Alexa based Weather Station

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Abstract: **Weather plays an important role in human life. As nature is described to be beautiful and want the environment around us to be healthy, according to the rapid growth of technology, we wish to come up with a device which provides the real time weather reports called "weather station". A weather station can be described as an instrument or device, which provides us with the information of the weather in our neighbouring environment. For example, it can provide us with details about the surrounding temperature, humidity, rain fall, air quality etc. Hence, this device basically senses the temperature, humidity, smoke, intensity, rain value. With the help of temperature and humidity we can calculate other data parameters, such as the dew point. In addition to the above mentioned functionalities, we can monitor the condition of the place as well. In this paper, we come up with an Arduino setup that is connected to the four sensors namely temperature and humidity sensor(DHT11), raindrop module, soil moisture, and light dependent resistor(LDR). These values are updated in our cloud with the Alexa skill application and having all the recorded values in cloud data, the alexa app will then give the voice output with AI (artificial intelligence).**

Keywords: **ESP8266, Wifi module, sensors, aws console, Thingspeak, alexa developer console.**

1. Introduction

An automated weather station is an instrument that measures and records meteorological parameters using sensors without intervention of humans. The communication system is an essential element in an automated weather station. There is an ESP8266 based connected weather station kit containing different sensors that will teach about electronics, software and the weather. It contains all the sensors and wires to make a fully functional, WiFi weather station. We are building an Alexa skill that will interface to the "Our Weather Station". It provides the interface from your Amazon echo to the Our Weather system. The Alexa skill manages the voice part of the project. It takes verbal commands ("Alexa, ask Our Weather Status" which gives the current weather on YOUR "OURWEATHER"). This is for all your Amazon Echos, etc. at your house wired to your Amazon account. An Amazon Alexa skill takes voice input from an Amazon Echo or other device, translates it to text, compares it against what the skill is expecting ("utterances") and then sends a JSON response to a specific application or server. Apache servers were used in the past to receive this input, but this requires you to poke a hole in your home firewall and was really too complex for the normal user to implement.

This lead to our use of the "event driven" AWS Lambda function. No server. No firewall problems. No software server on your site. When you talk to Alexa, Alexa translates your speech to text, sends a request to the Lambda function. The Lambda function interprets this Alexa JSON request, gathers the weather data and sends a text response (JSON again) to Alexa with the required weather data embedded, and Alexa speaks the result. AWS Lambda is an event-driven, server less computing platform provided by Amazon as a part of the Amazon Web Services. It is a compute service that runs code in response to events and automatically manages the compute resources required by that code.

2. Literature survey

In 2015, Nisha Gahlot, Varsha Gundkal [1] presented "ZigBee Based Weather Monitoring System" wireless Zigbee technology monitors the weather station without human intervention. This paper mainly focus on reliability of the pollution monitoring system and a WMS Keeps track of humidity, temperature, speed of wind, and amount of rain fall etc. Further have proposed new approach AN1138 ZigBee mesh network performance it increases the performance such as data rate, throughput, and latency of weather

In 2016 Kurella vijayalakshmi, Dr. G.V Mahalakshmi [2] presented, "Real Time Weather Monitoring From Remote Location using Raspberry pi" In present world peoples are worried about their safety in hazardous environment. Climate change plays a very important role in the human life and living things. Monitoring is achieved to measuring and sense various weather parameters such as temperature, humidity, soil moisture using sensors the measured data or the sensed parameter are not useful if they are not send it in fast and accurate manner to the end users. The main aim of this paper is to develop an effective data transfer using Raspberry pi.

In 2017 Adult Hamid Malik, Meena Kohli [3] presented "Smart City IoT Based Weather Monitoring System" Weather station is very helpful for smart city challenges. This weather station is based on internet of things (IoT). Here the sensors equipted with an environment it captures or sense value of rain, soil, wind speed, temperature at any particular place and update in real-time on cloud. Accomplish this they used Raspberry pi2 and different environmental sensors like raindrop module KG004, DHT11, MQ2 and it needs a Wi-Fi connection to update the real time values in cloud.

International Journal of Research in Engineering, Science and Management
Volume-2, Issue-5, May-2019
www.ijresm.com | ISSN (Online): 2581-5792

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3. Problem Statement

In the Existing System they required more time and space to operate. They have Focused only on a Particular Parameter.

The Design was Complicated it makes the design complex to understand. Maintaining the system was quite difficult limited protocol standardization and accessing time to time was required. IOT based system was very difficult to maintain.

- Complicated Design
- Regular Inspection is required
- Limited Rang
- Monitoring for Small Areas
- Accessing Time to Time
- Maintenance is difficult in IOT

The main objective is to design an Alexa Based Weather Station with an Alexa skill i.e. It provides the interface from your Amazon echo to the Our Weather station and also manages the voice part of the project. An Amazon Alexa skill takes voice input from an Amazon Echo or other device, translates it to text, and then sends a JSON response to a specific application or server(AWS) and it uses AWS Lambda function interprets this Alexa JSON request, gathers the weather data and sends a text response (JSON again) to Alexa with the required weather data embedded, and Alexa speaks the result.

A. System architecture

The Fig. 1 shows the implemented system consists of an Arduino Uno which is used as a main processing unit for entire system and 5 sensors like Temperature Sensor, Soil Sensor, Humidity Sensor and LDR are used for sensing the weather parameters. The data's collected from these sensors will be in the form of analog signals and these signals will be sent to the microcontroller and this microcontroller will convert these analog signal into digital signals and these digital signals are serially passed to ESP8266 WIFI module and it will collect all the digitalized signals and it will place serially to the internet gateway.

When the user gives the voice command to the Alexa, the Alexa skill converts the voice input into text format and sends request to the AWS lambda server, this server will integrate this request and will fetch the data from the internet gateway. Then it responds to the alexa skill with the output in the text format. The alexa skill will convert this text output into voice and gives the voice output.
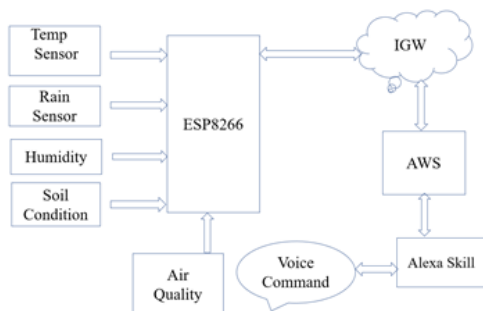

Fig. 1. Architecture diagram

4. Implementation and results

The proposed system is implemented using the Alexa skill through which the user interacts with the Weather Station. A channel is created for each sensor in ThingSpeak to store and retrieve the sensor values.
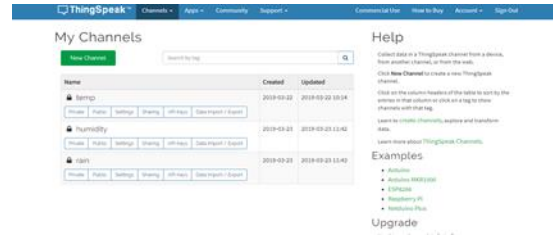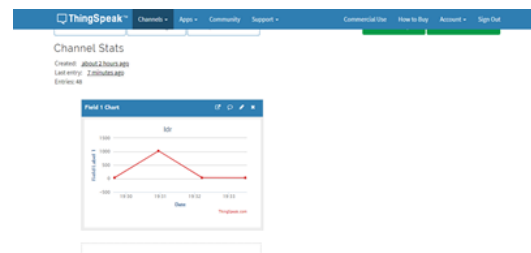

Fig. 2. Thingspeak account

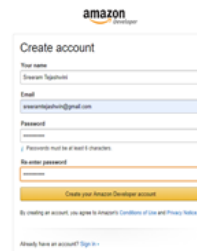Fig. 3. Graphical representation of sensor values
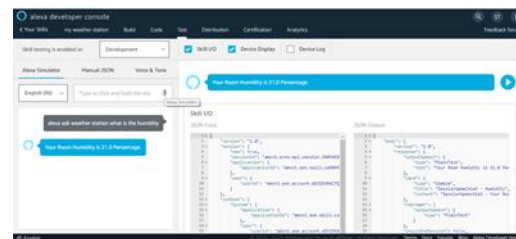

Fig. 4. Amazon developer account

Fig. 5. User interaction with Alexa

5. Application

1. Weather Enthusiasts and Agriculture: Information for anyone personally interested in monitoring the weather in detail, whether or not you have any previous experience of using a weather station. It goes without saying that farms, and indeed horticulture on any scale, rely on keeping track of weather conditions to guide many aspects of their work, for example: Crop irrigation; Monitoring growing conditions about planting, harvesting etc; Deciding when to spray to prevent disease; A modern weather station can provide a genuinely local source of data to help growers

International Journal of Research in Engineering, Science and Management
Volume-2, Issue-5, May-2019
www.ijresm.com | ISSN (Online): 2581-5792

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with all these decisions.

2. Weather Parameters can be Analyzed: Smart weather station gives you much more comprehensive and in depth information on your local conditions. It precise outdoor sensors detect and record temperature, humidity, and rainfall. The kit also comes with an LCD console and indoor sensors that measure temperature, humidity, and the barometric pressure inside your home. With all this data, it makes sense to put it to good use. It is designed to integrate with other smart home devices, so you can program your home system to react to different weather conditions. (sprinkler's to automatically turn off). By syncing with weather, you can view, store and analyze current local weather stations around the world. This is a great extra feature if you're interested in studying or keeping up weather trends over time.

3. Alexa Skills and Voice Service: Amazon allows developers to build and publish skills Kit known as Alexa skills. These third party developed skills once published, are available across Alexa enabled devices. Users can enable these skills using Alexa app. Amazon allows device manufacturers to integrate Alexa voice capabilities into their own connected products by using the Alexa Voice Service(AVS), a cloud-based service that provides APIs to interface with Alexa. Products built using AVS have access to alexa's growing list of capabilities including all of the Alexa Skills. Alexa provides cloud based automatic speech recognition (ASR) and Natural language understanding (NLU). The voice of Amazon Alexa is generated by a long short-term memory artificial neural network.

6. Conclusion

It will provide a competent method for recording real time weather readings and help farmers whose livelihood depends on the weather in a country like India to produce better quality crops. It can be used to gather information about the requirements for each area over the years. Embedded controlled sensor networks have proven themselves to be a reliable solution in providing remote control and sensing for environmental monitoring systems. The sensors can upload the data in Lab view using serial Communication. The developed system is very flexible and accurate.

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