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Novel Weather Alert and Logger System using IOT, Cloud and Sensors

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Abstract: ***The IoT and cloud based Weather Alert and Logger Software is a Raspberry Pi based project. IoT is Internet of Things and is the network of interconnected devices which are embedded with sensors, network, network connectivity and necessary electronics that enables them to collect and exchange data making them responsive. The Weather Alert and Logger Software is used to sense the weather conditions using sensors and collect temperature and humidity data and store it on to Cloud. It also retrieves data from Cloud and updates it after every specified time interval. The users receive the updated data on their smart phones. The purpose of the project is to monitor the weather conditions as per desirability. The software can be used in various fields like, pharmaceutical warehouses, oil refineries, dairy product warehouses, hospitals where it is important to maintain a particular weather conditions. The Software is also very cost effective and easily implementable.***

Keywords: Raspberry Pi, Sensor, Temperature, IoT, Cloud, Python

I. INTRODUCTION

An important part of human life is weather. Not only does it have an impact on all living and nonliving things but the change in the temperature can bring about differences in the environment and lives. Due to this weather monitoring becomes an important task. It's important we understand the change in the temperature in order to take the right measures and decease the impact of the changes in the temperature. The Weather Alert and Logger system is an IoT based device that can monitor temperature and indicate it beforehand in order to take precautionary measures.

IoT is Internet of Things and is the network of interconnected devices which are embedded with sensors, network, network connectivity and necessary electronics that enables them to collect and exchange data making them responsive. Each thing is uniquely identified through its embedded computing system but is able to inter-operate within the existing Internet infrastructure. The IoT allows objects to be sensed or controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer based systems, and resulting in improved efficiency, accuracy and economic benefit in addition to reduced human intervention.

The data from the sensors are processed by the Raspberry Pi which acts as a data logger. The logged data can be moved to a desktop for further monitoring. Such a system can be used in industries, refineries, forest and farms where temperature change can create problems.

II. PROPOSED SYSTEM

The proposed system is based on Raspberry pi which consists of the latest wireless technology. The system is created in order to measure and record the parameters of the atmosphere without human efforts. The temperature sensors sense the temperature and the humidity and this data is stored on to the cloud. The data is then retrieved from cloud and displayed to the user. The data is updated every 5 seconds and is visible to the user. As all the data is saved on Cloud, there is no loss of data and the recorded data can be viewed at any point of time. The system has fixed constraints and when the temperature goes above or falls below the constraint, the system instantly notifies the user because of which the user can take safety measures.

When the system is active, it gives you updates on the temperature on the display/smartphone. It helps you monitor the desired area. IoT helps you find the exact situation of the area. Raspberry Pi is used in order to reduce complexity.

The application where the results are displayed is our weather station.

The system is highly useful in farms where the healthy growth of crops depends on the weather conditions. Monitoring the weather conditions can lead in a better yield

and prevent loss. Also in order to maintain a safe working environment in the industries, weather monitoring becomes essential.

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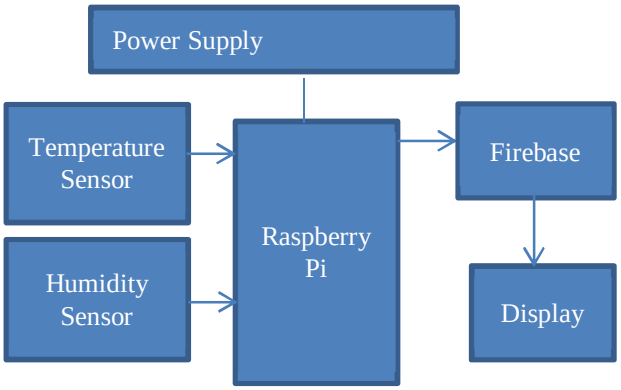

Figure 1: Block diagram of Weather Alert and Logger System

III. IMPLEMENTATION

A. *Components Description*

The proposed system consists of the following components:

1) Raspberry Pi board: The Raspberry Pi foundation developed the Raspberry Pi which is a series of small single-board computers. It uses the Linux operating system and it is most used for IoT projects as it can be directly connected to the internet. For direct connections, Raspberry Pi has 40 GPIOs. Different sensors can be interfaced with general purpose input output (GPIO) of Raspberry Pi board for environmental parameter monitoring. The credit card sized device can do many functions like word processing to playing games. The Broadcom BCM2835 system based Raspberry Pi consists of ARM1176JZF-S runs on 700 MHz processor, and primarily works on 256 megabytes of RAM, later upgraded to 512 MB. This system uses micro SD cards for saving data, so it is easier to organize and on equivalent hardware it can run many different operating systems. The GPIO pins have different uses individually such as power supply, ground, clock, UAR. The Raspberry Pi featuring of a 40-Pin GPIO header, 4 x USB ports, 1x LAN port, also 1x CSI and 1x Touch Screen interface, 1x HDMI port, also 1x integrated audio and video output port. So there is no need to have large SD card. Figure 1 shows the Raspberry Pi B+ Model.

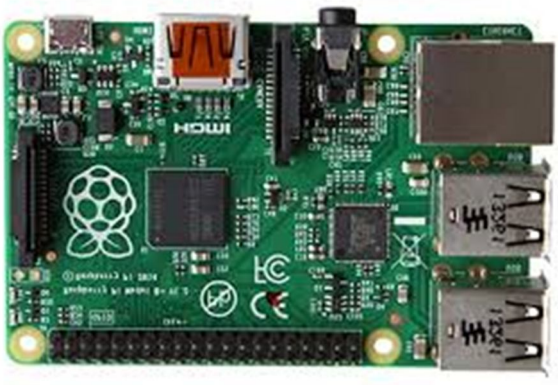

Figure 2: The Raspberry Pi Model

2) DHT11 Sensor is an ultra low-cost, basic digital temperature and humidity sensor. Its technology ensures the high reliability and excellent long-term stability. Good for 20-80% of humidity measurement and 0-50°C of temperature measurement. The sensor uses a thermistor and resistive humidity sensor to measure the surrounding air and displays a digital signal on data pin.

3) LAN Cable (Local Area Network) is used connect the Raspberry Pi to the internet, with which the real time parameters at any remote location and be accessed. The connectivity is way higher using a LAN cable.

4) *HDMI Display:* In order to view the current status or results, the measure of the temperature and humidity, we need a HDMI display which could be a webpage or a Smartphone.

5) *External SD Card:* The external storage is used in order to store the operating system Raspbian.

6) *Connecting Wires:* In order to connect the components and set it up to bring the system into working.

7) *Keyboard:* In order to provide inputs

B. Software Requirements

1) *Raspbian:* Raspbian is free and open source software. Raspbian operating system is based on Linux kernel. An SD card is used to install an operating System.
2) *Python:* Recommended language for Raspberry Pi as it works on the Linux operating system. Python is a simple, dynamic, interpreted, object oriented language. Python is designed to be highly readable.
3) *Firebase:* Firebase is a NoSQL cloud database. A NoSQL database provides a mechanism for storage and retrieval of data that is modeled in means other than the tabular relations used in relational databases. The Firebase Realtime Database is a cloud-hosted database. Data is stored as JSON and synchronized in realtime to every connected client. Firebase is used in order to store the recorded parameters and view it.
4) *Adafruit:* It is a Python library which needs to be installed in order to use the temperature sensor or import any python statements.

IV. RESULTS AND CONCLUSION

The Raspberry Pi is a device capable of being a weather station as it is compact but a powerful device. RPI GPIO library is needed which gives access to raspberry PI's GPIO's is get accessed by RPI GPIO library which additionally needed by for final programming. And the HTTPLIB which can access internet connection of raspberry and over internet data pushed on the server. Data that's available on the cloud can be viewed at any point of time and can be retrieved using applications. The system is efficient in situations where manually monitoring is highly impossible.

The table below shows the comparison between the different models of Raspberry Pi in terms of cost, memory capacity and other features.

Different Models of Raspberry Pi

Table 1: Raspberry Pi Models

Parameter Zx	Model B+	Model 2	Model 3
GPIO Ports	40	40	40
Processing Speed	700 MHZ	900 MHZ	1.2GHZ
RAM	512 MB	1GB	1GB
Bluetooth and WiFi	No	No	Yes
USB Ports	4 USB	4 USB	4*USB2

V. CONCLUSION & FUTURE SCOPE

The scope of this system is very high as high. IoT is just seeing daylight and will be put into practice in various ways. A similar system can be used for data monitoring and other projects where manual efforts need to be reduced and various things must be taken care of.

The use of Raspberry Pi makes the applications of this system limitless. The system can be used in farms where it is important to have the right temperature for a good yield, in forests to prevent unexpected fires or in order to take safety measures, and in various places where change in temperature could lead to disasters. The system can also be used in industries where temperature plays and important role in various processes. Also because of the use of Raspberry Pi which acts like a complete computer, we can program the system in order to receive results in text messages and emails or as an app notification.

As the systems applications falls under remote areas and the system is very inexpensive, it can be set up very easily.

With the use of many more sensors such as pressure sensors, light sensors and moist sensors, the system can be used for automatic irrigation control which is likely to reduce most efforts of farmers.

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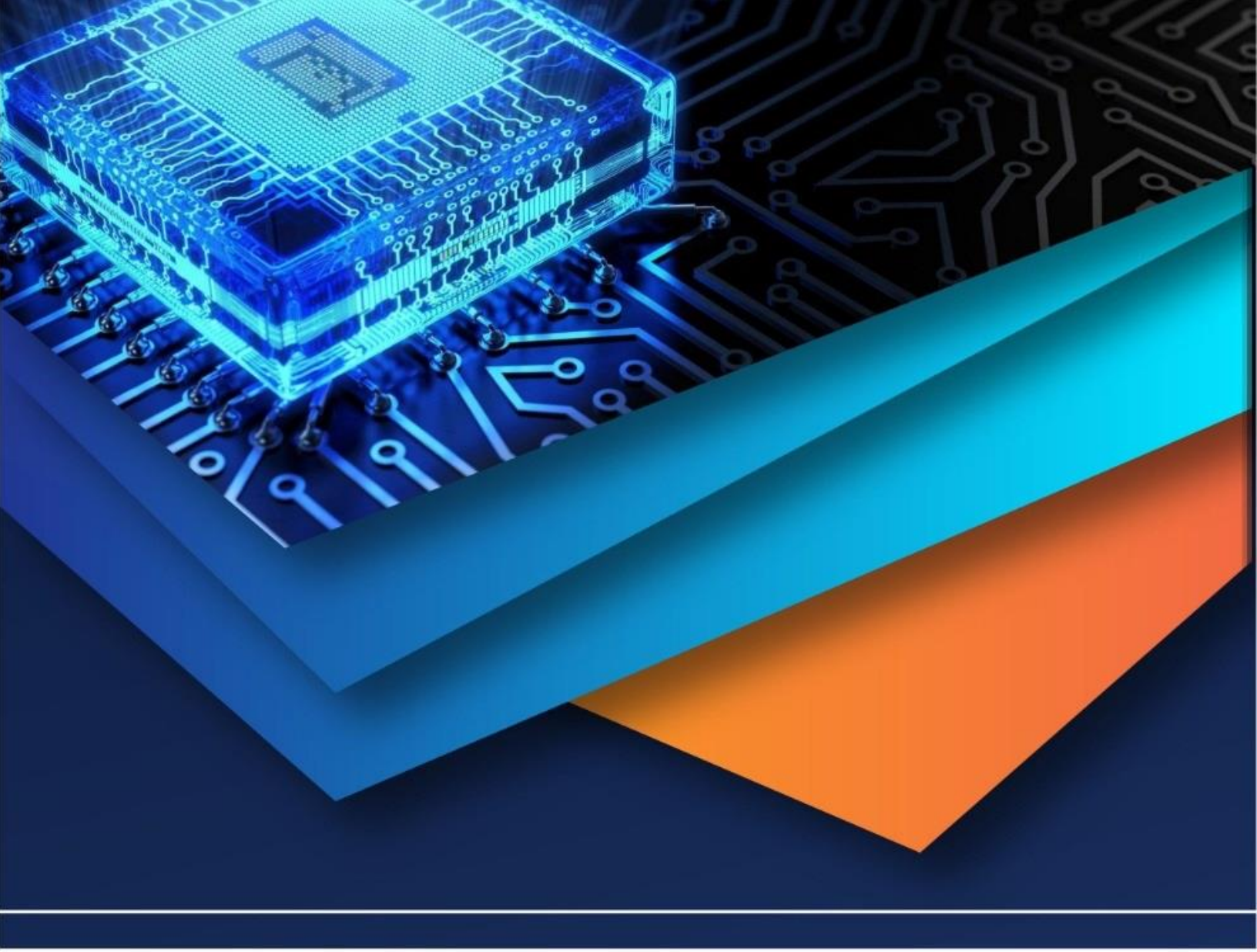

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