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RAINFALL PREDICTION THROUGH IOT AND ARTIFICIAL INTELLIGENCE

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Abstract - *The system proposed in this paper is an advanced solution for monitoring the weather conditions at a particular place and make the information visible anywhere in the world. The technology behind this is Internet of Things (IoT), which is an advanced and efficient solution for connecting the things to the internet and to connect the entire world of things in a network. The data updated from the implemented system can be accessible in the internet from anywhere in the world. In agriculture zone it will be very difficult to check and monitor the weather parameter through wires and analog devices during some weather hazards. To overcome this problem here the wireless sensors are used to check and monitor the weather parameters. The other idea is Vertical farming system. It is implemented for cultivating different crops in small area.*

Key Words: **Rain Sensor, Humidity Sensor, LDR, Temp Sensor, IOT webpage (thingsspeak), GSM technology.**

1. INTRODUCTION

With the advent of high speeds Internet, more and more humans around the globe are interconnected. Internet of Things (IoT) takes this a step further, and connects not only humans but electronic devices which can speak amongst themselves [1]. With falling costs of Wifi enabled devices this trend will only gather more momentum. The main concept

behind the Internet of Things(IoT) is to connect various electronic devices through a network and then retrieve the data from these devices (sensors) which can be distributed in any fashion, upload them to any cloud service where one can analyze and process the gathered information. In the cloud service one can utilize these data to alert people by various means such as using a buzzer or sending them an e-mail or sending them an SMS etc.

Existing technology mainly focus on controlling and monitoring of different activities. These are increasingly emerging to reach the human needs. An efficient environmental monitoring system is required to monitor and assess the conditions in case of exceeding the prescribed level of parameters. Sensors are placed at different locations to collect the data to predict the behavior of a particular area of interest. The

main aim of the this paper is to design and implement an efficient monitoring system through which the required parameters are monitored remotely using internet and the data gathered from the sensors are stored in the cloud and to project the estimated trend on the web browser. The values from the cloud are updated at each and every moment. The crops are cultivated and the soil are tested mainly the moisture is measured. Thus we can cultivate different crops at a particular area. Vertical farming is nothing but it is a vertically stacked farming and it is a upcoming methodology for farming.

1.2. LITERATURE REVIEW

In this section, an analysis is carried with the current weather prediction strategies accessible in the literature. Linear Regression is the most fundamental and regularly utilized prescient model for investigation. Regression estimates are for the most part used to depict the information and illustrate connection between at least one independent and dependent factor. Linear regression finds the best-fit through the points, graphically. The best-fit line through the focuses is known as the regression line. Here, the line can be straight or curved relying upon the data. The best-fit line can likewise be a quadratic or polynomial which gives us better solution to our inquiries. Two of the algorithms used as a part of this research are Decision Tree and Time Series Analysis Weather prediction has been a major challenge from early days; new methodologies cluster everyday replacing the old ones. Literature studies have shown that machine learning techniques achieved better performance than traditional statistical methods. The next wave in the era of computing will be outside the realm of the traditional desktop. In the Internet of Things (IoT) paradigm, many of the objects that surround us will be on the network in one form or another. Machine Learning is closely related to internet of things.

2. PROPOSED SYSTEM

In this, we present the theory on rainfall prediction through IOT. In this proposed block diagram consist of several sensors (LDR sensor, Humidity sensor, temp sensor, Rain Sensor) is connected to our controller. The controller is accessing the sensor values processing them and display on LCD Display and upload data over web server. All sensors interface with microcontroller. Updated readings are sent into a Wifi module that translates the data into a graphical and statistical manner.

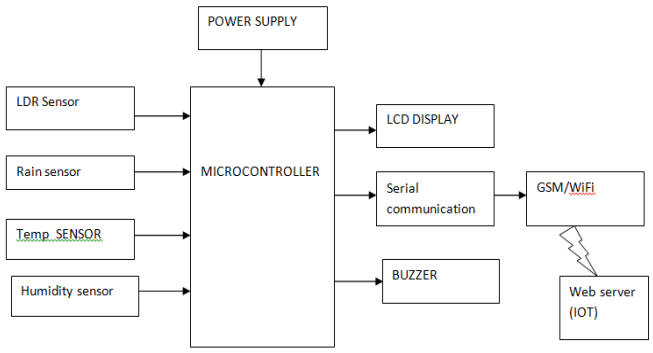

Fig 1: **Block Diagram of System**

A. PIC 18f4520 microcontroller:

Data Memory up to 4k bytesn Data register map - with 12-bit address bus 000-FFF

- Divided into 256-byte banks
- There are total of F banks
- Half of bank 0 and half ofbank 15 form a virtual (oraccess) bank that is accessibleno matter which bank isselected – this selection isdone via 8-bits
- Program memory is 16-bits wide accessed through a separate program data bus and address bus inside the PIC18.
- Program memory stores the program and also static data in the system.
- On-chip External
- On-chip program memory is either PROM or EEPROM.
- The PROM version is called OTP (one-time programmable) (PIC18C) The EEPROM version is called Flash memory (PIC18F).
- Maximum size for program memory is 2M n Program memory addresses are 21-bit address starting at location 0x000000

Fig -2: **PIC18f4520**

B. Rain Sensor:

It is used for the detection of rain. It can also be used for measuring the intensity of the rain. It has both digital output as well as analog output. This module measures the moisture through analog output pin and when the threshold of moisture exceeds too much it provides a digital output. The more water or the lower resistance means lower output voltage. Whereas, the less water means higher resistance, i.e, high output voltage on the analog pin.

Fig -3: **Rain Sensor**

C. Humidity Sensor:

DHT11 is a Humidity and Temperature Sensor, which generates calibrated digital output. DHT11 can be interface with any microcontroller like PIC, Arduino, Raspberry Pi, etc. and get instantaneous results. DHT11 is a low cost humidity and temperature sensor which provides high reliability and long term stability.

It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and outputs a digital signal on the data pin (no analog input pins needed). It's very simple to use, and libraries and sample codes are available for Arduino and Raspberry Pi.

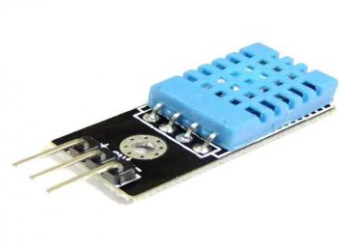

Fig -4: **Humidity Sensor**

D. LM35 Temperature Sensor:

The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in ° Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling. The LM35 does not require any external calibration or trimming to provide typical

accuracies of ±¼°C at room temperature and ±¾°C over a full -55 to +150°C temperature range. Low cost is assured by trimming and calibration at the wafer level. The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy.

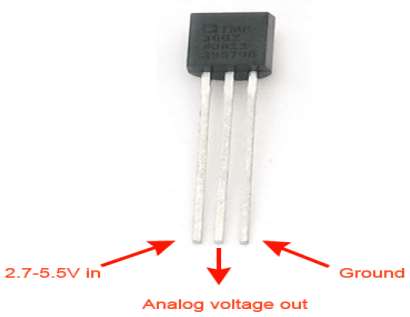

Fig -5: **LM35 TEMP Sensor**

E. LCD display:

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.

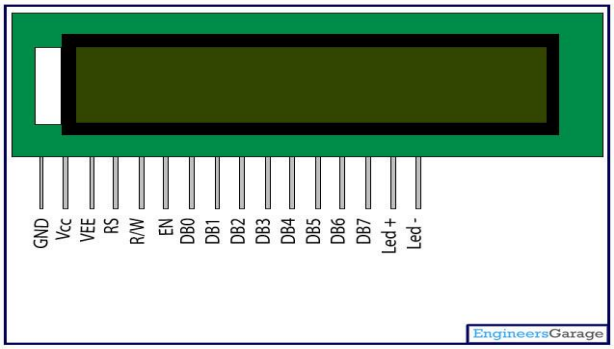

Fig -6 LCD display

F. GSM module:

This GSM modem has a SIM800A chip and RS232 interface while enables easy connection with the computer or laptop using the USB to Serial connector or to the microcontroller using the RS232 to TTL converter. Once you connect the SIM800 modem using the USB to RS232 connector, you need to find the correct COM port from the Device Manger of the USB to Serial Adapter. Then you can open Putty or any other terminal software and open an connection to that COM port at 9600 baud rate, which is the default baud rate of this modem.

Fig -7 GSM Module

3. CONCLUSIONS:

By keeping the embedded devices in the environment for monitoring enables self-protection (i.e., smart environment) to the environment. To implement this need to deploy the sensor devices in the environment for collecting the data and analysis. The main motto was to use the inexpensive components and attain to maximum best accurate system which could monitor the weather in real time application in agricultural lands and use this data to make more accurate future weather predictions using machine learning algorithms. Compared to the Decision Tree, ARIMA can more efficiently capture dynamic behavior of the weather temperature, resulting in a more compact and natural internal representation of the Rain information contained in the weather profile.

Weather prediction has been a major challenge from early days, new methodologies cluster everyday replacing the old ones. The next wave in the era of computing will be outside the realm of the traditional desktop. In the Internet of Things (IoT) paradigm, many of the objects that surround us will be on the network in one form or another. Machine Learning is closely related to internet of things. A perfect combination of them can promote fast development of agricultural modernization, realize smart agriculture and effectively solve the issues concerning agriculture, countryside and farmers. Then the collected data and analysis results will be available to the end user through the Wi-Fi/GSM.

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