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WIRELESS ARDUINO BASED WEATHER STATION

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The monitoring of weather is really helpful in different applications. Weather is the state of atmosphere, which is hot or cold, dry or wet,etc. Most of the weather phenomena occur in the troposphere. Monitoring of weather is manually difficult. Weather monitoring is one of the major functions in aerospace application to check the weather environment. Weather monitoring is also used in the fields like agriculture, disaster management and the medical environments.

KEYWORDS: Arduino, weather station, thingspeak, weather monitoring.

1. INTRODUCTION

Weather monitoring is done y using the values obtained from the sensors or instruments. Human beings have attempted to predict the weather informally and formally since the nineteenth century. Weather forecast are made by collecting quantitative data about the current state of the atmosphere. On a given place and using scientific understanding of atmospheric processes to project how the atmosphere will evolve on that place. On the basis of these weather forecasting patterns, people can take precautions on even harsh weather conditions. Weather is driven by air pressure (temperature and moisture) differences between one place and another. These pressure and temperature differences can occur due to the sun angle at any particular spot, which varies by latitude from the tropics. The atmosphere is a chaotic system, so small changes to one part of the system can grow to have large effects on the system as a whole. This makes it difficult to accurately predict weather more than a few days in advance, though weather forecasters are continually working to extend this limit through the scientific study of weather, meteorology. It is theoretically impossible to make useful day-to- day predictions more than about two weeks ahead, imposing an upper limit to potential for improved prediction skill.

Once an all-human endeavour based mainly upon changes in barometric pressure, current weather conditions, and sky condition, weather forecasting now relies on computer-based models that take many atmospheric factors into account. Human input is still required to pick the best possible forecast model to base the forecast upon, which involves pattern recognition skills, tele-connections, knowledge of model performance, and knowledge of model biases.

2. PROPOSED WORK

The device works by taking readings from various sensors at different pins in arduino microcontroller. For this purpose we've used an arduino compatible WiFi shield stacked upon our arduino microcontroller which adds up extra functionality to our arduino board. It increases the scope of this project. The various sensors are attached to the microcontroller each of them taking 5V input from arduino except one pressure sensor requiring 3.3V using a 3.3V pin out from the board. All the sensors are connected using a breadboard. For temperature sensor to prevent any damage or unstable behavior a 10kΩ resistor is attached in parallel to the temperature sensor on the breadboard. We've used DHT11 temperature sensor to get the temperature and humidity readings connected to digital pin 7 on board for input signals. It gives us continuous reading of surrounding environment in the range of two to three seconds. A raindrop sensor module is also attached from analog pin on arduino to take input signals from the sensor. The sensor detects either there is any rain or not in terms of values. The raindrop sensor module comes with a potentiometer attached to it. For simulation purpose we can check it by putting some water droplets on the board and we can see the readings fluctuating.

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BMP185 pressure sensor module is also attached to get the pressure readings in an environment. Because of its low cost it doesn't affect the overall system. We know that pressure varies with the altitude. Hence it could be used to measure the altitude too. One more sensor attached which is soil moisture sensor module, which when dipped within a humid wet or dry soil fluctuates accordingly. It detects how much moisture is present in the soil. For quick representation purpose it could be checked with moistening the board by dropping some water. It consists of two tongs like rod for sensing the moisture so that it could be added within the soil and take readings. The other part of the system is wireless connectivity. We've attached a esp2866 wifi shield over the arduino to connect it to the local internet connection providers and connect. Its job is to transmit the data to a website linked to it and visualize the data over there for every minute or thirty seconds.

Since it is a shield and not a breakout board we don't have to make particular connections for each of IRQ, VBAT and CS. It makes our circuit less wired and neat. It has its own mac address and transmit to the web server. There are many benefits of using this shield over other wifi circuit modules present there in market as it can accept DNS where others require IP address as well as good circuit components and inbuilt antenna. It also has great libraries and support all around the world.

The website for this project is an open source IOT(Internet of Things) website named Thingspeak by a community of Mathworks. So it provides further facility to add code in Matlab and various function to get knowledge from the information obtained from the readings on the server. The website provides its DNS. On the Thing speak website, the first step is to register for the account.

After registration, create a channel which will be for your device. A channel is made for taking all the information you want to display update send or receive. It is used for interaction between arduino and your channel. While creating the channel, specify or check the number of fields for data you want to visualize or post on the server.

Thingspeak website provide API write key and API read key for each of its own purpose. In order to send or update information regarding our device in live feed we will use API write key and specify in our code while making requests to the website.

Arduinois an open source device, a prototyping board consisting of ATmega328Pmicrocontroller providing a 5V and 3.3V output volatage options. It takes input voltage from either connecting USB to your computer or either using a coaxial cable using a portable power supply. The arduino board is also capable of reading Twitter messages and respond in order to that. On the arduino you can upload sketches using Arduino IDE. Arduino comes in various flavours and according to needs like Uno, Mega, Yun etc.

In this instrument we used Arduino unoboard. It is cheap and feasible. Also it is good to start as a beginner. It has 14 digital input/output pins, 6 analog inputs and a reset button. It takes input voltage in between 7-12V.

DHT11 is a basic low cost temperature and humidity sensor. In this project we've connected DHT11 sensor to the digital pin 7 of arduino. It consists of 4 pins from left to right Vcc, Data, NC(not connected) and GND. There are mainly three pins which are used. Connecting the ground on ground of arduino and Vcc to 5v output of arduino.

The rain drop sensor module is a sensor which is used to detect whether there is any rain or presence of rain weather near surrounding. It is a tool for rain detection. The module consists of a rain board on which droplets can be detected, a potentiometer attached to adjust the sensitivity for it and a LED to show the power indication. It gives only analog output. It is connected to analog pin A0.

Soil moisture sensor module consists of a sensor which detects the moisture within the soil or volumetric water content. If you want to know that when you need to give water to your plants or they're needy. It can inform you that your garden soil is wet, dry moisture or not. It also consists of a potentiometer to vary the sensitiveness of the sensor. It is connected to analog pin A1 to take the readings.

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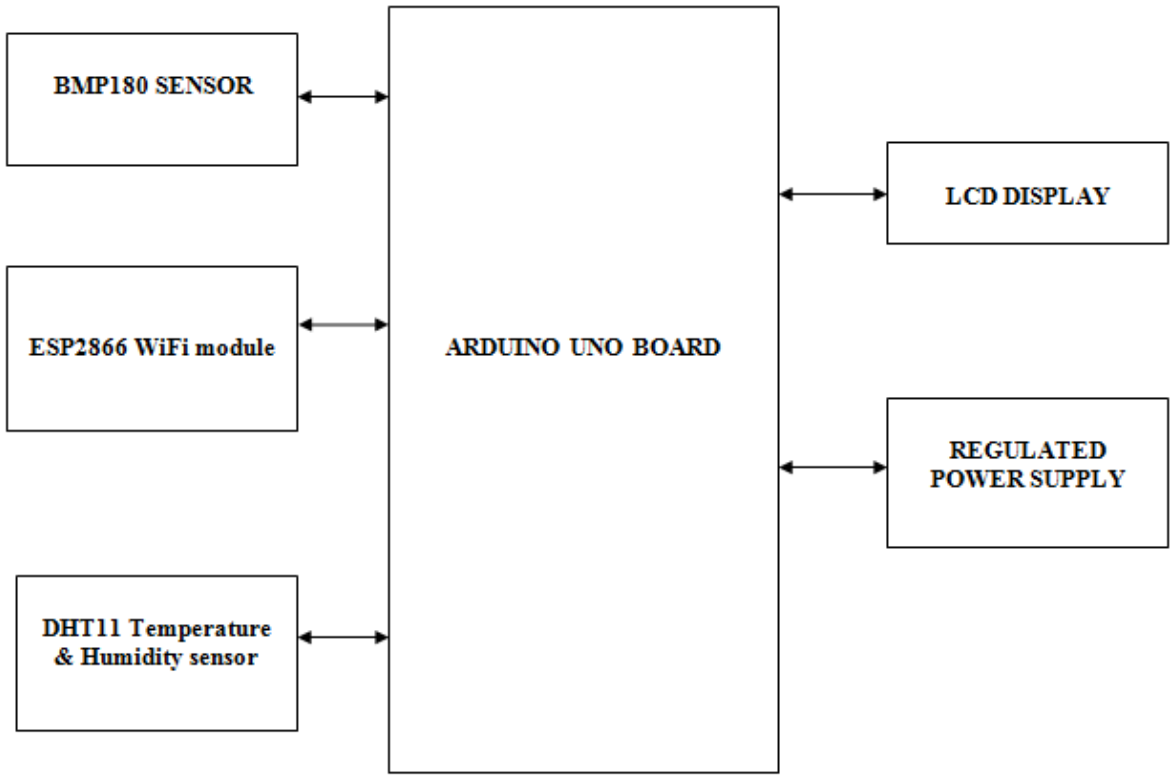
BMP180 sensor is a barometric pressure sensor which senses with an I2C interface As the pressure varies with altitude it can used to measure the altitude too. It has 4 pins SDA, SCL, GND and Vin.

3. MATHEMATICAL MODEL



4. CONCLUSION

In further improvements on small scale it is desired to be cased within a arduino case either own made or bought as desired. Adding one more sensor LDR(Light dependent sensor) one of the other available cheap sensors can be used to light cloudy weather or not. One of the future scope of it as desired is compatible with smartphone apps to give any critical feedback of data. Updating twitter status and performing actions on the basis of that which is one of the most efficient use of IOT. The special feature to be included as an idea in this device is that it can be used for any critical environments or local area rather than expensive weather stations capable of performing over a large scale. These work on small scale too on public wireless LANs.