B.S. in Software and Electronic Engineering

Year 1

C/C++ Programming for Electronics

Summer Project I – Weather Station Monitoring System

Incorporating a multifile approach, develop a C++ program to create a weather station that monitors temperature, humidity, atmospheric pressure, and altitude using sensors.

Create a project including the following files:

main.cpp – code file to create and simulate objects of type dht11 and bmp180.

DHT11.h

DHT11.cpp

BMP180.h

BMP180.cpp

Upon running the program, the user will be prompted with a menu to choose one of the following options:

Normal – All sensors are simulated using a random number generator to display readings for all sensors.

Test – This option utilizes values from parameterized constructors to activate all sensors and show the appropriate outputs, indicating if temperature, humidity, or atmospheric pressure levels are dangerously high.

Exit

The DHT11 sensor provides both temperature and humidity outputs.

Include a default constructor for the dht11 that sets the initial values of temperature and humidity to 0, along with a parameterized constructor for testing purposes.

Incorporate readTemp() and readHumidity() functions that return the values of temperature and humidity.

For readTemp(), generate a random number between -5 and 50 to represent the sensor output.

For readHumidity(), generate a random number between 0% and 100% to represent the humidity from the sensor.

Integrate a convertToFah() function that converts temperature in Celsius to Fahrenheit.

Include a function to display the temperature and humidity around the weather station.

The BMP180 sensor provides both barometric pressure and altitude outputs.

Include a default constructor for the bmp180 that initializes the values of pressure and altitude to 0, along with a parameterized constructor for testing purposes.

Incorporate readPressure() and readAltitude() functions that return the values of pressure and altitude around the weather station.

For readPressure(), generate a random number between 300 and 1100hPa to represent the sensor output.

For readAltitude(), generate a random number between -50m and 9000m to represent the sensor output.

Include a function to display the pressure and altitude around the weather station.

The program should output statements every 5 seconds (or include a delay) with temperature (in both Celsius and Fahrenheit), humidity, pressure, and altitude. The program will continue to display the updated outputs until the user exits.

Test Mode: Reference a study from 2010 that suggested a wet-bulb temperature of 95 F (35 C) at 100% humidity, or 115 F (46 C) at 50% humidity, would be the upper safety limit. Utilize these values in your test mode and implement a function that warns if these conditions are detected by the sensors at the weather station.

Be sure to comment your code.

Due Date: August 31, 2024