

Agriculture Monitoring

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Abstract

Internet of Things (IoT) provides evolutionary role in smart agriculture. IoT sensors are used for providing information about their agriculture fields which made smart agriculture as an emerging concept. The main aim of this paper is to make use of evolving technology i.e. IoT and smart agriculture using Automation. The Major factor is to monitor the Environment and to improve the yield to get efficient crops. The aspect of this paper includes soil moisture, monitoring temperature, and water level in agricultural field through sensors using Arduino UNO. Anipcamera is interfaced with Arduino UNO to capture images. Alert message can be sent to the farmer to inform the status of the agricultural field using GSM module.

I. INTRODUCTION

The Internet of Things (IoT) consists of system-connected physical objects, computing devices interrelated, digital and mechanical machines. It consists of objects that are provided with unique identifiers which provides the ability to transfer data over a network without requiring human-to-human (H-H) or human-to-computer (H-C) interaction. IoT provides various things such that it can be a farm animal with a biochip transponder which receives a radio signal, person with an implanted heart, an automobile that has built-in sensors with sending alerts to the driver whenever tire pressure is low or any other natural disturbances or man-made objects. IP address can be assigned and the alerts are received through website notifications, android app notifications. Sensors will detect and send alerts with the data displayed on the websites linked to the IP Address over the network.

Increasingly, variety of industries organizations are using IoT for operating more efficiently, improved decision-making makes better understand for customers to deliver enhanced customer service and also increases the value of the business
Agriculture monitoring involves,

- I. **No need for physical presence** – It is fully automatic and simple process.
- II. **Easy monitoring** – Monitoring the agricultural field very easily.

- III. **Alerting** – Sends alerts to the text message to the farmer about the status of the agricultural field.

Benefits of Agriculture monitoring

The Internet of Things provides number of benefits to organizations, enabling them to:

- Monitor their overall processes.
- Improve the user experience.
- Save time and money.
- Make better business decisions
- Generate more revenue.
- Enhance employee productivity.
- Integrate and adapt business models

II. LITERATURE SURVEY

A. Agriculture monitoring-Review

In this paper we are going to learn about monitorization of agricultural fields and it describes how the Agriculture Monitoring system can be used to maintain efficient crop growth, characteristics and benefits of Agricultural monitoring system, pros and cons of Agricultural monitoring system and origins of Agricultural monitoring.

B. Agriculture monitoring for farmers

The usage of technological transformations has been seen by the farmers in the last decades, becoming more technology-driven and industrialized. Farmers have gained better control over the process of growing crops and raising livestock, making it more efficient and predictable by using various smart agriculture gadgets.

C. Crop management using IoT

IoT product in agriculture and another element of precision farming are to be used in crop management devices. Like how the weather stations are placed, IoT products should be placed in the field to collect data specific to crop farming. These IoT products can also be used for precipitation to leaf water potential, measuring temperature and overall crop health. It can also be used to readily collect information and data for better farming practices.

Thus, you can monitor your crop growth and any anomalies to effectively prevent diseases or

infestations that could harm your yield. Semios and Arable can be used to serve as good representations of how these use cases can be applied in real life.

III. IoT IN AGRICULTURE

As we can see obviously, these use cases for IoT in agriculture monitoring and irrigation system are endless. There are many ways of using IoT such as smart devices can help you increase your farm's performance and revenue. However, agriculture IoT apps development is not considered as an easy task. We need to consider various challenges that arises during the deployment process and should be aware of investment that made for the development of smart farming. Building an IoT solution for agriculture can be done by using various sensors for your devices (or create a custom one). The selection of sensors depends on the types of information that the farmer want to collect and it also depends on the purpose of your solution. In some cases, the quality of your sensors is critical to achieve success of your product which reveals that it will depend on the accuracy and its reliability of the collected data. The major core used in Agriculture Monitoring system can be Data analytics. It provides various solutions to the smart agriculture issues. Whenever the data has been collected without using data analytics, it will be little that the users cannot make use of it. Thus, you need to provide powerful data analytics capabilities and apply predictive algorithms with machine learning concepts in order to obtain direct well informed decisions with huge amount of information based on the collected data. Hardware Maintenance is a challenge which can be considered as a primary importance for IoT products in agriculture, as these sensors are typically used in the agriculture fields and can be easily damaged. Thus, you need to make sure your hardware provides durability and easy to maintain. In other aspects, you will need to provide replacement for your sensors more often. Smart farming applications can be tailored for use in the field. A farm manager or business owner can be able to access the information on site or remotely via desktop computer or smartphone.

In additional to that, each connected device can be made autonomous and provides larger wireless range to communicate with other devices and sends data to the central server.

IV. AGRICULTURE MONITORING BENEFITS

Technologies with IoT have the potential to supply transformed agriculture in many aspects. By comparing

the transformations, five ways of IoT methods can be used to improve agriculture:

- Data (tons of data) collected by smart agriculture sensors, e.g. soil quality, crop's growth progress or cattle health, weather conditions, these data can be used to track the conditions of your business in general, as well as equipment efficiency, staff performance, etc.
- It provides better control over the internal processes. As a result, it has lower production risks. The ability to foresee the results of your production makes you to plan for the creation of better product distribution. If you are aware of how much crops you are going to harvest, Waste reduction and Cost management and increased control over production can be obtained. You can be able to see any anomalies in the livestock health or crop growth. You will be able to mitigate the risks and cautions of losing your yield.
- Amount of business efficiency might be increased through process automation. By using smart devices, you can manage and perform multiple processes across your production cycle, e.g. pest control, fertilizing, or irrigation.
- Improved product quality and volumes provides better control over the production process and also maintains higher standards of growth capacity and crop quality through automation.

A. Procedure: Code uploading

- 1) Connect the Arduino UNO to your computer.
- 2) Compile the code attached and open it.
- 3) Select Arduino **Board** and **COM Port** from **Tools** Option.
- 4) Click Upload Button.

B. Procedure: Component

- 1) Connect the Arduino to power supply (5V) via External power source or USB.
- 2) Bury or dip the moisture sensor in the soil. It is safer to place the sensor near the roots of plants for précised measurements. Do not bring the terminals into direct contact with each other.
- 3) Connect the Water pump to Relay (Common terminals and N/O) and switch ON the mains. Refer the Circuit for connections and pin out.
- 4) The temperature sensor can be placed on the soil or PCB itself. Do not immerse the sensor into the water.

5) The potentiometer can be used to adjust and vary the LCD brightness.

V. ARCHITECTURE OF PROGRESSIVE WEB APPLICATION FOR AGRICULTURE MONITORING

The main components involved in the architecture of Agriculture monitoring are,

- Arduino UNO
- GSM module-SIM 900A
- Relay
- Water level sensor
- Temperature sensor-LM35
- Moisture sensor

i) Arduino UNO

Arduino - Single-board microcontroller used for making applications more accessible which involves interactive objects and its surroundings. The hardware features with an open-source hardware board in Arduino are designed around an (8-bit) Atmel AVR microcontroller or a (32-bit) Atmel ARM. Models that has been used at a present time consists a USB interface, 14 digital I/O pins, 6 analog input pins which allows the users to join various extension boards.

ii) GSM module- SIM 900A

SIM900A - Dual-band GPRS/GSM solution which attached in a SMT module that can be firmly used in the customer applications allowing you to get benefit from cost-effective solutions and small dimensions (features). When you consider the features of an industry-standard interface, the SIM900A provides GSM/GPRS 900/1800MHz performance for SMS, voice, Data, and Fax in a small form factor with the providence of low power consumption. It consists of tiny configuration - 24mm x 24mm x 3 mm. Thus, SIM900A can fit almost all the space requirements in your agriculture applications, especially for slim and compact demand of design.

iii) Relay

Relay is a device that can be used in microcontrollers (or microcontroller based boards) like Arduino for the usage of switch on/off different household appliances like lights, water heaters, television, motors and fans etc. Arduino can be used for wide range of applications such as controlling LEDs, logging data and turning on motors, monitoring temperature, etc. Another important process that can be accomplished by the Arduino is controlling of 5V Relay to operate high voltage devices such as AC appliances.

iv) Water Level sensor

Level sensors are used to identify the level of substances (tangible, solid presence) that can flow. Such substances include granular material and liquids, slurries, powders. Measurements of each levels can be done inside containers or it can also be the level of a river or lake. Such measurements can be used to analyze the amount of solid materials in the flow of water in open channels or within a closed container.

v) Moisture Sensor

Soil moisture sensor (FC-28) has been connected with Arduino. It measures the volumetric content of water inside the soil and provides us the moisture level as result. These sensors are equipped with both analog and digital output, so it can be used in both modes. It will detect the water content by checking whether there is an passage of electricity such that whenever there is an detection of electricity then it denotes that it contains water content and measure of these values from passage of electricity provides how much water content the soil has. We are going to interface the sensors in both modes. The process undergone inside the sensor will take values as analog and displays the result of the volumetric content as digital values.

vi) Temperature Sensor-LM35

Temperature sensor can be used as a thermocouple or a resistance temperature detector (RTD) that collects the temperature from a particular source and changes the information that are collected into understandable type for an observer or an apparatus. It can be used in various applications namely chemical handling, controlling systems, AC system environmental controls, medical devices, HV system and food processing units, etc.

VI. CONCLUSION

Internet of Things enables the agriculture crop monitoring system easy and makes efficient to improve the productivity of the crop yield and hence it provides various profits and benefits to the farmer. Wireless sensor network (WSN) and sensors of different types can be used to collect the information of crop yield conditions and environmental changes. These information are transmitted through network to the farmers/devices that maintains correct actions towards farming. Farmers should get awareness about the conditions of the agricultural field at anytime and anywhere in the world. Some problems that occurred in communication during monitoring process must be overcome by making use interface ease of use and to use advanced technology that consume less energy.

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