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RENEWABLE POWERED PORTABLE WEATHER MONITORING SYSTEM

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Abstract - *Weather estimate, in reality continuous weather gauge is essential for our day by day life particularly in agribusiness. National weather data does not generally contain the precise information of each area rather it contains the information of closest climate station for a timeframe. The fundamental aim of this project is to develop a RES powered Weather Station which will help to monitor the weather parameters. Such a project contains sensors for detecting temperature, humidity, raindrop, carbon mono-oxide, smoke, LPG in the environment, barometric pressure, altitude etc. The information from the sensors are gathered by the Arduino. Arduino sends the sensors information in LCD display. Additionally, the device sends an SMS which contains weather information to the user with the assistance of a GSM module. At the end of the project the results have been compared between the national weather data and the actual reading. According to the results, the percentage of deviation for Temperature is 1%, Humidity is 5% and Barometric Pressure is 8%.*

Key Words: **Arduino Mega microcontroller board, GPS, GSM, Temperature sensor, Gas sensor, Humidity sensor, CO2 sensor, Pressure sensor.**

1. INTRODUCTION

Weather estimate, in reality continuous weather gauge is essential for our day by day life particularly in agribusiness. National weather data does not generally contain the precise information of each area rather it contains the information of closest climate station for a timeframe. The fundamental aim of this project is to develop a RES powered Weather Station which will help to monitor the weather parameters. Such a project contains sensors for detecting temperature, humidity, raindrop, carbon mono-oxide, smoke, LPG in the environment, barometric pressure, altitude etc. The information from the sensors are gathered by the Arduino. Arduino sends the sensors information in LCD display. Additionally, the device sends an SMS which contains weather information to the user with the assistance of a GSM module. At the end of the project the results have been compared between the national weather data and the actual reading. According to the results, the percentage of deviation for Temperature is 1%, Humidity is 5% and Barometric Pressure is 8%.

A wireless Sensor Network (WSN) is a wireless network consisting of spatially distributed autonomous devices using sensors to cooperatively monitor physical or environmental conditions, such as temperature, humidity, at different locations. In the temperature sensor is used to measure the temperature around environment. The humidity sensor is calculate the temperature into the surrounding air and the Gas sensor is used to measure Gas level. This all data are updated to the Authorized Person using GSM.

The nodes in the network are connected via wireless communication channels. Each node has capability to sense data, process the data and send it to restate nodes or to base station. LCD is used to print the current status from the controller.

1.1 LITERATURE SURVEY:

Through weather observation system we are able to collect the data about humidness and temperature and in keeping with current and former data we are able to manufacture the ends up in graphical manner within the system. Once reviewing several articles, there are presently no papers that mention observation the mixture of temperature, lighting and humidness in one integrated system and have actuators to change these settings. Additionally to this, there's one analysis paper that has mentioned observation these three environmental conditions; but, there has been no mention regarding having actuators to change. Therefore our main plan was to coin a system which will sense the most parts that formulates the weather and may be able to forecast the weather without human error.

Weather is that the state of the atmosphere, to the degree that it's hot or cold, wet or dry, calm or stormy, clear or cloudy. Most weather phenomena occur within the layer, just under the layer. Weather usually refers to day-after-day temperature and precipitation activity, whereas climate is that the term for the common region conditions over longer periods of your time.

Once used while not qualification, “weather”, is known to mean the weather of earth. Observing the climatic conditions manually is tough. Through this technique we will mechanically collect the knowledge regarding wetness and temperature. The small print square measure hold on during an information and in keeping with current and former knowledge we will manufacture the leads to graphical manner within the system.

In human life weather monitoring plays an important role, as the data collection related to dynamically changing weather conditions are important. It is very important to monitor weather in packaging industry during certain hazards. The monitoring of weather parameters in an industry and also in a room can be done by using the weather monitoring system. The design of such a system is discussed in this paper. The weather monitoring system contains DHT sensor by which temperature and humidity will be monitored. The data from the sensors are collected by the micro controller and also micro controller sends the sensors data in to the Arduino Software (IDE) by using the Serial Communication.

1.2 EXISTING SYSTEM:

The sensor data's can send using Wired communication. There is no wireless system for data transfer. It is not possible without caregivers. High cost and more time consumption. There is no privacy security system in now a day.

1.3 PROPOSED SYSTEM:

In proposed system we can send the data's in GSM. They can immediately give recover treatment to the patient to save their life. It is used in military, sports and individual purpose. Low cost and wireless.

2. HARDWARE DESCRIPTION:

ARDUINO: Arduino Mega microcontroller board as a platform for open source hardware and software. The Arduino Mega consists of ATmega2560 microcontrollers. Arduino hardware is programmed in a wired language (syntax and library), such as C++ with minimal modification and a combined processing environment. It allows communication between computers through programming. It receives the input signal from the sensor, and then generates the output voltage.

The development environment of the Arduino project, or integrated development environment (IDE), is a free download for Windows operating systems. Fig-1 demonstrates the open-source Arduino Software – Integrated Development Environment (IDE) for programming Arduino UNO. The open-source Arduino Software (IDE) makes it easy to write code and upload it to the board. It runs on Windows, Mac OS X, and Linux. The environment is written in Java and based on Processing and other open-source software.

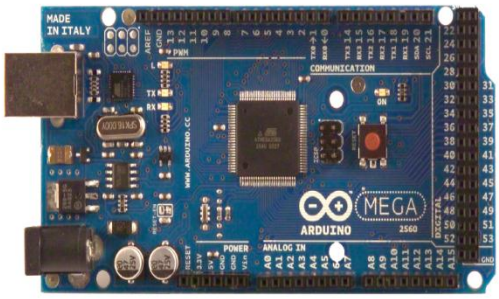

Fig-1: Arduino MEGA

The key features are:

Arduino boards are able to read analog or digital input signals from different sensors and turn it into an output such as activating a motor, turning LED on/off, connect to the cloud and many other actions. You can control your board functions by sending a set of instructions to the microcontroller on the board via Arduino IDE (referred to as uploading software).Unlike most previous programmable circuit boards, Arduino does not need an extra piece of hardware (called a programmer) in order to load a new code onto the board. You can simply use a USB cable. Additionally, the Arduino IDE uses a simplified version of C++, making it easier to learn to program. Finally, Arduino provides a standard form factor that breaks the functions of the micro-controller into a more accessible package. Various kinds of Arduino boards are available depending on different microcontrollers used. However, all Arduino boards have one thing in common: they are programmed through the Arduino IDE. The differences are based on the number of inputs and outputs (the number of sensors, LEDs, and buttons you can use on a single board), speed, operating voltage, form factor etc. Some boards are designed to be embedded and have no programming interface (hardware), which you would need to buy separately.

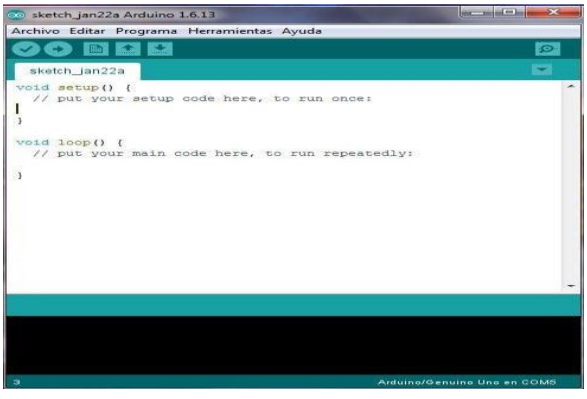

Fig-2: Arduino IDE

LIQUID CRYSTAL DISPLAY:

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters animations and so on. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data.

The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD.

Fig-3: 16x2 LCD

TEMPERATURE SENSOR:

Temperature is the most-measured process variable in industrial automation. Most commonly, a temperature sensor is used to convert temperature value to an electrical value. Temperature Sensors are the key to read temperatures correctly and to control temperature in industrials applications. A large distinction can be made between temperature sensor types. Sensors differ a lot in properties such as contact- way, temperature range, calibrating method and sensing element. The temperature sensors contain a sensing element enclosed in housings of plastic or metal. With the help of conditioning circuits, the sensor will reflect the change of environmental temperature.

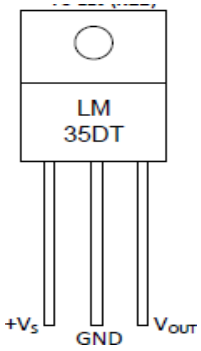

Fig-4: Temperature Sensor

HUMIDITY SENSOR:

Humidity sensor is an instrument used for measuring the moisture content in the environment. Humidity measurement instruments usually rely on measurements of some other quantity such as temperature, pressure, mass or a mechanical or electrical change in a substance as moisture is absorbed. By calibration and calculation, these measured quantities can lead to a measurement of humidity.

Fig-5: Humidity Sensor

GAS SENSOR:

A gas detector is a device which detects the presence of various gases within an area, usually as part of a safety system. This type of equipment is used to detect a gas leak and interface with a control system so a process can be automatically shut down. A gas detector can also sound an alarm to operators in the area where the leak is occurring, giving them the opportunity to leave the area. This type of device is important because there are many gases that can be harmful to organic life, such as humans or animals.

Fig-6: Gas Sensor

CO2 SENSOR:

Features Good sensitivity and selectivity to CO2 Low humidity and temperature dependency Long stability and reproducibility.

The carbondioxide gas sensor measures gaseous carbon dioxide levels by detecting the quantity of IR radiation absorbed by carbon dioxide molecules.

Fig-7: CO2 Sensor

PRESSURE SENSOR:

A pressure sensor is a device which senses pressure and converts it into an analog electric signal whose magnitude depends upon the pressure applied. Since they convert pressure into an electrical signal, they are also termed as pressure transducers.

Since a long time, pressure sensors have been widely used in fields like automobile, manufacturing, aviation, bio medical measurements, air conditioning, hydraulic measurements etc.

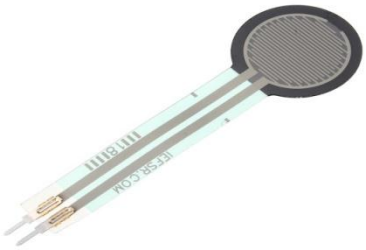

Fig-8: Pressure Sensor

Global Positioning System:

The Global Positioning System (GPS) is a satellite based navigation system that can be used to locate positions anywhere on earth. Designed and operated by the U.S. Department of Defense, it consists of satellites, control and monitor stations, and receivers. GPS receivers take information transmitted from the satellites and uses triangulation to calculate a user's exact location.

GPS is made up of three parts: between 24 and 32 satellites orbiting the Earth, four control and monitoring stations on Earth, and the GPS receivers owned by user. GPS satellites broadcast signals from space that are used by GPS receivers to provide three-dimensional location (latitude, longitude &altitude).

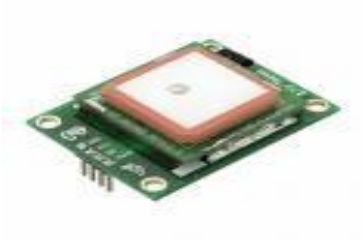

Fig-9: GPS

Global System for Mobile Communication:

Global System for Mobile Communications (GSM) modems are specialized types of modems that operate over subscription based wireless networks, similar to a mobile phone. A GSM modem accepts a Subscriber Identity Module (SIM) card, and basically acts like a mobile phone for a computer. Such a modem can even be a dedicated mobile phone that the computer uses for GSM network capabilities.

Traditional modems are attached to computers to allow dial-up connections to other computer systems. A GSM modem operates in a similar fashion, except that it sends and receives data through radio waves rather than a telephone line.

Fig-10: GSM

3. SOFTWARE DESCRIPTION

The Arduino Integrated Development Environment:

Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to

the Arduino and Genuino hardware to upload programs and communicate with them.

WRITING SKETCHES:

Programs written using Arduino Software (IDE) are called sketches. These sketches are written in the text editor and are saved with the file extension .ino. The editor has features for cutting/pasting and for searching/replacing text. The message area gives feedback while saving and exporting and also displays errors. The console displays text output by the Arduino Software (IDE), including complete error messages and other information. The bottom right hand corner of the window displays the configured board and serial port. The toolbar buttons allow you to verify and upload programs, create, open, and save sketches, and open the serial monitor.

NB: Versions of the Arduino Software (IDE) prior to 1.0 saved sketches with the extension .pde. It is possible to open these files with version 1.0, you will be prompted to save the sketch with the .ino extension on save.

Additional commands are found within the five menus: File, Edit, Sketch, Tools, Help. The menus are context sensitive, which means only those items relevant to the work currently being carried out are available. Since version 1.0.1, the Arduino Software (IDE) has been translated into 30+ different languages. By default, the IDE loads in the language selected by your operating system. (Note: on Windows and possibly Linux, this is determined by the locale setting which controls currency and date formats, not by the language the operating system is displayed in.)

If you would like to change the language manually, start the Arduino Software (IDE) and open the Preferences window. Next to the Editor Language there is a dropdown menu of currently supported languages. Select your preferred language from the menu, and restart the software to use the selected language. If your operating system language is not supported, the Arduino Software (IDE) will default to English. You can return the software to its default setting of selecting its language based on your operating system by selecting System Default from the Editor Language drop-down. This setting will take effect when you restart the Arduino Software (IDE). Similarly, after changing your operating system's settings, you must restart the Arduino Software (IDE) to update it to the new default language.

4. Flow Chart

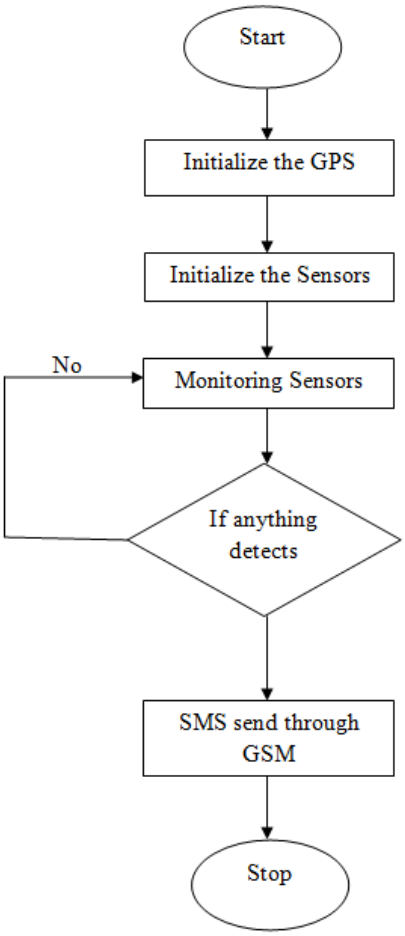

Fig-11: Flow chart

5. RESULT

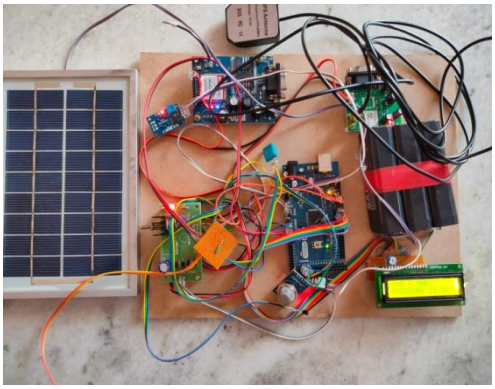

Fig-12: LCD Displaying Latitude and Longitude

It depicts the initialization of the device by displaying the latitude and longitudinal values then the Arduino takes all the sensors output reading and display it on Liquid Crystal Display (LCD).

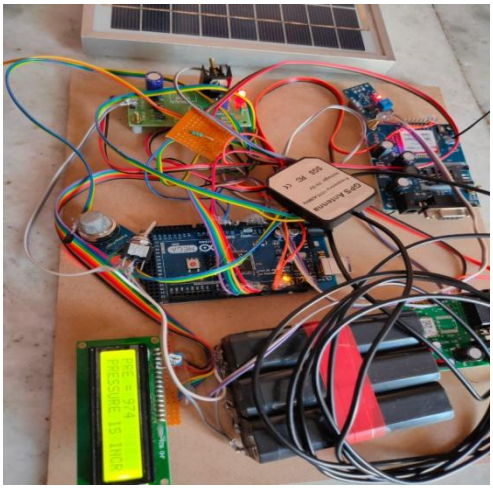

Fig-13: LCD displaying Pressure is high

The output is displayed on the LCD and the SMS will also be sent. Consumer can get output using GSM. If there is any abnormality detected in the sensor readings then GSM send the Arduino output to the consumer.

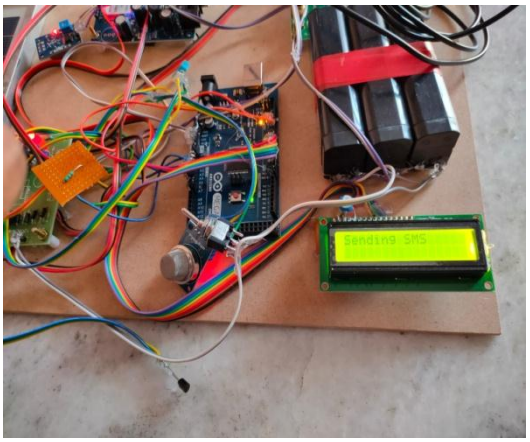

Fig-14: LCD displaying SMS send using GSM

6. CONCLUSIONS

The scope of the weather station will give us the chance to distinguish a slight difference in climate inside a little space of region, which will make our climate anticipating framework more one of a kind and solid. As time utilization one of the greatest issues of this project, a few tests were executed where we took the information in a short time interim, which makes the information legitimacy more dependable.

After comparing the device data with the national data, it was found that the percentage of deviation for Temperature is 1%, Humidity is 5% and Barometric Pressure is 8%. Hence the weather forecast can be accurately known from this device. The proposed system is a portable system, so it can be easily moved to any place. It is easy to install and cost effective as well. To run this station, solar power has been used, so that it can be used in off-grid area. A GSM module will help the user to get the data by SMS.

FUTURE SCOPE

The proposed system sensors for detecting Temperature, Humidity, Raindrop, Carbon mono-oxide, smoke and barometric pressure. The system mainly is used for maintaining the temperature and humidity in a room. It can also be used in packaging industry where weather monitoring plays a crucial role. The sensors can be sensed in a room or an industry by using this system. People who suffers from asthma or the new born or old age people prefers to have temperature and humidity in particular range. The system is going to sense targeted area not city or village. By this way we get specific results regarding environmental factors.

The system developed is cost effective and all the parameters are uniquely identifiable through the embedded computing system. The system can be further modified as a system which senses and after some intervals and communicates it to the IOT analytics platform service in future. This information can be accessed via Android app. As a further part, one can control to switch the A.C on/off. It takes information about the surroundings environment through sensors and upload it directly to the internet, where it can be accessed anytime and anywhere through internet.

REFERENCES

[1] Mendelsohn, Robert, and Ariel Dinar. "Climate change, agriculture, and developing countries: does adaptation matter?." The World Bank Research Observer 14, no. 2(1999): 277-293.
[2] Glahn, Harry R., and Dale A. Lowry. "The use ofmodel output statistics (MOS) in objective weatherforecasting." Journal of applied meteorology 11, no. 8(1972): 1203-121.
[3] Fiebrich, Christopher A. "History of surface weatherobservations in the United States." Earth-ScienceReviews 93, no. 3 (2009): 77-84.
[4] Banani Model Town Weather - AccuWeather Forecastfor Dhaka Bangladesh. (n.d.). Retrieved from https://www.accuweather.com/en/bd/banani-modeltown/27905/weather-forecast/27905
[5] Weather in Cumilla, Bangladesh (n.d.). Retrieved from https://www.timeanddate.com/weather/bangladesh/co