Desktop Application based Atmospheric Temperature and Humidity Monitoring

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***Abstract*— In this paper, a desktop application has been developed to monitor atmospheric temperature and humidity such that weather forcasting can be done easily based on the above mentioned parameters. From desktop application, we can easily select the parameter to be observed. Separate sensor has been used for temperature and humidity monitoring and the data has been fed to a microcontroller. The command for the selection of the parameters is given by the desktop application. Liquid Crystal Display (LCD) is connected with the microcontroller displays the atmospheric temperature or humidity. The desktop application has been developed by Python language.**

Keywords*— *Desktop Application, Sensor, Microcontroller, Liquid Crystal Display, Python

I. INTRODUCTION

Weather monitoring is a major field of work now a days because of the frequently occurred natural calamities. For weather monitoring the main parameters are temperature, relative humidity, air pressure etc. There are many instruments for weather monitoring like temperature sensors (thermister, thermocouple), barometers etc. which are used in different government organizations like Mousam Bhawan etc. There are several literatures [1-4] on the measurement of temperature and humidity and all the works are based on the transmission of data from one place to another by some communication system. Also the related previous works [1-4] are purely hardware based. In [4], DHT-22 has been used as temperature and humidity sensor. Getting inspired with the earlier reported works, we have also designed an application based system for monitoring temperature and humidity. Our work is purely a combination of hardware and software where the observation of parameter is controlled by an application which is new to the best of our knowledge and belief.

Here we aim to design a homemade equipment to monitor temperature, humidity etc. such that weather forecasting can be possible at home. In this equipment at a time all the parameters can not be observed. The command for the parameter observation is given by an application. At a time one parameter is observed in the LCD screen. The work is totally new to the best of the knowledge of the authors and therefore can not be compared with other similar works. In future, our aim is to design mobile application as well as web application for the design and monitor the parameters using remote access. The design is cost effective in the sense the hardware costing is within Rs. 1000/- and there is no costing for the application.

II. DESKTOP APPLICATION

The flow chart and the block diagram of the proposed design is shown in Figure 1.

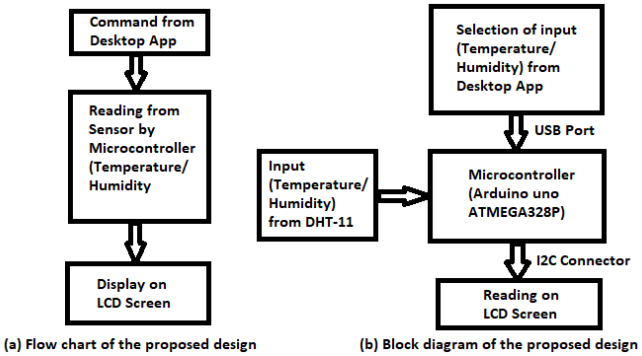

Figure 1 Flow chart and the block diagram of the proposed design

The application has been developed in Python. Here we have used a well known library "wxpython" to create the user application. To create user interface at first we have to import the class **"import wx"**. **"app=wx.App()"** creates the application interface. **"app.MainLoop()"** maps the application interface in the main loop. Next we have to create the application frame in the interface which is done by the code **"frm=wx.Frame(None,title="Give App Title",size=(width,height))"**. Next we have to create a panel in the frame which consists of different widgets. This can be done by the following code **"pnl=wx.Panel(frm)"**. Here the object "frm" is the master class object for the panel creation. Figure 2 shows the user interface window for the application. There is a provision for user authentication (User ID and Password verification). Figure 3 shows a text file where the user ID and password is stored in encrypted version. Here the encryption is achieved by the character to ASCII code conversion. The application decrypts the ASCII code to character and the ID and the password is verified with user inputs. If the match is found then only the dropdown box is enabled which contains the weather parameters to monitor. Figure 4 and 5 shows the authentication process and the selection of parameters after the successful authentication.

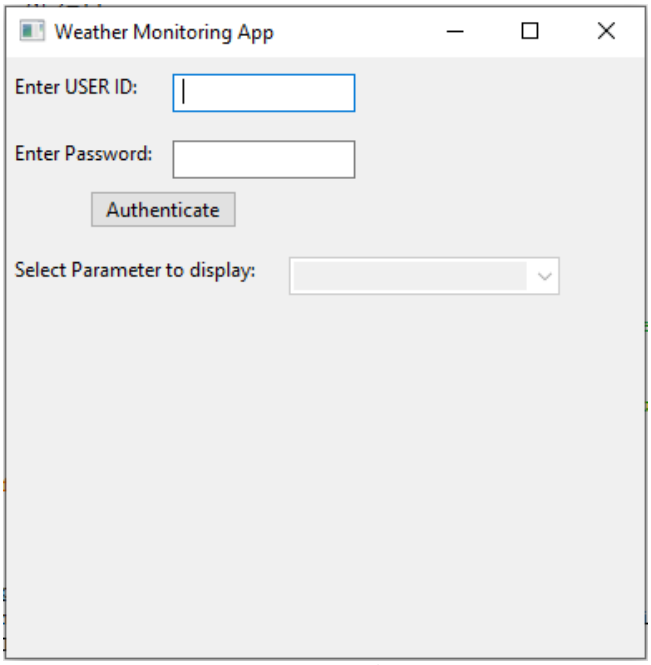

Figure 2 Application window for weather monitoring

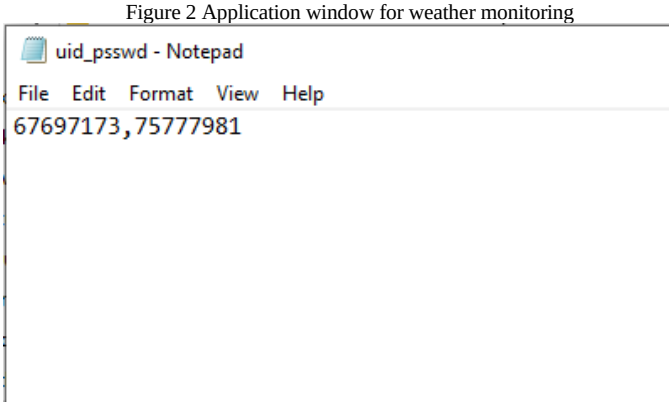

Figure 3 Encrypted User ID and Password in the text file

When one parameter in the dropdown list is selected then the corresponding reading of the sensor is displayed in the LCD screen. To interface the application with the hardware **"pyserial"** library has been used. In the **"serial"** class, port number and the baud rate is given. The following code is to identify the hardware **"board=serial.Serial("COMX",baudrate)"**. **"board.write(stringdata.encode())"** converts the Unicode string to byte and transfers to the microcontroller serial port.

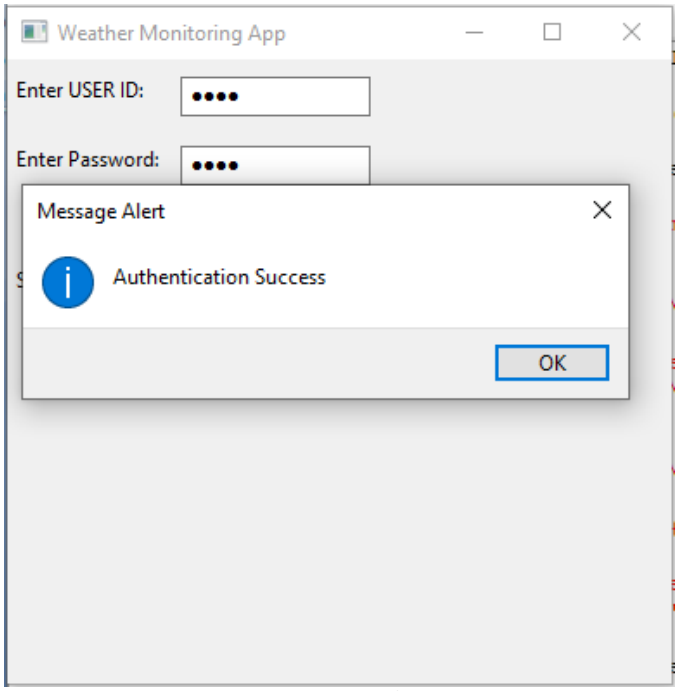

Figure 4 Authentication process for weather monitoring

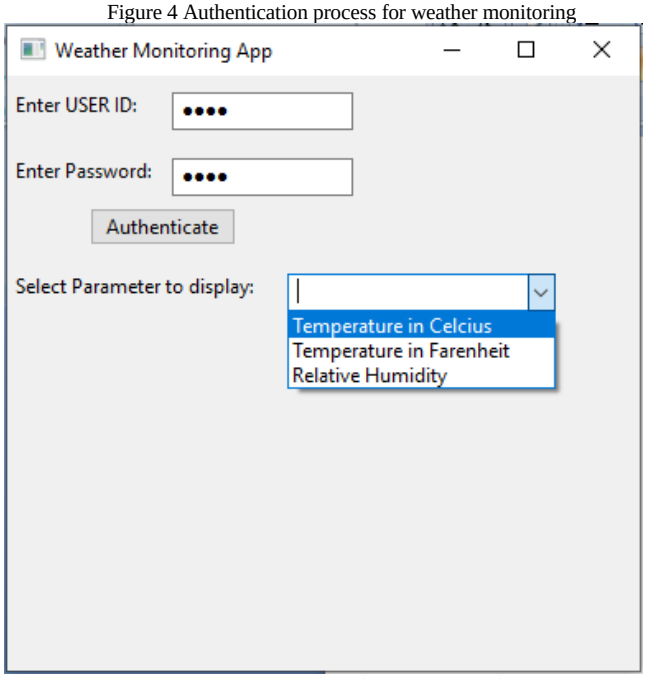

Figure 5 Weather parameters to select for the display after authentication

III. HARDWARE APPLICATION USING MICROCONTROLLER

A. Microcontroller Programming Fundamentals

In this work, as a microcontroller Arduino Uno AtMega328P has been used though Arduino Mega 2560 can also be used. Figure 6 shows the diagram for the microcontroller board. It is a 16MHz microcontroller and run by 5V volt DC power supply. The programming language used here is embedded C. For serial communication, the code **"Serial.begin(9600)"** is used. Here 9600 is the baud rate or the data transfer rate. **"Serial.readString()"** converts the byte code to Unicode string. The selection of the sensor parameter is taken based on the string value. The temperature and the humidity sensor is interfaced with the microcontroller. Here a compact chip

has been used which has the provision for temperature and humidity and the name of the sensor is **"DHT11"**. **"readTemperature()"** method gives the temperature reading in Celsius scale. **"readTemperature(true)"** method gives the reading in Fahrenheit scale. Similarly **"readHumidity()"** method gives the reading of relative humidity in percentage.

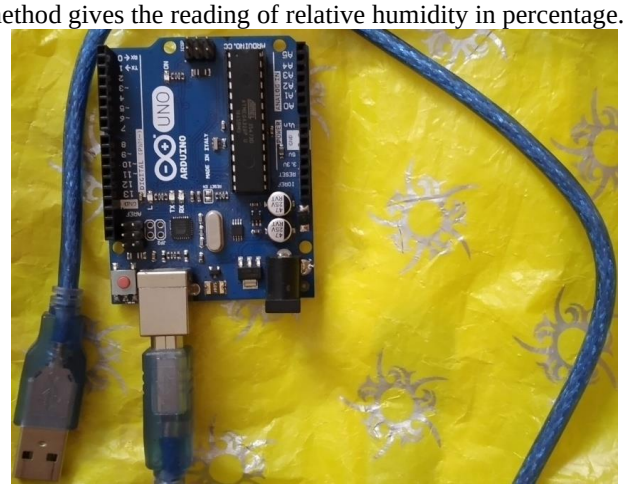

Figure 6 Arduino Uno AtMega328P microcontroller board

B. Temperature and Humidity Sensor (DHT-11)

The temperature and the humidity sensor used here is DHT11. Figure 7 shows the sensor module. It has 3 pins, supply (3.3V/ 5V), ground and the reading pin. The reading pin is connected to some digital IO pin of the microcontroller.

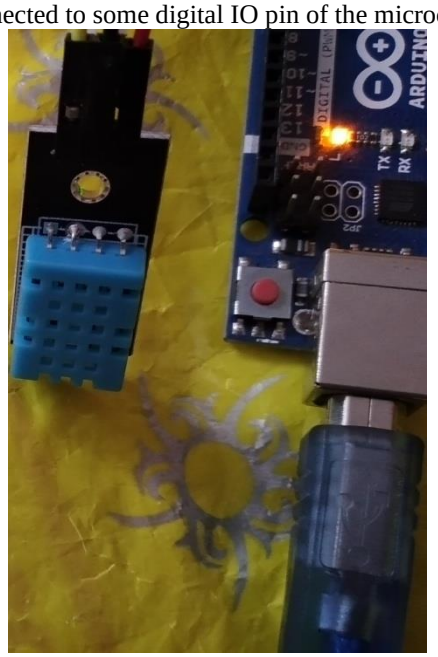

Figure 7 DHT11 sensor diagram

The following equation converts Celsius reading in Fahrenheit scale.

$$F = 32 + \frac{C \times 9}{5} = 32 + 1.8 \times C \qquad (1)$$

where C and F are the values in Celsius scale and Fahrenheit scale respectively.

C. Liquid Crystal Display

Liquid Crystal Display is used to display the reading following the command given by the application. Figures 8, 9 and 10 show the reading display of the LCD module. Basically LCD has 8 pins but here another I2C (Inter Integrated Circuit) module has been interfaced with the LCD such that the data from the 6 pins (excluding supply and ground pin) can be easily transferred by serial communication. In I2C module there are SDA (Serial Data Adapter) and SCL (Serial Clock) pins for serial communication.

Figure 8 Humidity reading

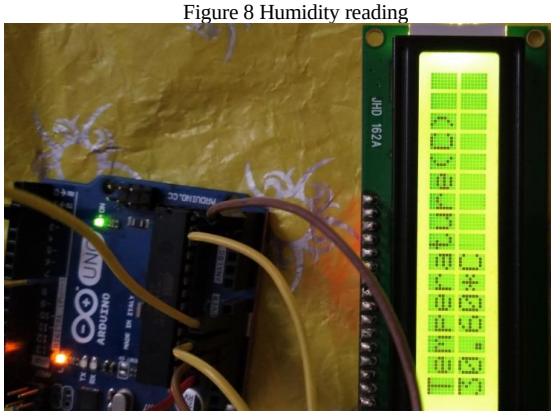

Figure 9 Temperature reading in Celsius scale

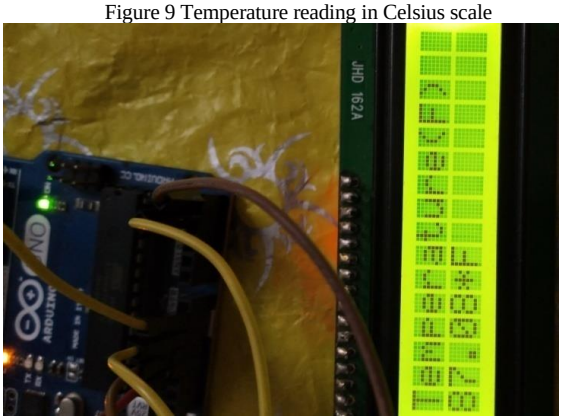

Figure 10 Temperature reading in Fahrenheit scale

IV. CONCLUSION

In this paper, we designed a desktop application for atmospheric temperature and humidity monitoring. The application was developed in python and hardware interfacing was done with the application to give command to display the weather parameters like temperature, humidity etc. as per the requirement of the user. Though there were related similar works reported earlier but this work was totally for the common people who could observe the atmospheric parameters at home. In this context, the work was totally new

to the best of the knowledge of the authors and so could not be compared with any other existing works.

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