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IoT-based Temperature and Humidity Monitoring System using Raspberry pi

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Abstract: This paper presents the calculation and display of live temperature and humidity using raspberry pi. It is based on raspberry pi temperature and humidity sensing DHT11 sensor for measurement and it is distinctive as it not only reads temperature from sensor but also stores displays data on screen and other devices. In this paper we used Python language.
Keywords: IoT, Raspberry pi, sensors, python

I. INTRODUCTION

Almost all the activities surrounding us have impact on Temperature [1]. An accurate calculation of temperature and humidity is a important factor in many fields and industries of science. The constant observation of temperature is crucial in lot of applications like food industry, the manufacturing factory and pharmaceutical industry. For commercial purpose of temperature sensing we have analog and digital Temperature sensors. Temperature sensors which have temperature-dependent functions can be measured using resistors, semiconductors like diodes, thermocouples and thermistors. The main objective of the project is oversee the live temperature and humidity in a less cost .The observational node is raspberry pi. The programming language used for raspberry pi is Python. The Sensor used is DHT11 temperature sensor. This sensor consists of temperature calculating function and main advantage of using DHT11 sensor is it is inexpensive and has less weight. Sensor is connected with the raspberry pi using jumper wires. The temperature is perceived using the sensor DHT11 and is read, stored and displayed by the raspberry pi kit.

II. LITERATURE SURVEY

M. Rahaman Laskar et al. presented paper on weather forecasting using Arduino and Cube-Sat. This proposed system uses temperature and humidity sensor (DHT11), pressure and altitude sensor (BMP180) and accelerometer (ADXL-335). The data processing unit Arduino Uno is used. Cube satellite is used to provide information of weather from anywhere without using network. A gas balloon is used to hold and carry the Cube satellite. This system is simple to construct, portable, cost efficient, low power consuming and reliable. But there are some limitations such as device may not communicate at long distance without powerful transceiver section, at higher altitude record of data with the help of gas balloon may be a problem and components may be damaged by rain or long time use. [2]

Vinayak Aappasaheb Pujari et al. have proposed the system that uses the solar power panel. This system is used to monitor temperature, wind speed, wind direction, humidity and rain. The sensed data will be sent to GSM module and through gateway to the personal computer. A server is connected to the database. [3]

Prof. Satyashil Nagrale et al. have proposed the weather monitoring system using real time data transmission. The proposed system uses VAISALA weather transmitter sensor WXT520 to transmit the data to the control room. It sense the parameters like wind speed, wind direction, precipitation, atmospheric pressure, temperature, relative humidity. This real time data is transmitted wirelessly through GSM over long distance. This system provides flexibility as needs changes. [4]

Sheikh Ferdoush et al. have proposed their system for environmental monitoring applications. This system includes an in-situ base station and a number of distributed wireless sensor nodes. Base station is designed using Raspberry Pi Model B. networked sensor nodes are developed using Arduino and Zigbee modules. To access the sensor nodes and data from the outside world, a web application is developed on the base station using the Apache HTTP web server. This system is low-cost, compact, scalable, easy to customize, easy to deploy and easy to maintain. This system can be expanded by integrating additional sensing modalities to sensor nodes. Also web interface can be further developed. [5]

Prof. C. H. Chavan et al. have proposed their system to develop wireless sensor network for an agricultural environment. This system uses the Wireless Sensor Networks which consisted of radio frequency transceiver, sensors, microcontrollers and power sources. Hardware of this system includes 8 bit AVR, ZigBee, Blue tooth module, temperature, humidity, soil moisture sensors, LCD. This system is reliable
and efficient for agricultural parameters monitoring. [6]

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III. ARCHITECTURE OF THE SYSTEM

Raspberry pi with internet connectivity, Temperature and Humidity sensor are the main hardware of this system. It is easy to operate and is cost effective and consumes low power . The monitored data is collected at the Web server with perfect date and time. The design of the system is done in such a way that system can work 24x7 and give exactdata of temperature and humidity on real time basis. With the help of this system precision farming can be done. It provides the convenience to handle different kinds of devices such as water pumps, located remotely using a Mobile phone from anywhere using internet connectivity. By adopting these system farmers can switch on and off their pump from their home or where ever they want using their mobile phone.

A. Temperature And Humidity Sensor (Dht11)

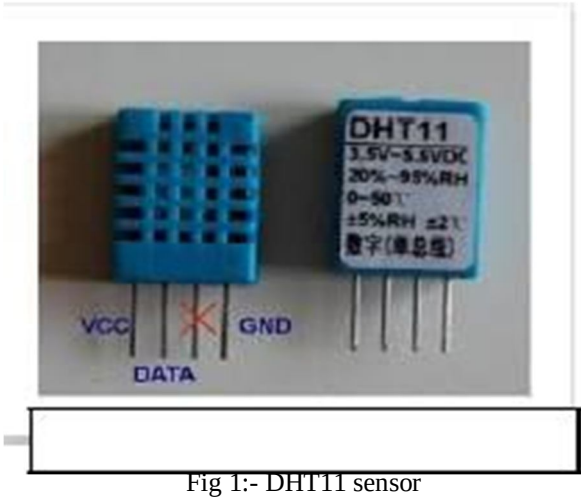

Fig 1:- DHT11 sensor

The DHT11 Temperature & Humidity Sensor is a 4-pin low cost highly reliable sensor. Pin-1 is Vcc, Pin-2 is data pin which collects data from outside world and gives data to the microcontroller. Pin configuration for DHT11 sensor is shown in figure. It features a temperature & Humidity sensor complex with a calibrated digital signal output. It fortifies high reliability and excellent long-term stability. The DHT11 sensor includes a resistive-type humidity measurement component, and connects to a high-performance 8-bit microcontroller, offering excellent quality, fast response, anti-interference ability and cost-effectiveness. Its temperature range is 00-550C and Humidity range is 20-90%.

B. Raspberry Pi

Raspberry Pi is small size minicomputer used to do small computing and networking operations which can be done by a computer system. Also, it provides GPIO pins due which it becomes the main element in the field of internet of things. It provides access to the internet using wires or wireless connectivity and hence automation of various systems of different devices with remote location becomes possible. Raspberry pi is available in various versions, here we used Raspberry Pi 3 model B, it has a 1.2 GHz 64-bitquad core ARMv8 CPU, and RAM of 1GB. it also has 40 GPIO pins, Full HDMI port, 4 USB ports, Ethernet port, 802.11n wireless LAN connectivity, Bluetooth 4.1 connectivity, Bluetooth low energy, 3.5mm audio jack, video Camera interface (CSI), the Display interface (DSI), and Micro SD card slot.

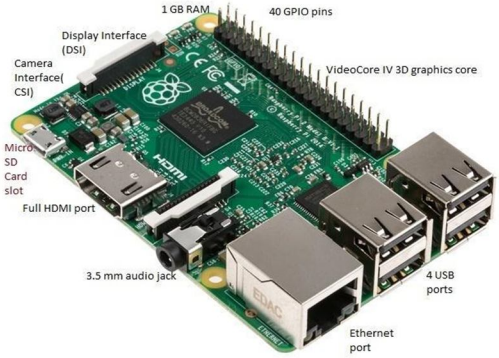

Fig 2 :- Raspberry pi

C. Raspbian Operating System

The raspbian operating system is an open source and free operating system which is a Debian based Operating system and it is a primary operating system of Raspberry pi. Raspbian provides the basic set of programs and software utilities for operating Raspberry Pi. It comes with more than 35,000 Raspbian packages which are precompiled software ,which provides a smooth and error free installation on Raspberry pi.It has avery good community of developers which runs the discussion forms and provides solutions to many relevant problems. Raspberry operating system is under effective development with an attention to enhance the stability and performance of the system.

D. Python (Programming language)

Python is a programming language that provides an easy and quick way to operate Raspberry pi. It is a powerful programming language that is easy to use (easy to read and write) with Raspberry pi. Python syntax is very clean, with an emphasis on legibility and uses Standard English keywords. Python allows programmers to use fewer lines of code than would be possible in languages such as assembly, C, or Java. Initially, the Python programming language used as a scripting language for Linux. Python programs contain a series of commands. These programs are executed by the computer from top to bottom same as shell scripts.

IV. WORKING METHODOLOGY

First of all Raspberry pi has to be prepared and for that we require NOOBS. NOOBS, short for New Out of the Box Software. It's an operating system manager that makes it easy to download, install, and set up your Raspberry Pi. When you first boot up NOOBS, you'll get a selection of OS to choose from. NOOBS makes getting started with Pi easy, and includes a bunch of different operating systems to choose from. The Raspberry Pi itself doesn't come with an operating system, we need to select it while booting of NOOBS. Raspbian is the "official" operating system of the Raspberry Pi. Raspbian has been the standard Raspberry Pi operating system. Raspbian is a version of Linux built specifically for the Raspberry Pi.

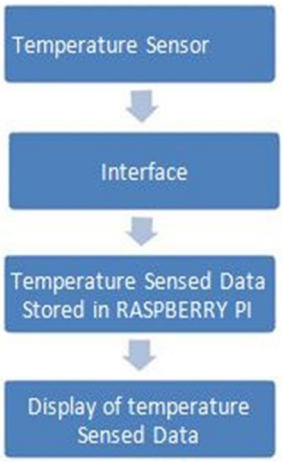

Fig 3Flow chart of Circuit system

V. RESULT

IoT-Based temperature and humidity calculating system provides an efficient and safe system for detecting agricultural parameters. The results of temperature and humidity can be seen on Raspbian OS terminal. By clicking on the broadcast channel options..

VI. CONCLUSION

IoT-Based temperature and humidity detecting system provide an efficient and definitive system for monitoring agricultural parameters. The corrective action can be taken. IoT-Based monitoring of field not only allows user to reduce the human work and time, but it also permits user to analyze accurate changes in the atmosphere and for taking possible action. It is cheaper in cost and consumes less power. The GDP per capita in agro sector can be increased. This IoT-based system can be extended for controlling different electronic and electrical apparatus from remote locations and the system can also extended for soil moisture and cattle monitoring.

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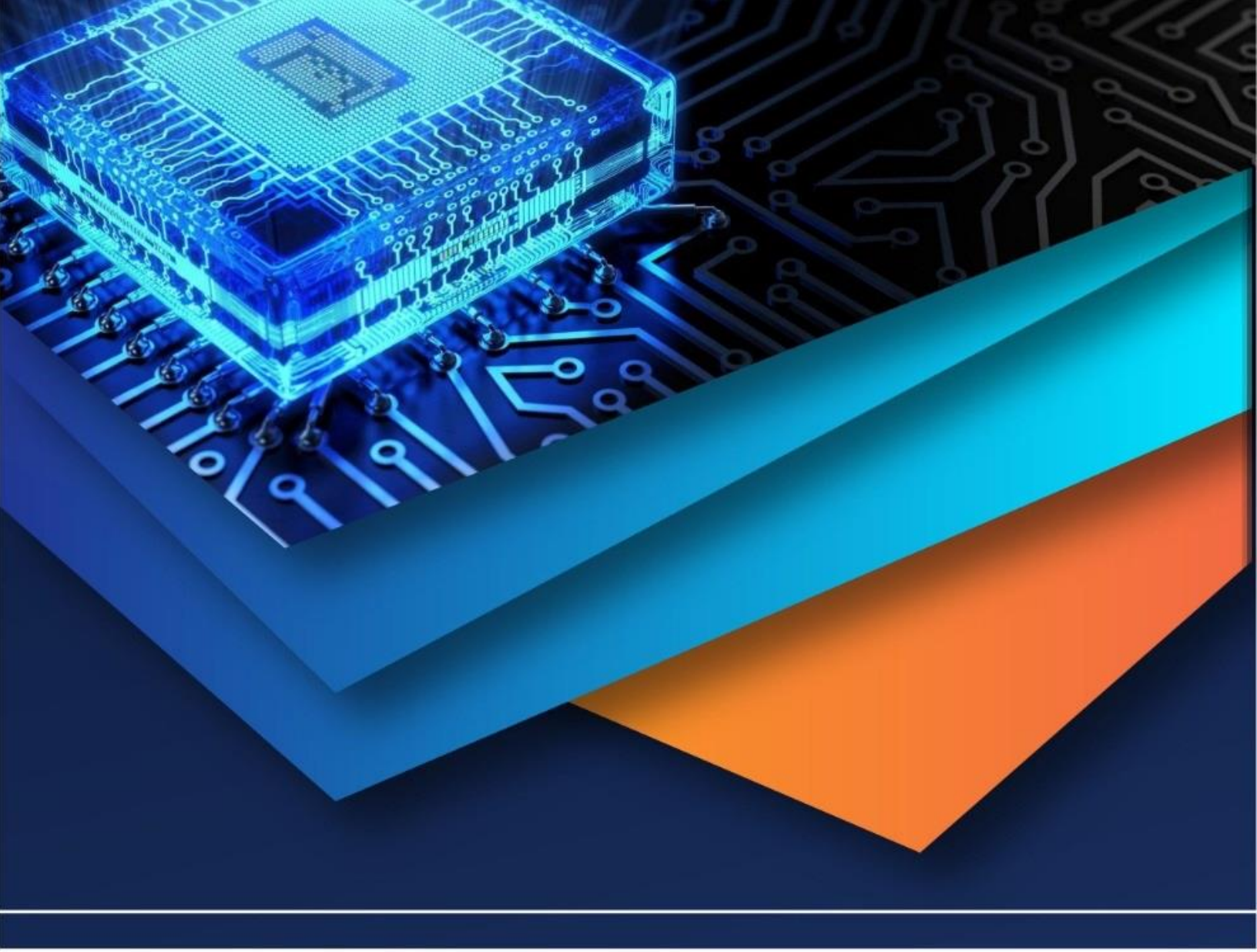

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