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Smartfarmer - IOT Enabled Smart Farming Application

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ABSTRACT: Internet of Things (IOT) Technology has brought Revolution to each and every field of Common Man's Life by making everything smart and intelligent. IOT refers to a Network of things which makes a self-configuring network. The development of intelligent Smart farming IOT based device is day by day turning the face of agriculture production by not only enhancing it but also making it cost-effective and reducing wastage. The Aim/Objective of this report is to propose IOT based smart farming system assisting farmers in getting live data (Temperature, Soil moisture, Humidity) for efficient environment monitoring which will enable them to increase their overall yield and quality of products. The IOT based smart farming system being proposed via this report is integrated with Arduino Technology mixed with different sensors and a wifi module producing live data feed that can be obtained.

I. INTRODUCTION

Agriculture is done in every country from ages. Agriculture is the science and art of cultivating plants. Agriculture was the key development in the rise of sedentary human civilization. Agriculture is done manually from ages. IOT plays a very important role in smart agriculture. IOT sensors are capable of providing information about agriculture fields. We have proposed an IOT and smart agriculture system using automation. This IOT based agriculture monitoring system makes use of wireless sensor networks that collect data from different sensors deployed at various nodes and send it through the wireless protocol. This smart agriculture using IOT system is powered by Arduino, it consists of temperature sensor, moisture sensor, water level sensor. When the IOT based agriculture monitoring system starts it checks the water level, humidity and moisture level. It sends sms alert on the phone about the levels. The objectives of this report is to propose IOT based smart farming system which will enable farmers to have live data of soil moisture environment temperature at very low cost so that live monitoring can be done. The introduction of high-speed internet, mobile devices, and access to reliable and low-cost satellites is just some of the key technologies characterizing the precision farming trend in agriculture. Precision agriculture is one of its best-known applications of IoT in the agricultural sector, with many organizations around the world using the technology. Products and services used include VRI Optimization, Soil Moisture Probes and Virtual Optimizer PRO. Optimize variable rate irrigation (VRI) to maximize profitability, improve yields and increase water efficiency in irrigated fields.

II. OBJECTIVE:

Smart farming is management concept focused on providing the agricultural industry with the infrastructure to leverage advanced technology- including big data, the cloud and the internet of things(IOT) for tracking, monitoring, automating and analyzing operations. Better production management leads to better cost control and less waste. For example the ability to eliminate abnormal animal health conditions helps eliminate the risk of yield loss. In addition ,automation increase efficiency. Smart farming forms the ecological base of farming. Minimizing the site-specific application of inputs such as fertilizers and pesticides in precision farming systems reduces leaching issues and digester gas emission

III. LITERATURE REVIEW

1. INTERNET-OF-THINGS (IOT) BASED SMART AGRICULTURE TOWARDS MAKING THE FIELDS TALK

Despite the perception people may have regarding the agricultural process, the reality is that today's agriculture industry is data-centered, precise, and smarter than ever. The rapid emergence of the Internet-of-Things (IoT) based technologies redesigned almost every industry including "smart agriculture" which moved the industry from statistical to quantitative approaches. Such revolutionary changes are shaking the existing agriculture methods and creating new opportunities along a range of challenges. This article highlights the potential of wireless sensors and IoT in agriculture, as well as the challenges expected to be faced when integrating this technology with the traditional farming practices.

2. A RESEARCH PAPER ON SMART AGRICULTURE USING IOT

Smart agriculture is an emerging concept, because IOT sensors are capable of providing information about agriculture fields and then act upon based on the user input. The feature of this paper includes development of a system which can monitor temperature, level of water, moisture and even the movement if any happens in the field which may destroy the crops in agricultural field through sensors using Arduino UNO board.

Key Words: Internet of Things (IOT), Smart Agriculture using IOT, Arduino, Soil Moisture Sensor, Water level Sensor

3. SMART FARMING USING IOT, A SOLUTION FOR OPTIMALLY MONITORING FARMING CONDITIONS

Network of different devices which make a self-configuring network. The new developments of smart farming with use of IoT, by day turning the face of conventional agriculture methods by not only making it optimal but also making it cost efficient for farmers and reducing crop wastage. The product will assist farmers by getting live data (temperature, humidity, soil moisture, UV index, IR) from the farmland to take necessary steps to enable them to do smart farming by also increasing their crop yields and saving resources (water, fertilizers). The product proposed in this paper uses esp32s node MCU, breadboard, dht11 temperature and humidity sensor

Keywords: Smart Farming, Internet of Things (IoT), ESP32s, DHT11 Temperature and Humidity Sensor, Soil Moisture Sensor, SI1145 Digital UV Index / IR / Visible Light Sensor

4. SMART AGRICULTURE USING IOT

Due to population growth and demand for resources, water shortage is a major threat to agriculture. Determination of soil fertility also plays a vital role. Also, the major challenge lies in trapping the field animals such as Rats, Snakes etc. Hence this project proposes an innovative smart solution using "SMART AGRI App" which runs on IoT platform and addresses all the above mentioned issues. The user has to feed the data about the land area and the type of crop planted in the app.

Keywords- Arduino Uno, IR sensor, Ethernet Shield, GSM, Humidity and Moisture sensor, Motor driver

5. SMART AGRICULTURE SYSTEM USING IOT TECHNOLOGY

The farming of agriculture has started past 12000 years back, Neolithic age gave birth of civilization, Farming and later being continued as traditional farming practices. India being an agrarian's country, Mostly Indian farming are dependent on rains, soil, dampness and environment challenges. Our farmers upgraded to modern state of art technology in cultivation. Globally the IoT systems has contributed its application in many fields and proven to be

successful. It is the time that Indian farmer need to introduce the Smart Agricultural systems for higher crop yield.

Keywords: SMART (S-Specific, M-Measurable, A- Attainable, R-Realistic T-Time Bound) Soil moisture sensor, raindrop sensor, Humidity sensor, Temperature sensor, Arduino, Networking, WIFI and IOT (Internet of Things)

IV. PROPOSED METHOD

IoT-based agriculture system helps the farmer in monitoring different parameters of his field like soil moisture, temperature, and humidity using some sensors. Farmers can monitor all the sensors parameters by using a web or mobile application even if the farmer is not near his field. watering the crop is one of the important task for the farmers. They can make the decision whethert to water the crop or postpone it by monitoring the sensors parameters and controlling the motor pumps from the mobile application itself.

MERITS:

- Farms can be monitored and controlled remotely.
- Increase in convience to farmers.
- Less labor cost.
- Better standards of living.
- Accurate Farm and Field Evaluation
- RemoteMonitoring

DEMERITS:

- Lack of internet/connectivity issues.
- Added cost of internet and internet gateway infrastructure.

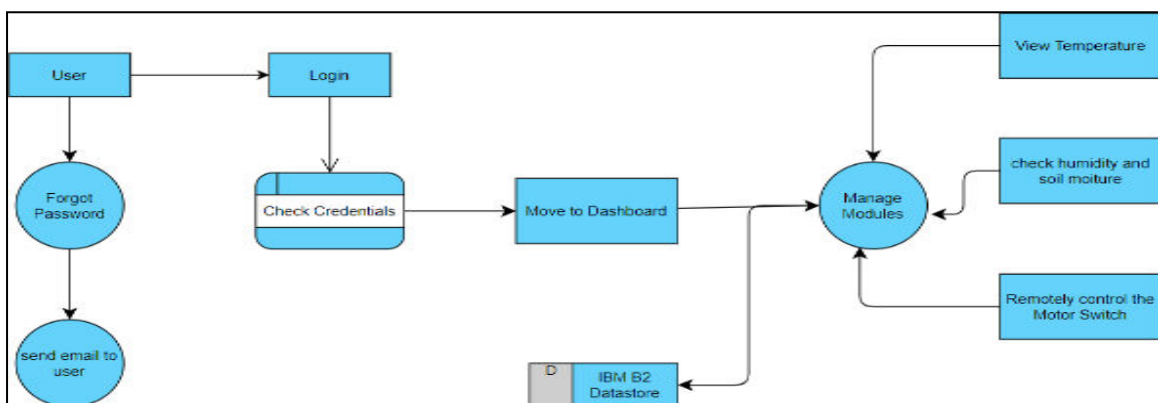


Fig 1: Data flow diagram

V. MODULE DESCRIPTION

- **Simulation creation**
Connect sensors and Arduino with code
- **Software**
Creating device in the IBM Watson IOT PLATFORM workflow for IOT scenarios using Node-RED
- **MIT App Inventor**
Develop an application for the smart farmer project using MIT App Inventor

- **Dashboard**
Design the modules and test the app
- **Web UI**
To make the user to interact with software

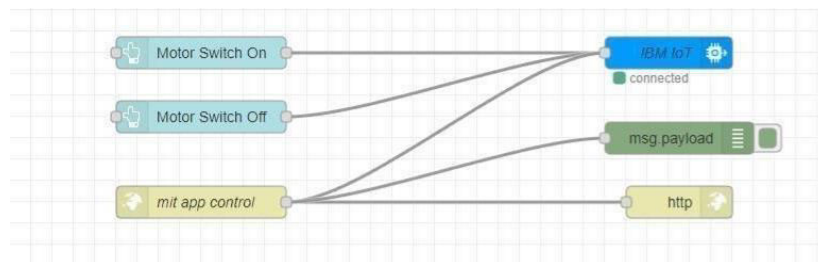


Fig 2 : Node-RED Sending Commands To IBM Cloud

VI. ARCHITECTURES

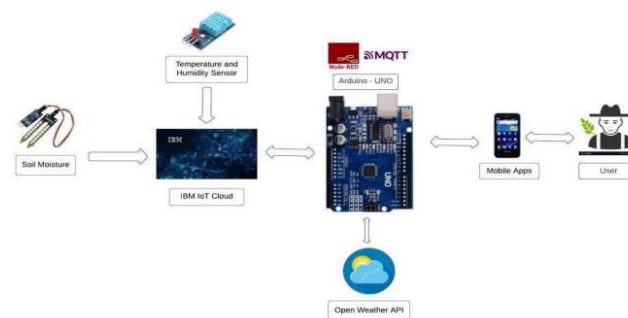


Fig 3: Solution Architecture

Step 1:

Different sensors are used to measure the various soil characteristics (temperature, humidity, and soil moisture) and the result are saved in the IBM cloud

Step 2:

The data from sensors and weather data from weather API are processed using an Arduino UNO as a processing unit.

Step 3:

Node-red is employed as a programming tool to connect the APIs, hardware, and software. It uses the MQTT protocol for communication.

Step 4:

A mobile application that was created utilising the MIT app inventor gives the user access to all the collected data. Depending on the sensor results, the user might decide via an app whether to irrigate the crop or not. They are able to remotely control the motor switch by utilising the app.

VII. RESULTS

Wiotp.sdk library is imported and we are using IBM Watson IoT platform's device details such as organization id, device id, device type, authentication token. Parameters like Soil moisture, temperature, humidity, Ph level, co2 are to be monitored by generating random values which decides the switching of the Motor, Delay is given in

general. In the Output screen you can visualize the connectivity to the IBM IoT platform and the values will be generated.

[illegible]

Fig 4: Source code screen short.

[illegible]

Fig 5: Output screen short.

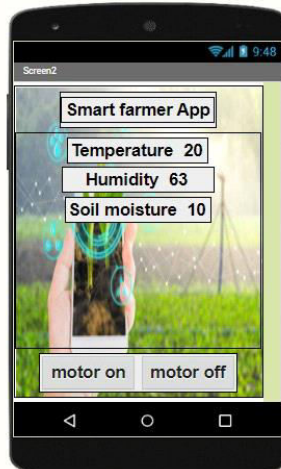


Fig 6: Mobile Application

VIII. CONCLUSION

This project gave us the chance to learn new technologies and work with new tools, this was a real proof that IBM has taught us to be long-life learners and to master self-learning before teaching us other class materials. Of course, this project is a combination of what we learned from all the training and orientation sessions conducted by IBM, altogether with what we learned from other disciplines and also by ourselves about IoT. In general, the project was successful and worked properly and succeeded in delivering the prototype on due time. We are proud and happy for this achievement especially that this our first theoretically, practically online stimulated project. It enabled us to get concrete results and to realize that we can indeed build products that would be beneficial in real life and that we can customize it upon demand as future projects.

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