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PROJECT REPORT

ON

WEATHER MONITORING STATION USING LABVIEW AND ARDUINO

SUBMITTED BY

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ABSTRACT

For a long time, weather monitoring was largely a pastime of enthusiastic amateurs, but over the last century, it has evolved into a well-organized and professional global activity that reflects its crucial importance in wide range of economic, environmental, civil protection and agricultural activities. The main objective of this project is to monitor various weather parameters such as temperature, pressure, humidity, and wind speed, light intensity etcetera and intimate to the concerned control authorities. To implement this, we use various sensors interfaced to the Arduino, to monitor the mentioned attributes and collect and store the data.

The Arduino is interfaced to the LabVIEW so that the data can be displayed on the front panel. All the above attributes can be recorded in real time and any abnormal pattern traced, can immediately be taken care of, by the respective bodies on intimation or an alert in some cases and appropriate precautionary measures can be deployed. As a result, the implemented weather monitoring system serves as an economical, accurate and reliable solution for weather prediction. Weather monitoring is not just about defining the present climate, but also to predict changes in the weather. Weather forecasting finds its applications in diverse fields like agriculture, renewable energy surveys, outdoor sports, research related monitoring etcetera.

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1. INTRODUCTION

A weather station is considered a technical method that allows measuring weather parameters based on atmospheric conditions either on the land or on the sea for a proposed location with specific devices to realize forecasted weather conditions and to study climate properties.

Weather prediction issues started formally since the nineteenth century, then as soon as altered based measuring and recording honest data about a specific location under certain atmospheric conditions. The collected data allows deciding and confirming the warranty of the proposed chosen location. The weather is appreciated mostly by two parameters, temperature, and humidity.

It has to be mentioned, that the struggling of a human being in the past was following some poor parameters and terms such as measuring the pressure, humidity intensity study and its effect on the temperature, climate situation, and finally the condition of the sky that effects hardly on the proposed parameters. The prosperity and smart devices generations based microcomputers and microcontrollers greatly abbreviated the presented terms into energetic factors, deal with the change of the atmospheric conditions wisely. However, user input adaptation considered the most important point that effects the forecasted output based database model preparations.

In this project, we monitor two parameters viz, temperature and light with the help of LM35 and Light Dependent Resistor respectively. We interface Arduino with LabVIEW and take the readings from sensors and present them on the front panel of LabVIEW.

2. AIM

To create a simple weather station by interfacing Arduino with LabVIEW to display weather forecast parameters on the front panel of LabVIEW.

3. OBJECTIVE

To develop:

- Interface external device Arduino with LabVIEW.
- Serial communication from Arduino to LabVIEW.
- Forecasting weather parameters like temperature, light intensity, relative pressure, etc.

4. DESCRIPTION

We will connect an LM35 and a light sensor for our weather station, which will measure temperature and intensity of light in real-time and using the LabVIEW interface it will be displayed on the panel of our weather station.

SOFTWARE REQUIREMENT:

- Arduino IDE
- LabVIEW
- VISA package and LabVIEW with Arduino interface package installed

HARDWARE REQUIREMENT:

- Arduino UNO Board
- LM35
- Light Dependent Resistor
- Jumper Wires and Connecting wires
- Bread Board

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs and turn it into an output. Arduino is designed to make electronics more accessible to artists, designers, hobbyists and anyone interested in creating interactive objects or environments. Figure 1 shows Arduino Microcontroller.

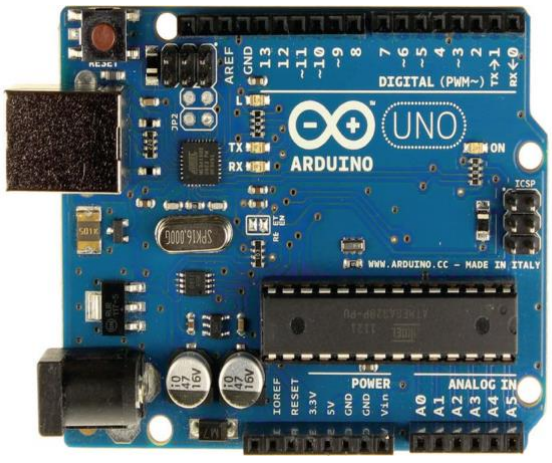

Fig.1: Arduino Microcontroller

LM35 is a sensor used to measure the temperature of surrounding. The output is actually an analogue voltage which corresponds to surrounding temperature when multiplied by 100. Figure 2 shows the LM35 Temperature sensor.

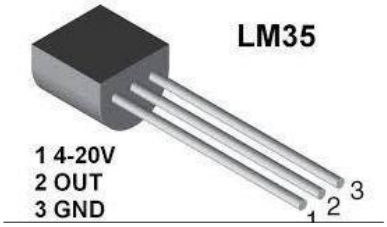

Fig.2: LM35 Temperature Sensor

Light dependent resistor is used to detect change in light intensity or as a light sensor. LDR is basically a variable resistor. LDR resistance changes with the change in intensity of light. If intensity of light falling on LDR is high, LDR will have low resistance. When intensity of light decreases, LDR offers high resistance. Hence there is inverse relationship between intensity of light and resistance of LDR. So LDR is used as a light sensor.Figure 3 shows the LDR sensor.

Fig .3:LDR sensor

5.BUILDING PROJECT

5.1CIRCUIT DIAGRAM

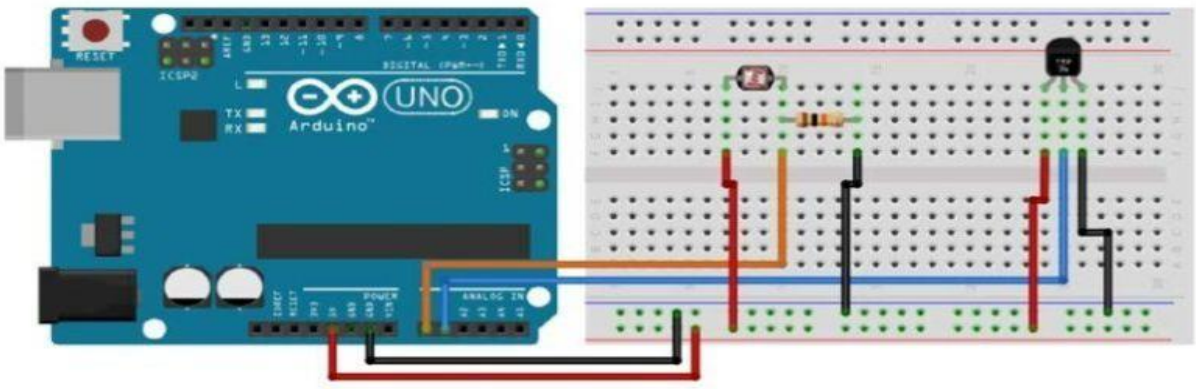

Fig. 4: Circuit diagram

- Connect Pin 1 and Pin 3 of LM35 with 5V Pin and GND Pin of Arduino respectively.
- Connect Pin 2 of LM35 with Analogue Pin A1 of Arduino.
- Connect a 10k resistor between Pin 2 and Pin 3 of LM35.
- Connect one pin of LDR with 5V of Arduino.
- Connect second pin of LDR with pin A0 of Arduino.
- Also connect a 10k resistor between second pin of LDR and ground.

5.2LabVIEW VI

- Start the LabVIEW.
- Create Blank VI for weather station.
- Go to LabVIEW "Block Diagram" Panel
- Right Click on white space. Go to "Arduino" and select "init". This will add Initializations of Arduino board.
- Bring Cursor to anywhere in LabVIEW "Block Diagram" panel and place the "Init".
- First input is "VISA resource". It is the serial port you are using for interfacing of Adruino. You can find it in "device manager" of your computer under "ports (COM & LPT)…." Make sure Arduino board is connected with computer.
- Bring cursor on first input of "Init" until it shows "VISA resource". Right click on it. Go to "create" and select "constant". As it will be a constant value of Port which will be always used for serial communication.
- Click on arrow it will show available option. Select appropriate one after checking from device manger as mentioned above otherwise it won't work.
- Second input is "Baud Rate". Create it as constant as done for "VISA resource". Right click on "Baud Rate" then "create" and then "constant".
- Third input is "Board Type", fourth is "Bytes per packet" and fifth is "Connection type" make them also constant.
- Click on white space on LabVIEW "Block Diagram" and follow "Structure → select While loop".
- Place two "analogue read pin" as follows one by one.
- Create "Control" for input parameter "Analogue input pin" of both "Analogue Read Pin" blocks

- Right click on white area. Go to “numeric” and find “divide”.
- Go to Front panel and find “thermometer” as shown on block diagram of LabVIEW.
- Also find “slide” as we found thermometer. Place both of them on front panel one by one.

This completes our VI. Block diagram is shown in figure 5.

Now we will upload program to Arduino and Run it from LabVIEW.

1. ‘Now Start Arduino IDE.
2. Click “File” then “Open” and Follow as shown. Go through all these folders from “Computer” onward and open LIFA_BASE Arduino file.
3. Upload the program opened in Arduino IDE using Arrow button on top of Arduino IDE.
4. Once uploading done close the Arduino IDE. It’s very important to close Arduino IDE because both LabVIEW and Arduino are using COM4. If not closed LabVIEW will not be able to communicate and LabVIEW will crash.
5. Go to front panel. Write “0” in LDR box and “1” in Temperature box. They indicate the arduino pins to which LDR and LM35 are connected in real time.

6. SIMULATION RESULTS

- The temperature has been displayed on the front panel and there are two conditions based on this
    1. If the temperature is above threshold, “It’s sunny day” will be displayed.
    2. If the temperature is below threshold, “It’s cold outside” will be displayed
- The light intensity has been displayed on the front panel and there are two conditions based on this
    1. If the light intensity is above threshold, “It’s bright sunny day” will be displayed.
    2. If the light intensity is below threshold, “It’s dark outside” will be displayed
- The relative air pressure and air density have been calculated form the temperature and displayed on the front panel. The results are shown in figure 6.

- The temperature recorded is 28deg which is below the threshold value 40 deg , so “It’s cold outside” was displayed and the light intensity level recorded is 340lumen which is below the threshold value 1000lumen , so “It’s Dark” was displayed as shown in the **Fig 6.**
- The temperature recorded is 28deg which is below the threshold value 40 deg , so “It’s cold outside” was displayed and the light intensity level recorded is 834lumen which is above the threshold value 1000lumen , so “It’s Bright” was displayed as shown in the **Fig 7.**

BLOCK DIAGRAM

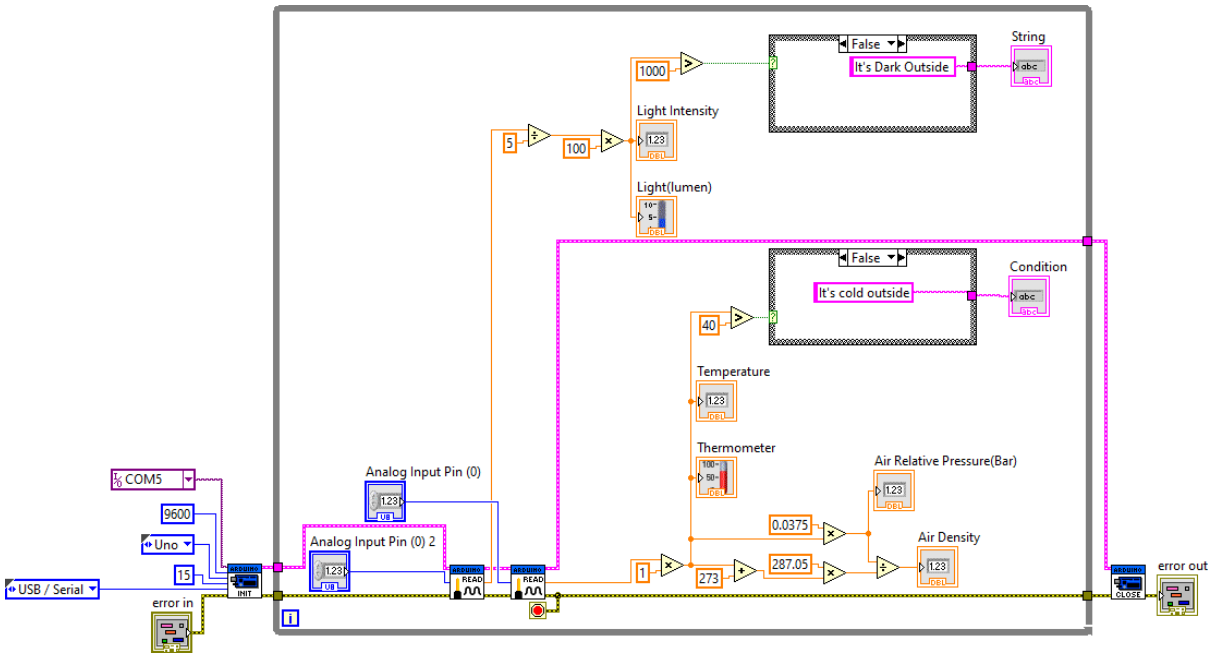

Fig. 5: Block Digram

FRONT PANEL

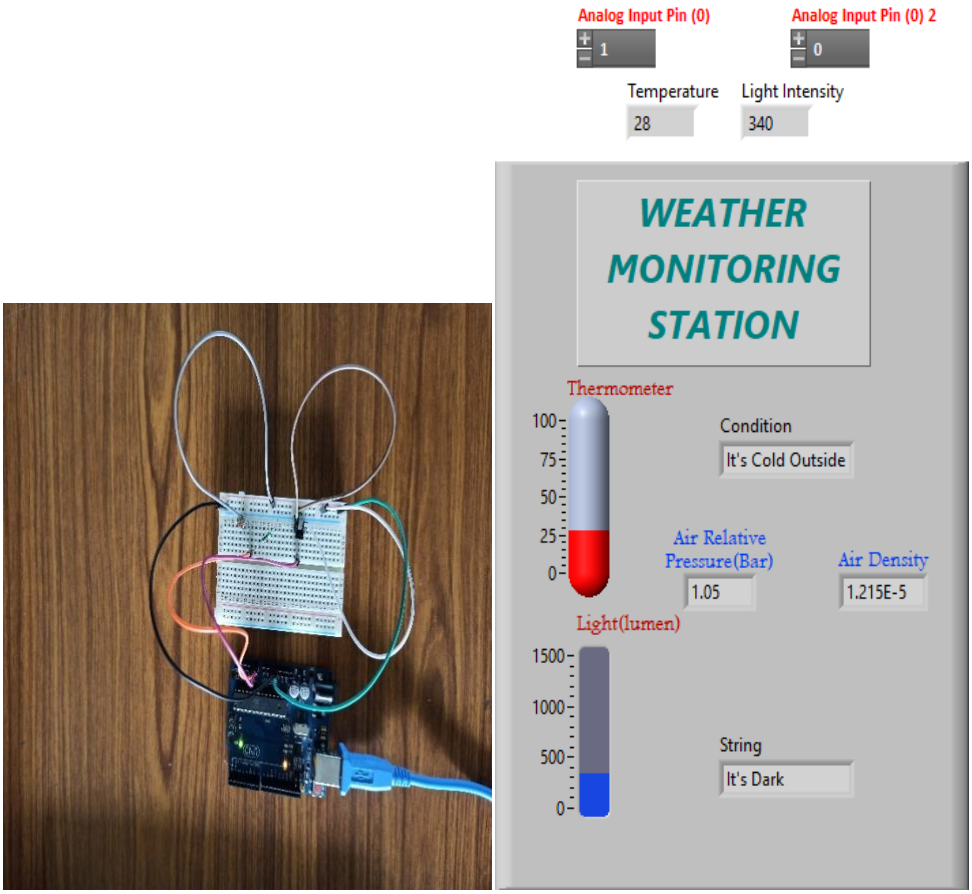

Fig. 6: When temperature and light is low

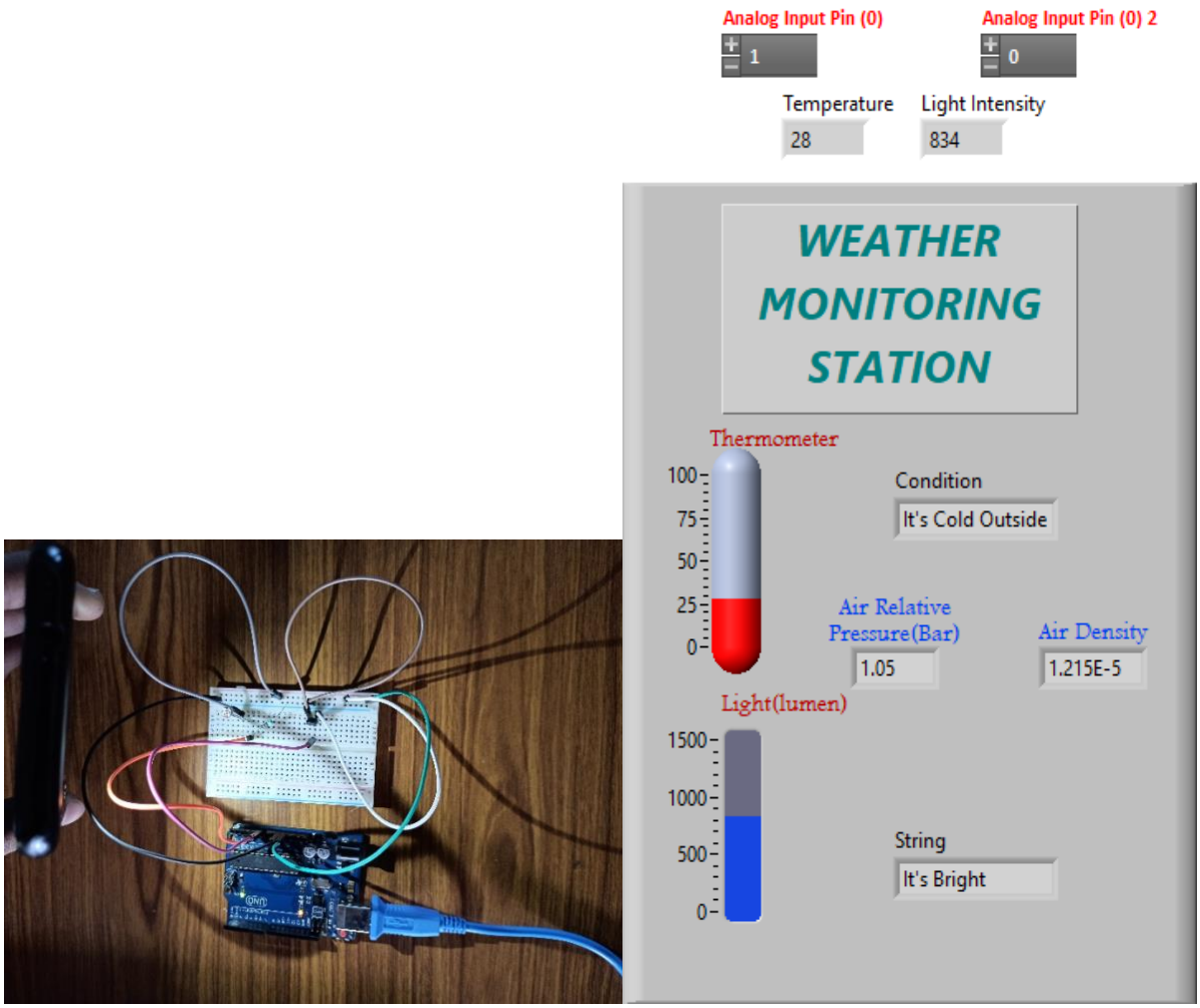

Fig. 7: When the temperature Is low and light level is high

7. CONCLUSION

Thus the Arduino has been interfaced to the LabVIEW software and the communication between them has been established successfully and the temperature, intensity of light, air pressure and density have been recorded in real time and displayed on the front panel.

As a result, the implemented weather monitoring system serves as an accurate and reliable solution for weather prediction.

8. REFERENCES

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