IoT interfaces from hardware to software and Wireless communication

Report on

Fire Warning System

Supervisor
Prof. Serge Stinckwich

Students
Tran Thi Hong Hanh
Kieu Quoc Viet

1 Introduction

Welcome to our project on IoT interfaces from hardware to software and wireless communications. In this project, we design a small IoT system to track the humidity and temperature in user's house and give warning if suspicious and abnormal condition happens such as fire.

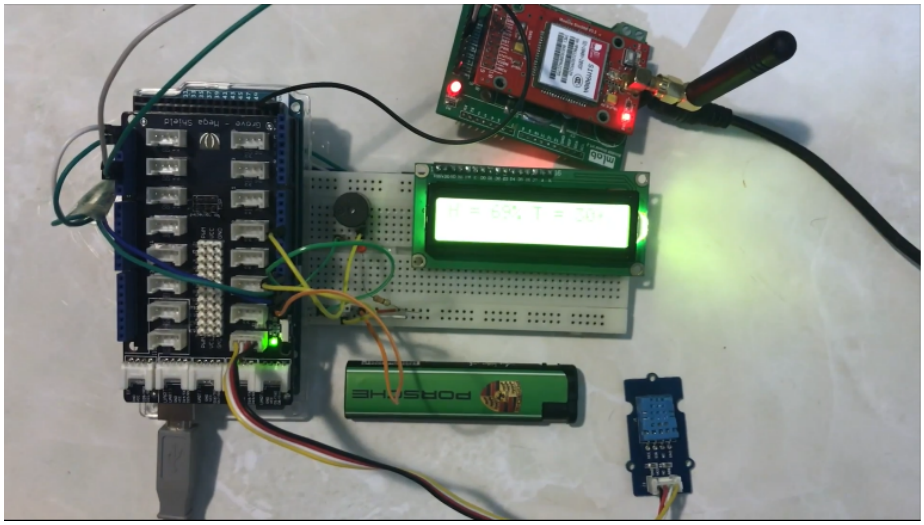
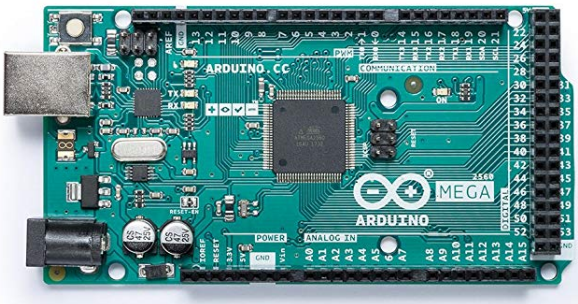


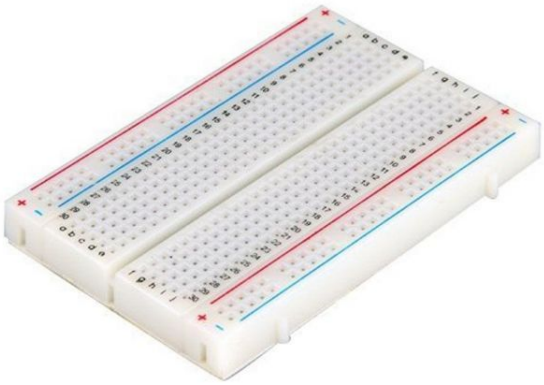
Figure 1: Overview of Fire Warning System

2 Components

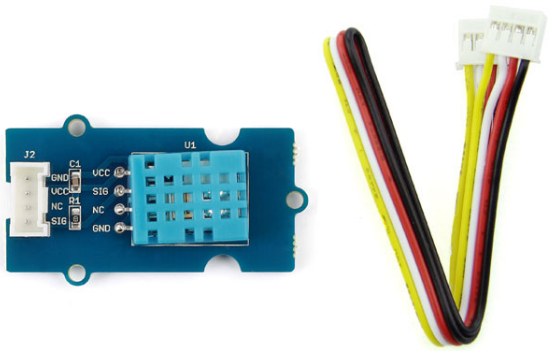
2.1 Arduino MEGA 2560



2.2 Breadboard



2.3 Temperature and Humidity sensor v1.2

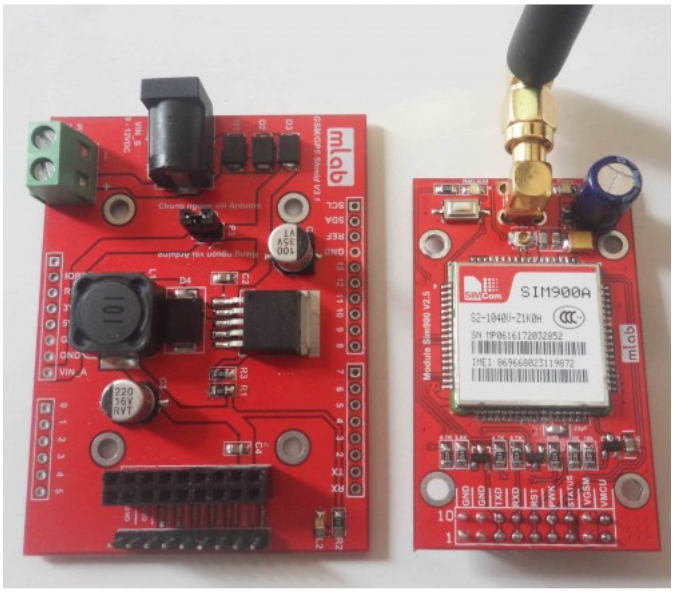


2.4 Resistor

2.5 Buzzer

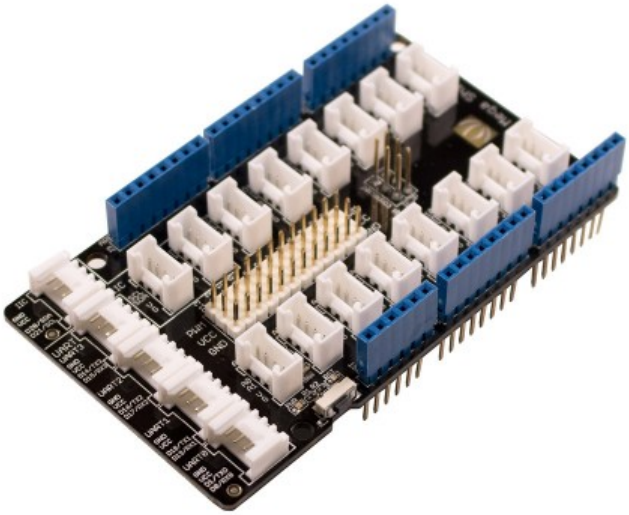
2.6 Led

2.7 GSM Module Sim900A



2.8 LCD Display

2.9 Grove Mega Shield



3 Architecture

The computer connects to the Arduino using an USB cable to supply the power. The Arduino also connects to the GSM Module and the breadboard where others devices are plugged in.

The buzzer, led, resistor and LCD display are all connected to the circuit on the breadboard.

For the temperature and humidity sensor, we connect the all the plug pins to the A0-A1 in ANALOG of the Grove Mega Shield. For the GSM Module, the GND, TXD, RXD, PWM pins join sequently to the GND, TX2, RX2 and PIN 9 in DIGITAL.

The output pin for LED and the Buzzer are connecting to ANALOG A3, while the other pin for the LED links with GND power.

4 Details

In normal condition, the temperature and humidity sensor will measure and display the 2 values on the LCD screen, the led and the buzzer are off.

```
    int h = int(dht.readHumidity());
    int t = int(dht.readTemperature());
    // check if returns are valid, if they are NaN (not a number)
    then something went wrong!
    if (isnan(t) || isnan(h))
    {
        Serial.println("Failed to read from DHT");
    }
    else
    {
        Serial.print("Humidity: ");
        Serial.print(h);
        Serial.print(" %\t");
        Serial.print("Temperature: ");
        Serial.print(t);
        Serial.println(" *C");
        //Print the result to LCD
        lcd.clear();//Clean the screen
        lcd.setCursor(0,0);
        lcd.print("H = ");
        lcd.print(h);
        lcd.print("% ");
        lcd.print("T = ");
        lcd.print(t);
        lcd.print("*C");
        digitalWrite(led_buzzer,HIGH);
        delay(1000);
```

To read the temperature values recorded by the temperature and humidity sensor, we use provided DHT library (https://github.com/adafruit/DHT-sensor-library).

With the help of provided functions from the library, we can review our circuit and receive signals from the sensor.

In our experiment, we use a lighter and light it close to the system to test it. We also set the temperature value to 50°C for the system to give the warning.

```
    if (t>51) {
        lcd.setCursor(0,1);
        lcd.print("Heat Warning!");
        digitalWrite(led_buzzer,LOW);
        delay(1000);
        Gsm_MakeSMS();
        delay(20000);
    }
```

After we increase the temperature value higher than the standard, the led will turn on and the buzzer will make the noise to warn that there is a fire. And in case that nobody is at home, we design the GSM Module to send a message to the register's mobilephone after a few second, therefore that person can get the warning wherever he is.

```
void Gsm_MakeSMS()
{
  Serial2.println("AT+CMGS=\"" + myphone + "\"");
  delay(5000);
  Serial2.print("Fire Warning!")
  Serial2.print("The temperature is over: ");
  Serial2.print(t);
  Serial2.print(" *C!");
  Serial2.print("Please check your house");
  Serial2.print((char)26);
  delay(5000);
}
```

5 Code repository

Our code: (https://github.com/LezardValeth97/Fire-Warning-System).

6 Experiment

The link video of our experiment: https://youtu.be/0Tr-kz3Y4ws
WARNING: lower the volume in case the buzzer sound is too loud!