

AMERICAN INTERNATIONAL UNIVERSITY BANGLADESH

Faculty of Engineering

Laboratory Report Cover Sheet

Please submit all reports to your subject supervisor or the office of the concerned faculty.



Students must complete all details except the faculty use part.

Laboratory Title: Implementation of a weather forecast system using the ADC modules of an Arduino.

Experiment Number: 08 Due Date: _____ Semester: Fall 2023-2024

Subject Code: COE_3104 Subject Name: Microprocessor & Embedded System Section: L

Course Instructor: PROTIK PARVEZ SHEIKH Degree Program: B.sc CSE

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For faculty use only:		Total Marks: _____ Marks Obtained: _____		
Faculty comments				

Title:

Implementation of a weather forecast system using the ADC modules of an Arduino.

Objectives:

The objectives of this experiment are to-

1. Familiarize the students with the Micro-controller-based weather forecast system
2. Implement the environmental parameters, such as temperature, pressure and humidity..

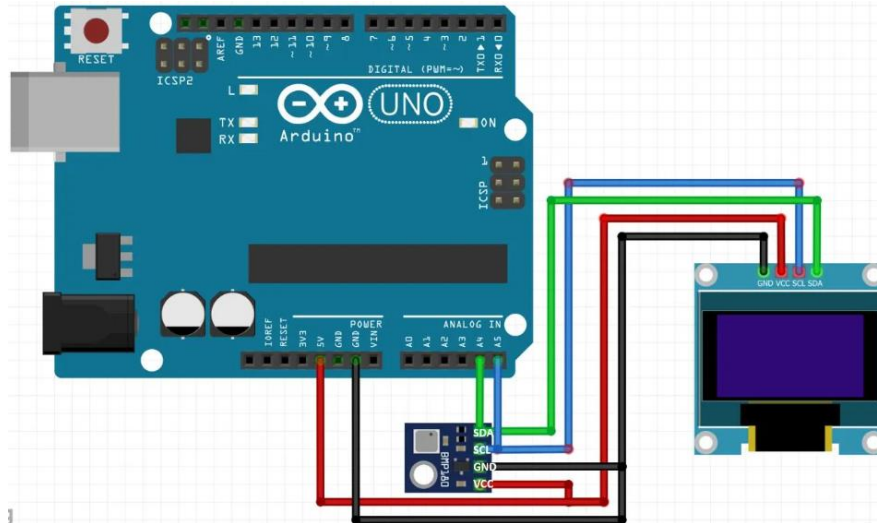


Figure 2. Arduino Uno with BMP180 and OLED

Components List

- Arduino Uno Board
- BMP180 / MPL115A
- inches96 inch OLED 128X64
- Breadboard and Jump Wires

Code:

```
#include <SPI.h>
#include <Wire.h>
#include <Adafruit_GFX.h>
#include <Adafruit_SSD1306.h>
#include <Adafruit_BMP085.h>
#define SCREEN_WIDTH 128
#define SCREEN_HEIGHT 64

Adafruit_SSD1306 display(SCREEN_WIDTH, SCREEN_HEIGHT);
Adafruit_BMP085 bmp;
#define SEALEVELPRESSURE_PA (101500)
float simpleweatherdifference, currentpressure, predictedweather, currentaltitude;
void setup() {
  // put your setup code here, to run once:
  display.begin(SSD1306_SWITCHCAPVCC, 0x3C);
  if (!bmp.begin()) {
    Serial.println("Could not find a valid BMP085 sensor, check wiring!");
    while (1) {}
  }
}
```

```

void loop() {
  display.clearDisplay();
  display.setTextSize(1);
  display.setTextColor(SSD1306_WHITE);

  display.setCursor(0,5);
  display.print("BMP180");
  display.setCursor(0,19);
  display.print("T=");
  display.print(bmp.readTemperature(),1);
  display.println("*C");

  display.setCursor(0,30);
  display.print("P=");
  display.print(bmp.readPressure()/100.0,1);
  display.println("hPa");

  display.setCursor(0,40);
  display.print("A=");
  display.print(bmp.readAltitude(SEALEVELPRESSURE_PA),1);
  display.println("m");
  delay(6000);
  display.display();

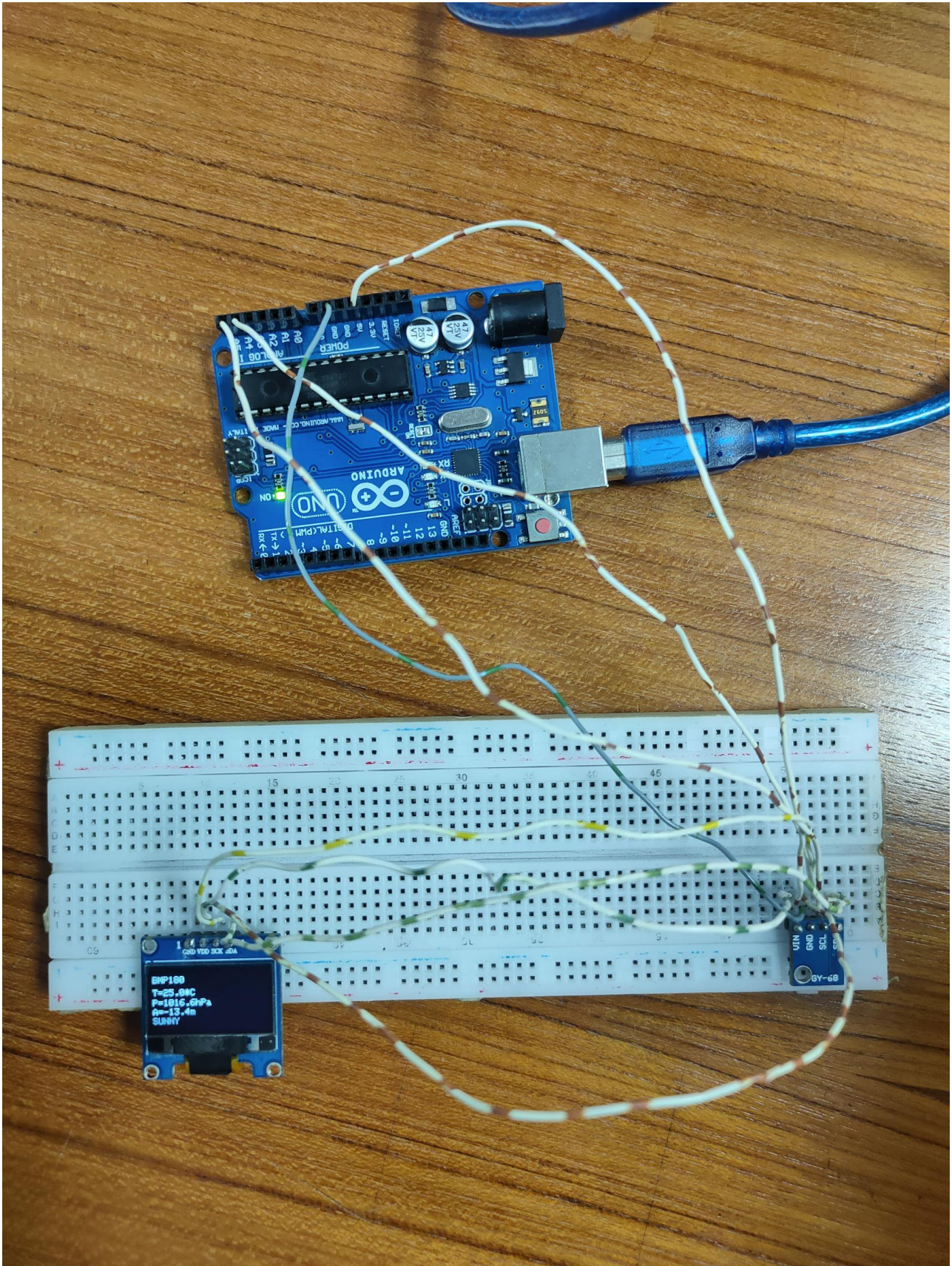
  currentpressure=bmp.readPressure()/100.0;
  currentaltitude=bmp.readAltitude(SEALEVELPRESSURE_PA);
  predictedweather=(101.3*exp(((float)(currentaltitude))/(-7900)));
  simpleweatherdifference=currentpressure-predictedweather;
  //display.clearDisplay();
  display.setCursor(0,50);
  if (simpleweatherdifference>0.25)
    display.print("SUNNY");

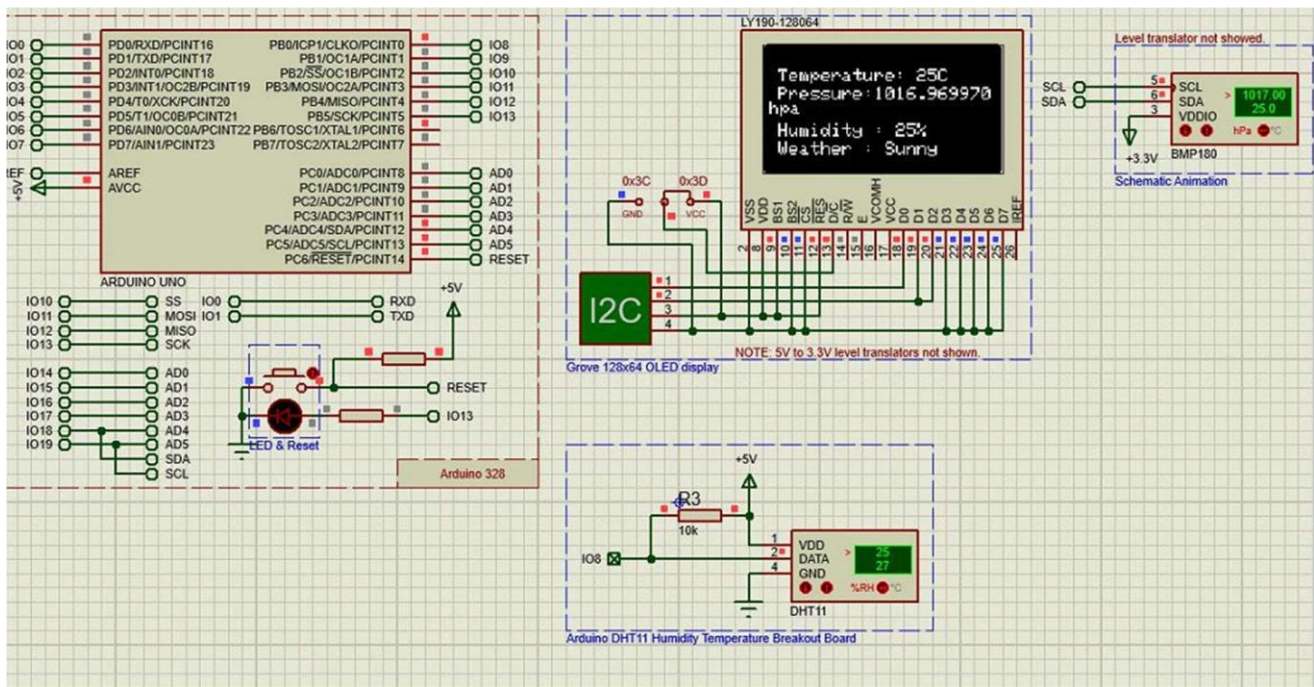
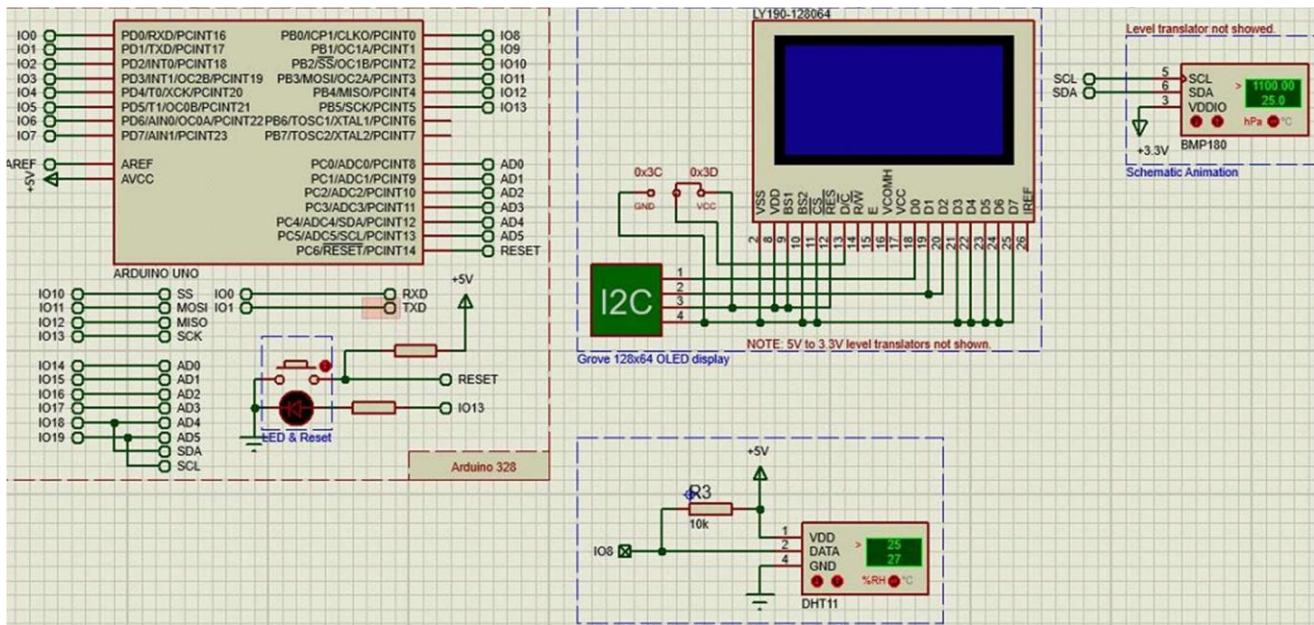
    if (simpleweatherdifference<=0.25)
      display.print("SUNNY/CLOUDY");

    if (simpleweatherdifference<-0.25)
      display.print("RAINY");
      display.display();
  delay(2000);
}

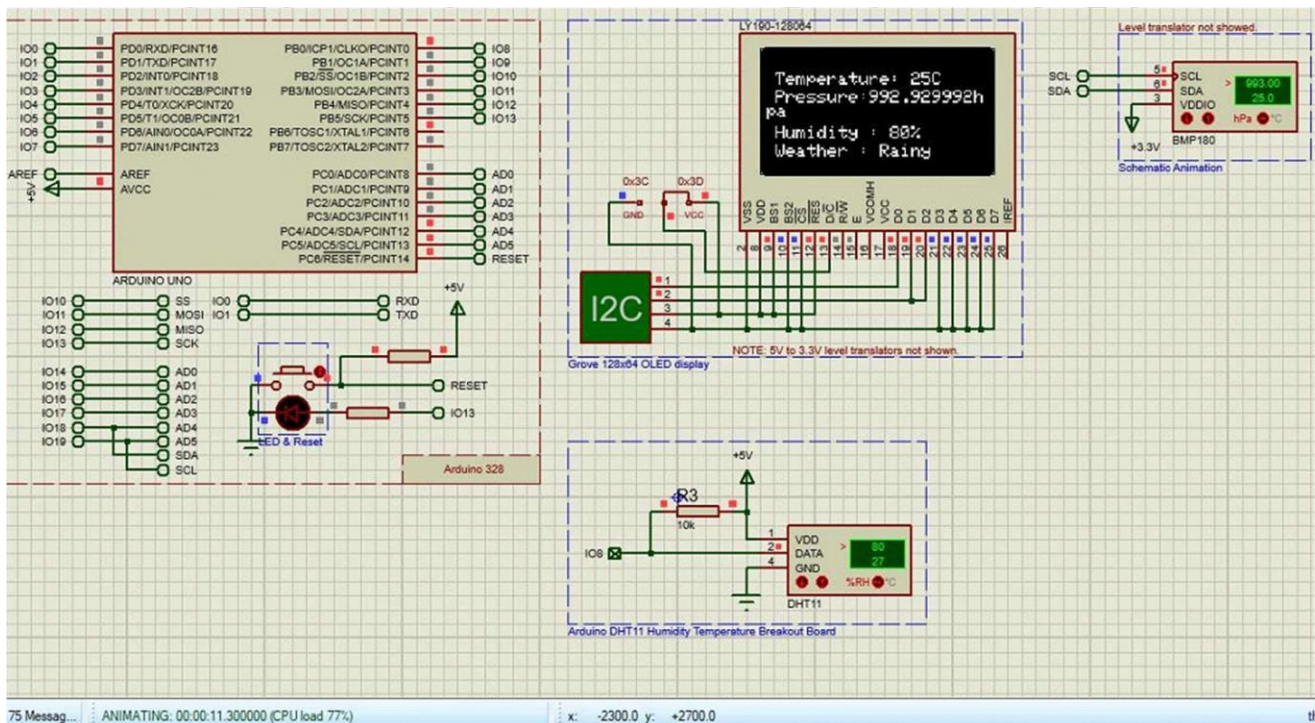
```


Hardware Implementation:





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Discussion:

In this experiment, the BMP180 sensor was employed to measure temperature, pressure, and altitude, with the collected data displayed on an OLED screen connected through ADC. Prior to implementation, a thorough understanding of the BMP180 sensor's pin operations and functionality was gained. The Arduino Uno board was configured to match the BMP180 sensor, and the OLED display was set up accordingly. System operations were observed, focusing on how weather conditions were determined through temperature and pressure readings. The results, generated using predefined formulas in the code, were diligently recorded for further analysis. A parallel system was also simulated using software like Proteus. Minor discrepancies between the physical and simulated outcomes were noted, potentially stemming from system and human errors, leading to inconsistencies in the serial monitor values. Despite these differences, both hardware and software implementations yielded expected outcomes, demonstrating successful achievement of the experimental objectives.

Reference:

- (<https://www.youtube.com/watch?v=M4f4ntzgkv4>)
- AIUB Microprocessor and Embedded Systems Lab Manual 8