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Agriculture Water Management System using IOT

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A B S T R A C T

Agriculture production is highly dependent on water. IoT-based agriculture water management system describes how irrigation can be handled smartly using IoT technology. This system can be used to collect data by connecting multiple sensors like Soil moisture, temperature, PIR motion sensor, and other factors the data collected will be sent to the user's mobile phone and also ensure crops receive the correct amount of water and optimize irrigation schedules by monitoring water levels, farmers can identify areas of potential water loss and take action to prevent it. The main aim of our paper is to improve productivity, improve efficiency and reduce water usage, live monitoring, water management, development in crop growth, and potential use of virtual water.

Keywords: DHT11 Sensor, IOT, OLED display, PIR motion sensor, 5-volt single channel relay module, Android, Node MCU-ESP8266, and Arduino IDE.

1. Introduction

Agriculture is an important part of the Indian Economy, it is not wrong to say that the food we eat is the gift of agricultural activities and farmers who work their sweat to provide us with food. Earlier we use to depend completely on monsoons for the cultivation of food grains but now with the advancement of technology, advanced equipment, better irrigation facility and the specialized knowledge of agriculture started improving. Furthermore, our agriculture sector has grown stronger than in many countries.

Agriculture water management system-based IoT saves time and money, by automating irrigation schedules, farmers can reduce labour costs and increase efficiency. IoT included different types of sensors, electronic devices network components, and software. IoT allows users to share their data on networks without human involvement to increase productivity, and efficiency and to minimize the problems in agriculture that are faced by the farmers, there is a requirement to use the latest technology and techniques known as the Internet of things. Nowadays farmers can get a lot of knowledge and information about the latest technology and farming techniques through IoT. In IoT- based smart farming, a system is built for monitoring the crop field with the help of sensors (temperature, soil, moisture, etc.) and automating the irrigation system. farmers can monitor their fields from anywhere, anytime.

2. Literature Review

IoT-Based Water Management System: Survey and Future Research Direction.

Precision agriculture is now essential in today's world, especially for countries with limited water resources, fertile land, and enormous population. Smart Irrigation Systems can help countries efficiently utilize freshwater [1].

The proposed system employs an advanced optical technique for sensing and transmitting collected data the technology collects information through wireless sensors that are self-configured into the network. Various systems have been proposed for water management and monitoring some of the proposed systems are aimed at reducing the amount of wastewater, and improving the efficiency of the water distribution systems. The authors reviewed the development of existing IoT systems for water management and quality control, including system components, communication technologies, and techniques [1].

This Survey on multiple sensors-based air and water quality monitoring using IoT measure the desired physical and chemical parameters of the water level and flow rate, temperature, pH turbidity, conductivity dissolved oxygen. This Discussion concludes by introducing a novel optical IoT-based water management System designed for use in fields via exploring possible solutions and discussing what could be practically achievable for each element of the system. This work aims to serve as a motivation for further research concerning IoT-based water management systems designated for fields application [1].

EEWMP: An IoT-Based Energy-Efficient Water Management platform for smart irrigation

In this paper, SWAMP(Smart Water Management Platform) is a collaborative project developed for smart irrigation and efficient freshwater utilization in agriculture. The aim is to auto-manage water reserves and avoid over-under irrigation problems. This research improved the SWAMP network's performance by introducing an in-field sink and fusion centre use of the open-source cloud to reduce cost. we called our improved model an energy-efficient water management platform (EEWMP) [2].

In the proposed EEWMP, The field sink node collects the data from the field's sensors and sends it to the fusion centre. The fusion centre aggregates the data and removes redundant information, thus reducing communication traffic and energy consumption. FIGARO(Flexible and precise irrigation platform to improve faRam scale water productivity) project was started. The FIGARO project is a decision support system proposed to manage freshwater irrigation and improve production [2].

In this paper, they proposed IoT based elegant farming model that uses mobile devices information processing systems and cloud services. And also IoT based greenhouse management system that uses various android applications sensors communication protocols and different hardware. Future interested in developing smart irrigation models for irrigation systems drip, and sprinklers also interested in utilizing other sensors to make smart irrigation models and algorithms for different soil types such as gravel, silt, loam, sand and barren land [2].

Smart Agriculture using IoT

Smart agriculture is an emerging concept because IoT sensors are capable of providing information about agriculture fields and then acting based on user input. This feature of this includes the development of a system that can monitor temperature, water, moisture, and even the movement of anything that happens in the fields which may destroy the crops in agricultural fields [3].

The Aim/Objective of this paper is to propose a Novel Smart IoT-based Agriculture assisting farmers in getting Live Data(Temperature, Soil Moisture) Which will enable them to do smart farming and increase their overall yield and quality of products. Some implementations are: 1) Implementation of soil moisture sensors in smart agriculture 2) Implementation of water level Sensors in agriculture fields and 3) implementation of IoT in the fields of smart agriculture [3].

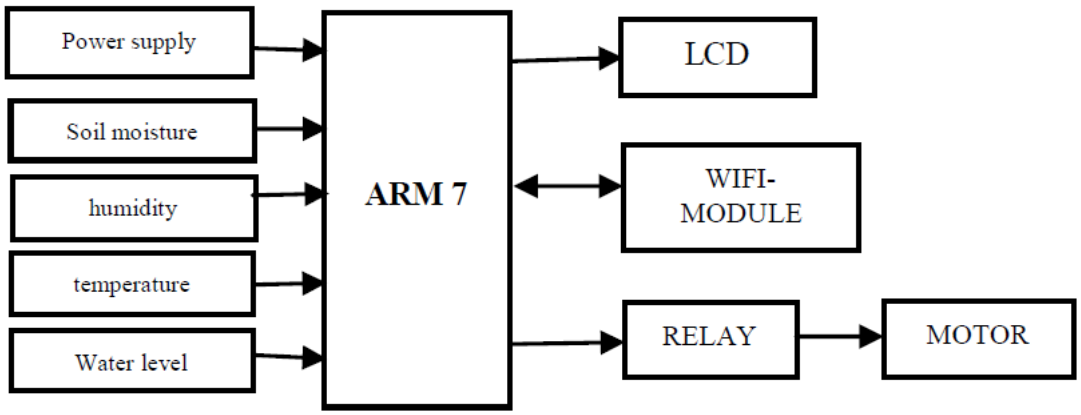
This system uses field-deployed sensors to detect soil characteristics weather and climate conditions and crop conditions for irrigation. Agriculture land and productive land with water on site will be valuable in the future [3].

Smart Agriculture System using IoT

The IoT enables things selected recognized or potentially forced remotely crosswise over completed the process of the existing configuration, and manufacture open gateways. The Development of smart agriculture and artificial intelligence can be cutting-edge technology in data compiling and resource optimization. The pest & insect controls that protect damaging crops and also optimize resources utilization can be breakthrough [4]

This paper proposes a thought of consolidating the most recent innovation into the agrarian field to turn the customary techniques for water systems into current strategies in this way making simple profitable and temperate trimming. Some degree of mechanization is presented empowering the idea of observing the field and the product conditions inside some long-separate extents utilizing cloud administrations. The point of interest like water sparing and work sparing are started utilizing sensors that work consequently as they are modified [4].

This idea of modernization of farming is straightforward, reasonable, and operable. SMART(S-specific, M- Measurable, A-Attainable, R-Realistic, T-Time Bound) [4].



Sensor-Based Water Management For Irrigation Systems Using IoT

In this paper, the system provides modern tools to enhance the workload of the farmers. Implementation of Global System for Mobile Communication(GSM) along with sensors, PIC16F877 Microcontroller, and transmitting the data using IoT plays a major role in soil irrigation. sensing information by a sensor is transmitted ADC. An ADC converts it from analog to digital and transmitted the digital data to LCD and IoT This is inbuilt into the PIC 16F877A microcontroller and information display on the LCD of IoT as well as PC [5].

GSM is used in monitoring the condition of the soil and controlling energy consumption. In this system, IOT plays a vital role based on WSN for agriculture energy monitoring systems in real-time. Optimization and modeling of transmission schemes also increase the network lifetime[5].

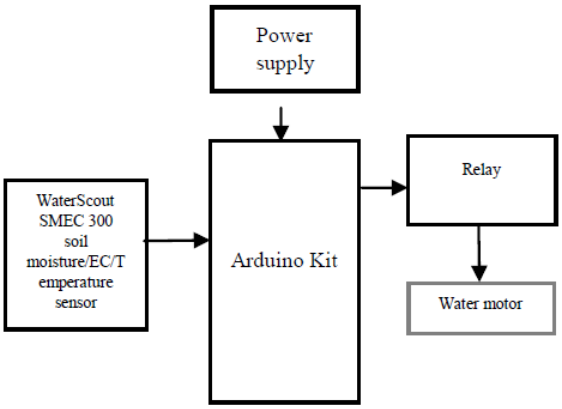
This system provides an optimized model in the transmission of information for the farmers to yield crops more reliable with less cost . water management can be identified using IoT which provides energy consumption [5].

Water Management in Agriculture Field Using IoT

In this paper, a system is proposed to monitor crops field using sensors for soil moisture, humidity, and temperature. After monitoring these parameters the irrigation system can be automated if soil moisture is low [6].

Proposes an idea about how an automated irrigation system was developed to optimize water use for agriculture purposes. The sensors are successfully interfaced with Arduino Kit. Implementation of such a system in the field can definitely help to improve the yield of the crops and aid to manage the water resources effectively reducing wastage and increasing soil quality [6].

Some of the research attempts are done for the betterment of farmers that provide systems that use technologies helpful for increasing agriculture yields. By using IoT sensors to sense data from agriculture fields and accurately feed data into the repositories [6].



Smart Water Management Platform: IoT-Based Precision Irrigation for Agriculture

This paper presents the SWAMP project architecture, platform, and system deployments that highlight the replicability of the platform and as Scalability is a major concern for IoT applications it is able to provide an adequate performance analysis of FIWARE components used in the platform. Results show that it is able to provide adequate performance for SWAMP pilots but requires specially designed configurations and the re-engineering of some components to provide higher scalability using fewer computational resources [7].

In this paper, the SWAMP project develops IOT-Based methods for smart water management in precision irrigation, and pilots and deployment scenarios for the four pilots using FIWARE as the underlying IoT platform [7].

The SWAMP is an ongoing project and therefore there are multiple paths for future work. Some examples are improving the platform deployment scenarios, including the experience with irrigation models and analytics and more advanced performance analysis [7].

Sustainable Water Resource Management Using IoT Solution For Agriculture

This paper, predominantly periodicals the engagement of a smart water management system prototype, the AGRI2L system, proposed as a part of the IoT solution. the system architecture and a detailed description of the physical scenario of how the AGRI2L system works for the management as a part of the IoT solution. The System architecture and a detailed description of the physical scenario of how the AGRI2L system allows for being managed and interoperable in the specific context of water resource management processes [8].

Big data in agriculture are divided into 3 categories first is Process-mediated (PM), second is Machine-generated or (GM) the last one Human resource(HS). Big data from the AGRI2L system serves as a platform for farmers to capture the potential data for decision-making as well as water forecasting. It plays a major role in revolutionizing the agriculture industry. All these data are integrated together to make the agriculture industry more productive and efficient [8].

This prototype aims at proposing a design for an implementation detail of a smart water level and leakage monitoring system by engaging the real-time data to facilitate the analyst focus more on analysis and action in a short period with low cost. Overall, data and IoT-based smart agriculture enable the future of agriculture [8].

Smart farming helps the farmers to be more productive in their products while helping manages and utilize nature smartly.AGRI2L system is the proposed system that helps farmers revolutionize current agriculture practices to smart farming practices. Water scarcity, urbanization, and climate change are also treated to the agriculture industry, this purposed system not only helps farmers to be more productive perhaps it will help to preserve nature [8].

An Intelligent Water Management in Farming through the IoT

In this paper, they worked on the development of an irrigation system controller through a mobile application where it consists of the agricultural values obtained from the sensors and a decision-making control option for irrigation. The application of water utilization optimization in irrigation to the plant solves the problem of inappropriate ways of irrigation to the farm fields. And depending on the soil condition, plants are to be provided with water through a proper irrigation system [9].

Here worked on this problem by designing considering for a prototype of a microcontroller-based intelligent irrigation system controller which will allow irrigation to take place from remote places where manual inspection is not needed [9].

The proposed system provides an attractive user interface with the most efficient way of controlling the irrigation system. It gives the idea to monitor the soil moisture content and temperature in a farming area and the user can control the watering system using the android application on the mobile phone. The application was built using the blynk software which provided an easy way in designing the application. so, the overall implementation cost is cheap and it is affordable for a common person. Considering the present situation, we have chosen the Android platform so that most people can get benefits. The design consists of an Android application by which the user can interact and send a control signal to the output [9].

A Review of Literature On Water Resource Management Using Data Mining Techniques

This paper aims to review the studies related to using of data mining techniques in the field of water resource sector for water management. Presently, water Resource Management has become the most challenging, interesting, and fascinating domain around the world in the last many years. The scientist tries to predict rainfall, Flood warnings, water availability, Requirements, etc. based on huge available metadata using various methods [10].

In this paper, they tried to search the use of data mining techniques for predicting the inflow, drought possibility, Weather report, rainfall, Evaporation, temperature, wind speed, etc. This paper provides a survey of some literature and work done by the researchers using various algorithms and modelings methods, Associations rules, classification, clustering, Decision tree, artificial Neural Networks, etc.. data Mining is a collection of techniques for efficient automated discovery of a previously unknown, valid, novel, useful and understandable pattern in large databases thus facilitating decision makers to make a proactive, knowledge-drive decision [10]

In this survey, we found that the thinking offered by the advent of computer technology is highly complementary to some of the goals of water management. Services delivered by technology are interactive, fast, and multi-dimensional. In this way, Data mining offers us a much-needed opportunity to deliver scientific findings and information to stakeholders and decision-makers for providing collective decision-making tools. An Integrated water management scale simulation model may be built and it may serve as a core for water management design to provide a conceptual basis for understanding the performance of the water management system [10].

3. Conclusion

The Agriculture monitoring System design is very simple to understand and handle. It can be operated by all age groups of farmers. It can be programmable to add more features. It is user-friendly and can also be used by uneducated farmers. The use of IoT technology allows for real-time monitoring and data collection. This can help to detect problems and provide insight into the effectiveness of water management practices this can help to improve water management strategies, this system helps to improve crop yields and provide real-time data for monitoring and analysis. However, it is important to ensure that the system is properly installed and configured and that security measures are in place. In agriculture, the value of irrigation water is dependent on the price of the crops produced, economic research combined with a greater understanding of water/irrigation governance provides the basis for optimism that future advances in agriculture water management, particularly where it is embedded in integrated water management and can lead to a more sustainable irrigation future despite potential climate change and demand growth impact.