A Brief Review on Raspberry Pi Based System for Monitoring Weather Parameter Using MQTT Protocol

Neha Saha[1], Ekata Patil[2]

[1]M.Tech Scholar, Electronics and Telecommunication (Digital Electronics), Central College of Engineering and Management, Raipur, India

[2]Assistant Professor, Electronics and Telecommunication, Central College of Engineering and Management, Raipur, India

Abstract: *In this paper, we have presented a brief review on the plan and performance of remote terminal unit for monitoring weather using raspberry Pi model recent years, some meteorological disaster took the people's life and property in danger, such as flood, dust storm drought and so on. And the relevant department such lives as launching shell or rocket to air so as to develop and utilize the water resources within the air yet as defense and reduce the climate damage. The data of the automatic detection about the weather modification is important for the standardized management. This papers introduces principle of IOT .IOT made possible to collect the data. In this system some sensors are like DTH11,soil sensor are used for environmental parameter. This data from input sensors is then read by server that is raspberry Pi itself and stored in csv .The sensors gathers the data of various environmental parameter and allow it to raspberry Pi which act as a base station.Raspberry Pi then transmit the data using w-fi and processed data will be displayed on laptop through accessing the server that is on the receiver side.*

Keywords: IOT, Raspberry Pi Model, Sensors, python programming, MQTT Protocol

1. Introduction

Weather or Climate is a vital part of human life to live on this earth so we have to keep knowledge about weather or climate. Sensors are essential components not only applicable to the industries for process control but also in daily life for safety of building's and traffic flow measuring, environmental parameters measurement Many things affect the weather. And weather also have affect on most of living as well as non-living things. At Weather station study of different environment parameters using some instruments and equipments has been done. So to meet the goal of weather monitoring we have designed IOT based real-time, low-cost, portable and high speed weather station using Raspberry Pi. This system provides an application platform under internet environment. it can also allow for several users to access weather operational products concurrently from different remote sides. Implementing a example model for weather observation system is that the main aim of paper. Temperature, humidity measurement by using the suitable sensors is extremely beneficial for industry, weather monitoring. As we know that weather is very important thing to us its affects on living thing as also as in non living thing.

IOT is called internet of things. Let us understand the basic of IOT architecture as we know IOT consists of three main parts viz. sensors, networks connectivity and data storage application. Sensors in the IOT devices either communicate directly with the central server for data storage or communicate via gateway devices.IOT has been classified into two categories viz people to things referred as c2b(customer to business) and things to things or machine to machine referred as machine to machine people to things involve IOT devices available at home such as useable, fitness related devices, connected goods etc. Machine to machine involve everything related to manufacturing and automation industry.

In weather monitoring factors such as temperature, humidity and soil sensor are to be measured for this project, thus sensors have always been given the task for doing so. Main focus of project is to develop compact and powerful weather station. Raspberry Pi is new technology of IOT, raspberry Pi is consists of USB port, HDMI port ,Ethernet port, GPIO header, MicroSD card slot, power, Audio out.USB port has 4 ports allowing you to connect it to keyboards, mice, wi-fi dongles, if you want to add a USB hub to the Pi you will need to find one that ,this is HDMI port ,the kind you will find on the back of most modern TV's and computer monitors use a standard HDMI cable to connect to your raspberry Pi to your chosen screen. the traditional way to connect to internet is via and wire called an Ethernet cable a GPIO cable comprises the general i/o Pins they are a set of connections that have various functions, but their main is allow you to connect to the raspberry Pi with an electronic circuit, microSD card slot is used as the raspberry Pi's hard drive and from the power supply point you give a power to raspberry Pi, audio out looks likes head phone sockets.

ARM processor is a 32bit architecture in this we use a ARM cortex A53 this is one of the first two micro architecture implementing the ARM v8 instruction set designed by ARM holding Cambridge design center when used in relation to the ARM bytes means 8 bits half word means 16 bits words means 32 bits, ARM follow the von Neumann model. this is 3 Pipeline structure(5-20 stages)instruction sets focus on processing intensive operations, ARM processor is a general purpose register which we can use for a versatile field this is more rigid than the aurdino but the permorfamance is very well than that. For this purpose we have got used ARM primarily based Raspberry Pi board. Raspbian operating

system is selected to use with Linux kernel for Raspberry Pi. Python language is used for programming because IDLE understand Python

1.1 Problem Statement

As we know that weather monitoring system known for better performance for solar plant and agriculture as well. The hard drive based embedded systems for monitoring operation is bit costly, so raspberry Pi is more cost effective. and another one for security is main concern of delicate data. We face a challenge to secured data so we come up with the idea that that we will upload data in a cloud MQTT where we have a secured password which we can share the password with authorized users only.

2. Methodology

Present innovation in technology main focus on controlling and monitoring of different activities. These are increasingly rising to reach the human needs. When the object like environment prepared with sensors devices, microcontroller and various software applications becomes a self protecting and self monitoring environment and it is called as a smart environment .in this we have to create a communication between peripheral and net and see to see a analysis measurement value we need a HDMI Port. Communication between electronic devices is like a communication between humans. But here together needs to speak the identical language .In electronics these language are called communication protocol .the three most common protocols are serial peripheral interface, inter integrated circuit, universal asynchronous receiver/transmitter driven communication. SPI, I2C and UART are quite a bit slower than protocols like USB, Bluetooth, Wi-Fi but they are a lot more simple and use less hardware and system means .SPI, I2C, UART are best for communication between microcontrollers, and between microcontrollers to sensors where large amount of high speed data don't need to be transferred. One sole advantage of SPI is the fact that data can be transferred in peace. Any number of bits be able to send or receive in a continuous stream. With I2C and UART, data is sent in packets restricted to a specific number of bits .start and stop state define the start and end of each packets, so the data is broken up in transmission device .communicating via SPI are in a master slave relationship. The master is a calculating device (usually a microcontroller), while the slave (usually a sensor, display or memory) takes instruction from the master. The simplest design of SPI is a single master, single slave system but one master know that how to handle more than one slave.
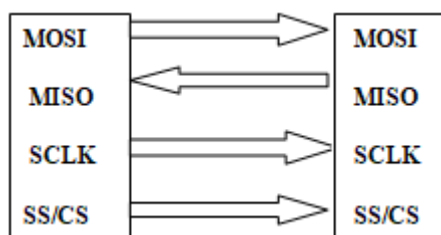

Figure: Master /Slave Relationship in SPI Communication

MOSI (MASTER OUTPUT/SLAVE INPUT)- Line for master to drive data to the slave
MASTER INPUT/SLAVE OUTPUT)-Line for drive to send data to the master
SCLK-Line for clock signal
SS/CS-Line for the master to choose which slave to send data to

In this whole system IOT is the Only Platform to create a path between things to internet for communication. It provides internetworking of physical devices, building, vehicles and other components like sensors and actuators. By giving network connectivity to systems implanted with electronics, software, sensors and actuators. These objects are able to collect and exchange data .Now a day's most of IOT framework seems to focus on real time data logging solution. The data of the measured parameters are not useful if they are not transmitted fast and accurate manner to users. Therefore transmitted and processing the measured data is a very important aspect of the modern weather forecast .Weather forecasting has to be reliable and accurate regardless of its application. MQTT enables to forced IOT devices to send data, or publish information about a topic to serve as an MQTT message broker. The MQTT protocol is a good choice for a wireless networks that experience varying levels of latency due to occasional bandwidth constrained or unreliable connections

The projected rooted device is for monitoring temperature, humidity and soil sensor in the atmosphere to make the environment intelligent or interactive with the objects through wireless communication. Raspberry Pi is the most recent wireless technology .Proposed systems will imagine and store various weather parameters with the help of sensors interfaced to raspberry Pi will get all data, SD card on Pi stores. The collected data as like memory card .Then at the output side LCD is to be connected for viewing the results and on off relays for server access. To know the current weather status at remote location, the user can to log in on web browser by entering username and password given for particular server by the user .Web application opens after entering password and it will show us decimal value. Raspberry Pi processed data will update continuously on cloud server and user will get to know the store data on hourly and daily basis.
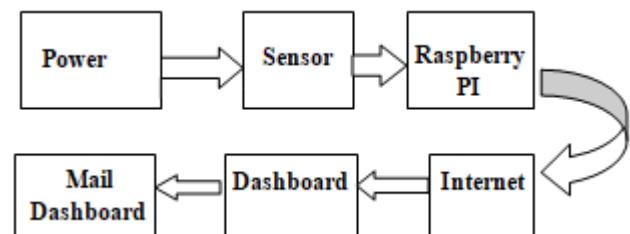
Figure: Proposed Method

3. Conclusion

This study examined the types of models and protocol to send and receive data in internet. To implement the weather monitoring system with IOT is fully concept experimentally tested for monitoring two parameters this data will be helpful for future analysis and it can be easily shared to

other end users. This model can be further expanded to monitor the developing cities and industrial zones for pollution monitoring. To protect the public health from pollution, this model provides an efficient and low cost solution for continuous monitoring of environment.

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