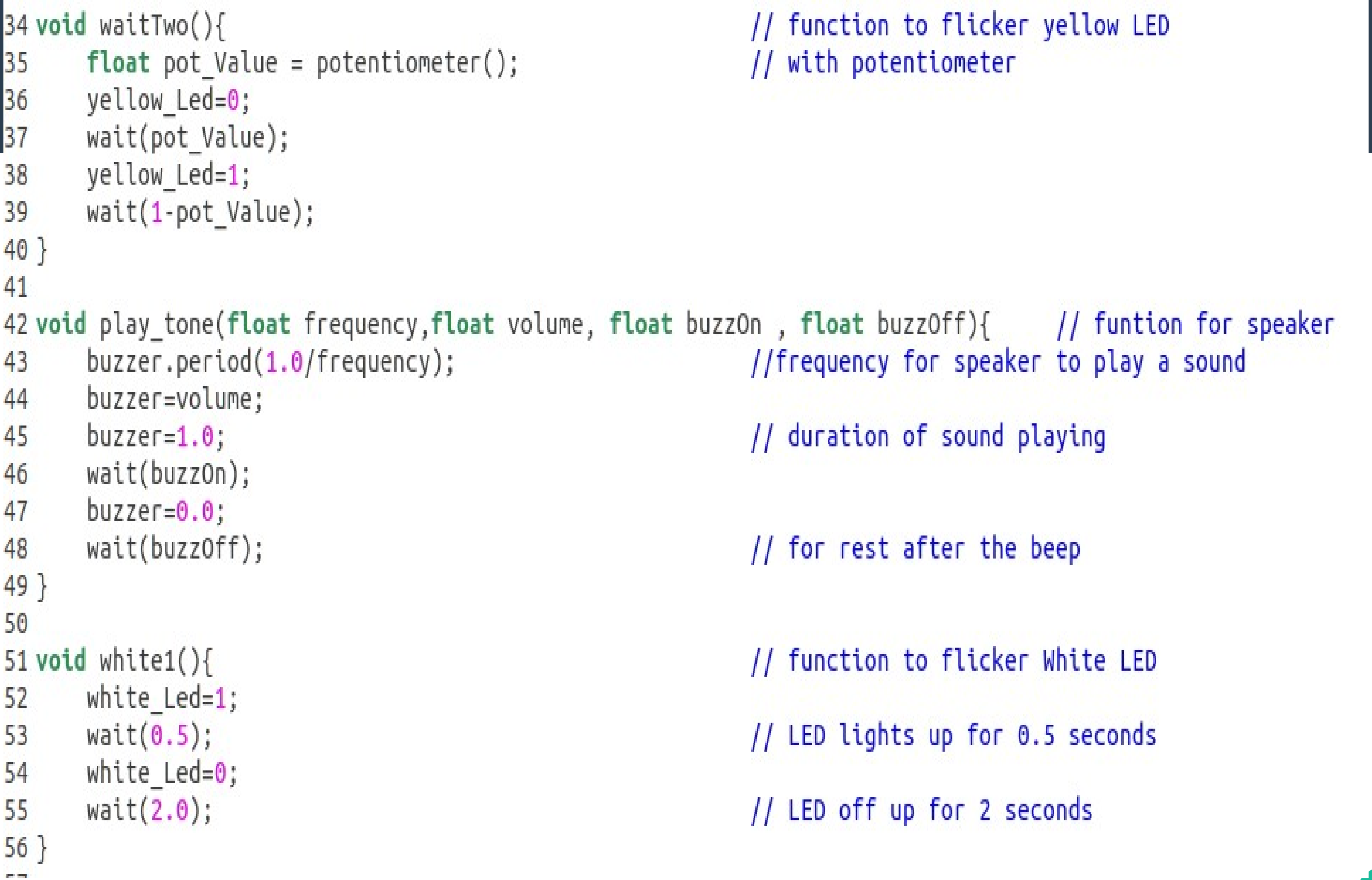
Stimulator.mbed.com

Code



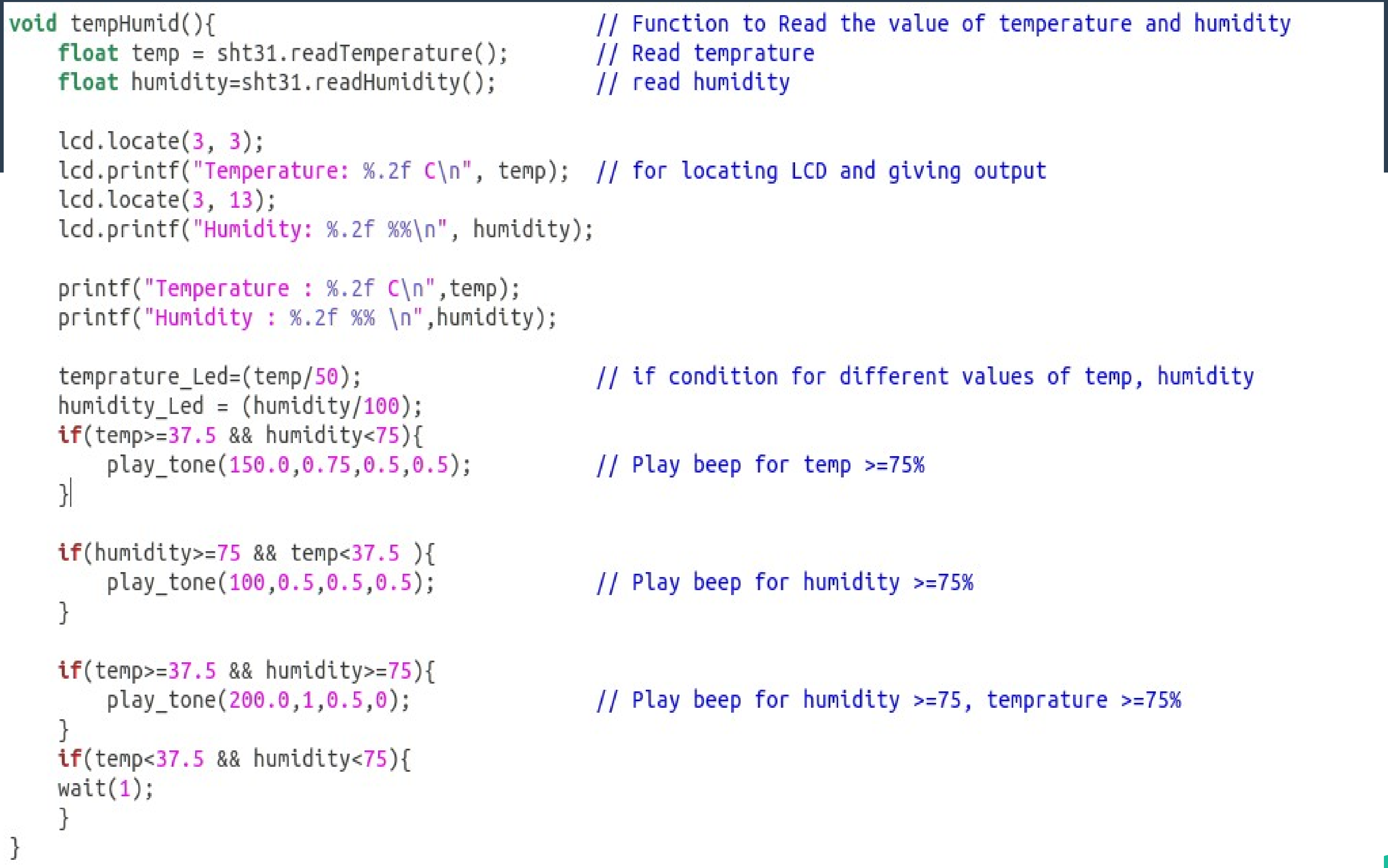
```
#include "mbed.h"
#include "C12832.h"
#include "Sht31.h"
C12832 lcd(SPI_MOSI, SPI_SCK, SPI_MISO, p8, p11);      // for connecting the LCD Screen
Sht31 sht31(I2C_SDA, I2C_SCL);                          // for connecting the SHT31 sensor
DigitalOut white_Led(LED1);                             //connecting the white led to LED1
InterruptIn btn(BUTTON1);                               // for connecting the interrupt button to BUTTON1
PwmOut temprature_Led(LED2);                            // for connecting the Red led to LED2
PwmOut humidity_Led(LED3);                              // for connecting the Blue led LED3
AnalogIn pot(p15);                                      // connecting potentiometer to pin 15
PwmOut yellow_Led(LED4);                                // for connecting the Yellow led to LED4
PwmOut buzzer(p21);                                     //for connecting the speaker to pin 21
Ticker t3;                                              // Intialization of ticker
Ticker t2;                                              // Intialization of ticker
Ticker t1;                                              // Intialization of ticker

float potentiometer(){                                  // Potentiometer function for
    float pot_Value=pot.read();                         // quantizing the potential input
    if (pot_Value>=0 && pot_Value<0.25){
        pot_Value=0.1;
    }
    if (pot_Value>=0.25 && pot_Value<0.5){
        pot_Value=0.25;
    }
    if (pot_Value>=0.5 && pot_Value< 0.75){
        pot_Value=0.5;
    }
    if (pot_Value>=0.75 && pot_Value<=1){
        pot_Value=0.75;
    }
    return pot_Value ;                                  //returns quantized potential output
}

```

Code



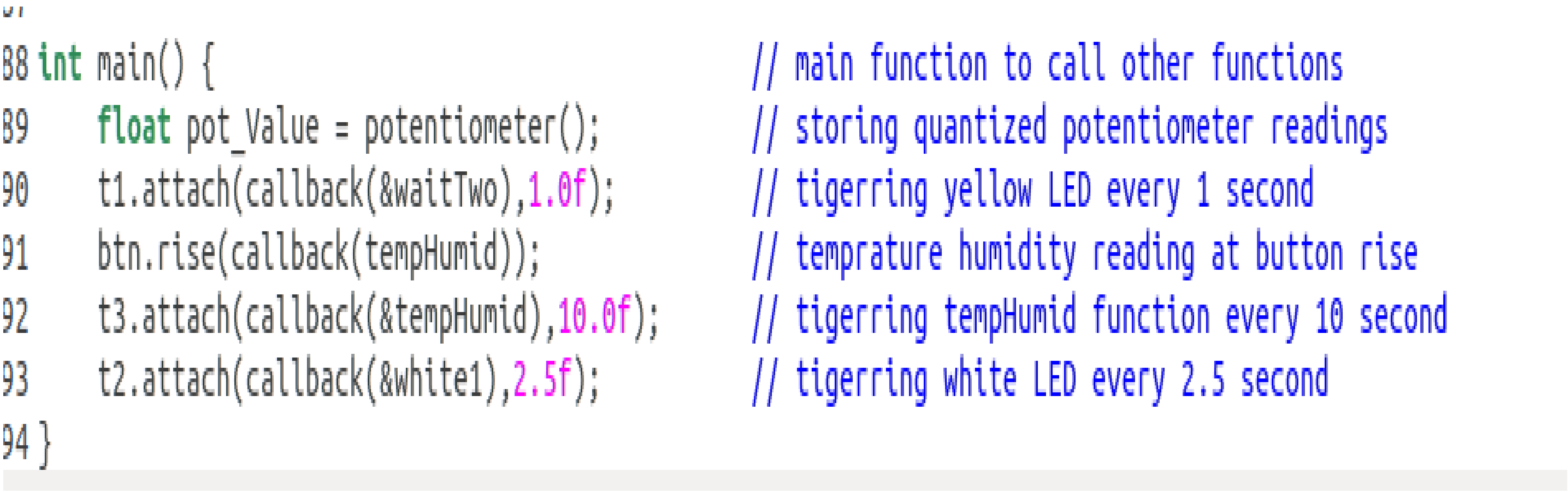
```
void waitTwo(){                                          // function to flicker yellow LED
    float pot_Value = potentiometer();                   // with potentiometer
    yellow_Led=0;
    wait(pot_Value);
    yellow_Led=1;
    wait(1-pot_Value);
}

void play_tone(float frequency,float volume, float buzzOn , float buzzOff){     // funtion for speaker
    buzzer.period(1.0/frequency);                        //frequency for speaker to play a sound
    buzzer=volume;
    buzzer=1.0;                                          // duration of sound playing
    wait(buzzOn);
    buzzer=0.0;
    wait(buzzOff);                                       // for rest after the beep
}

void white1(){                                           // function to flicker White LED
    white_Led=1;
    wait(0.5);                                           // LED lights up for 0.5 seconds
    white_Led=0;
    wait(2.0);                                           // LED off up for 2 seconds
}
```

Code



```
void tempHumid(){                               // Function to Read the value of temperature and humidity
    float temp = sht31.readTemperature();       // Read temprature
    float humidity=sht31.readHumidity();        // read humidity

    lcd.locate(3, 3);
    lcd.printf("Temperature: %.2f C\n", temp);  // for locating LCD and giving output
    lcd.locate(3, 13);
    lcd.printf("Humidity: %.2f %%\n", humidity);

    printf("Temperature : %.2f C\n",temp);
    printf("Humidity : %.2f %% \n",humidity);

    temprature_Led=(temp/50);                   // if condition for different values of temp, humidity
    humidity_Led = (humidity/100);
    if(temp>=37.5 && humidity<75){
        play_tone(150.0,0.75,0.5,0.5);          // Play beep for temp >=75%
    }

    if(humidity>=75 && temp<37.5 ){
        play_tone(100,0.5,0.5,0.5);             // Play beep for humidity >=75%
    }

    if(temp>=37.5 && humidity>=75){
        play_tone(200.0,1,0.5,0);               // Play beep for humidity >=75, temprature >=75%
    }
    if(temp<37.5 && humidity<75){
    wait(1);
    }
}
```

Code



```
int main() {                                      // main function to call other functions
    float pot_Value = potentiometer();            // storing quantized potentiometer readings
    t1.attach(callback(&waitTwo),1.0f);           // tigerring yellow LED every 1 second
    btn.rise(callback(tempHumid));                // temprature humidity reading at button rise
    t3.attach(callback(&tempHumid),10.0f);        // tigerring tempHumid function every 10 second
    t2.attach(callback(&white1),2.5f);            // tigerring white LED every 2.5 second
}
```

Code explaination

- Line 1 to 3 : For including important libraries.
- Line 4 to 12 : Setting of Mbed Pins as Input or Output
- Line 13 to 15 : Initiallising ticker t1, t2, t3.
- Line 17 to 32 : Quantising of Potensiometer Values.
- Line 34 to 40 : Function for Yellow Led that varies with potentiometer.
- Line 42 to 49 : Function for Buzzer, that beeps on high temprature, humidity readings.
- Line 51 to 56 : Function for blinking White Led for 0.5 seconds after every 2 seconds.
- Line 58 to 87 : Function for generating output for temprature Humidity readings.
- Line 89 to 95 : Main function to call all other functions using ticker.

References

- Stimulator.mbed.com
- Google.com
- os.mbed.com
- Geeksforgeeks.com
- Tinkercard.com
- Github.com