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Automated Control of Irrigation in Agriculture Using IOT and Wireless Sensor Networks

Swathi. N S[1], Dr. K. Deeba [2]

[1]*Student, Hindusthan College of Engineering and Technology Coimbatore, Tamil Nadu*

[2]*Assosiate Professor, Hindusthan College of Engineering and Technology Coimbatore, Tamil Nadu*

ABSTRACT

In the real world, farmers are facing the problem of monitoring their farms, at the same time. This project proposes a technology based on IoT, which reduces human intervention to ensure proper irrigation. It uses Pic16F877A as the microcontroller. This can be achieved by victimization associate degree op-amp as the comparator that acts as the interface between the sensing arrangement and therefore the microcontroller. Once the controller receives this signal, it generates associate degree output that drives a relay for in operation the pump and a liquid crystal display is additionally interfaced to the microcontroller to display data of the soil and pump. The Connections are interfaced to the control unit. This system monitor temperature, moisture, rain and according to the readings of the sensors and switches on the motor to give water to the farms. Here all the data are been hosted on the server and used to monitor the farms continuously. By using this concept, the development time gets reduced and save more time for monitoring the farms. Using this system the motor can switch on or off wherever in the world using the concept of IoT (Internet of Things).

Keyword: *IOT, Wireless Sensor Network, PIC, GSM, WIFI and Automatic Irrigation.*

1. INTRODUCTION

Agriculture is the need of most of the Indians livelihood and it is one of the main sources of livelihood. It also has a major impact on the economy of the country. A major quantity of water is used for the irrigation system and therefore 85% of available freshwater resources are used for yielding agricultural crops. This resource of water will decrease day by day and consumption of water will dominate and increase more than 85% in the upcoming half-century. This is due to the high growth in population due to this tremendous growth in population there is a huge demand for food. Agriculture is the main source for food production. Using science and technology we need to implement a method by which there can be limited consumption of water. The Internet of Things (IoT) is an important topic in the technology industry, policy, and engineering circles and has become headline news in both the specialty press and the popular media. Today several agricultural industries adopt the IoT technology for sensible farming to reinforce potency, productivity, international market and different options like a minimum human intervention, time and value etc.. Abundance of conferences, reports, and news articles discuss and discuss the potential impact of the "IoT revolution" from new market opportunities and business models to concern regarding security, privacy, and technical ability.

1.1 Wireless Sensor Network

Wireless networks are also known as wireless sensors and actor-network. These sensors generally look at physical or environmental conditions as temperature, pressure sound, wet etc. and it co-operatively passes this info via a network to the foremost location. WSN is constructed of few to many thousand nodes, wherever every node is connected to devices every sensor network node has usually many parts: a radio transceiver with associated internal/external antenna, a microcontroller, associated electronic circuit for interfacing with sensors associated an energy supply like a battery. The applications of these wireless sensors include area monitoring, healthcare monitoring, environmental sensing, earth sensing, air pollution monitoring, forest fire sensing, landslide detection, water quantity monitoring, natural disaster prevention etc.

These sensing nodes, distributed within the surroundings, are connected to a sink node – in centralized networks – or to different sensing nodes via a network. In centralized networks, the sink collects detector information to be utilized by the top user. In several cases, the sink is additionally capable of activating sensing nodes via broadcasting, by causing network policy and management data (Le et al., 2008). Like different networks, there are 3 common style challenges that extremely influence the property and productivity of the whole network:

- Exploitation network protocols to minimize management and information packets,
- Choosing the most effective topology by positioning nodes within the right places,
- Deploying a routing rule that effectively passes information through the network from the origin node to destination node/nodes.

Fig -1: Wireless Sensor

1.2 IOT Applications

It is not possible to conceive of all potential IOT applications having in mind the event of technology and also the various desires of potential users. In the following sections which present several applications, which are important. These applications are described, and the research challenges are identified. The IOT applications are addressing the social group desires and therefore the advancements to enabling technologies like Nano physical science and cyber-physical systems still be challenged by a range of technical, institutional, and economic problems. The list is limited to the applications chosen by the IERC as priorities for consecutive years and it provides the analysis challenges for these applications. Whereas the applications themselves can be completely different, the analysis challenges are usually an equivalent or similar.

1.3 IOT in Agriculture

Agriculture is the main backbone of India's Economic growth. The most important barrier that arises in traditional farming is climatic change. The major effects of climatic change include heavy rainfall, most intense storm and heat waves, less rainfall etc. Due to these effects the productivity decreases. Climatic change can additionally raise the environmental consequences such as seasonal changes in the life cycle of plants. To boost the productivity and minimize the barriers in the agriculture field, there is need to use innovative technology and techniques called the Internet of Things.

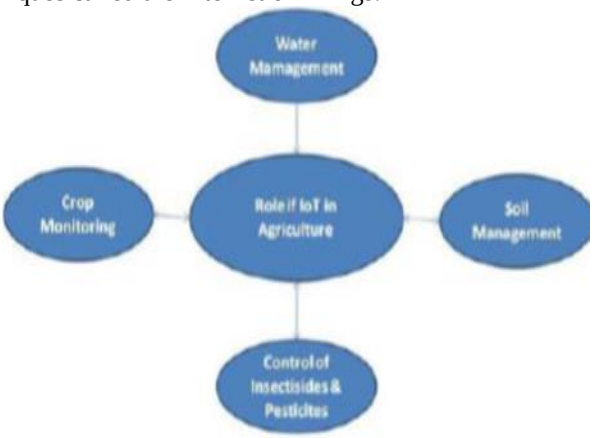

Fig -2: Role of IOT in Agriculture

a. Water Management

The sensors within the farmland are capable of notifying during a period concerning the wet level in lands and may stop spoiling of water to unravel this downside sensible irrigation systems high-powered by latest IoT technology will facilitate conservation of water resources higher by watching irrigation through remote sensing technologies. This capability is more aggravated if the period detector information will trigger action within the motor by switch it off or on. The motor is mechanically switched on or off looking on the necessity for irrigation and level of the water resource. Besides, sensible sensors will determine the issues within the irrigation system framework in the associate degree in progress and may counteract depleting of water while not legitimate management. For spills in pipelines, such such sensible sensors square measure a doubly effective absence of as they're usually hidden from reading and create detection of leaks extremely difficult. The prompt detection of leaks and faults in can change users addressing the problem quickly and can facilitate saving water.

b. Crop Monitoring

Web of Things empowers the cultivation and crop observation straightforward and skillful to upgrade the efficiency of the product and henceforth benefits for the rancher. Wireless sensing element system and sensors of assorted types area unit

utilized to collect information of yield conditions and natural changes and these data area unit transmitted through the system to the cultivator that starts remedial activities. Ranchers area unit associated and aware of the states of the agriculture field at whenever and anywhere on the earth.

c. Soil Monitoring

Internet of things (IoT) for an agricultural atmosphere it includes monitoring of various agricultural environment factors such as soil humidity, temperature, and moisture along with other factors can be of significance. A standard to compute these factors in a farming atmosphere meant farmers physically taking measurements and examine them at numerous times.

d. Farmers Detect Crop Diseases

Farmers are able to notice several diseases within the season's crop through mobile phones, attributable to sensible wireless sensors employed in the sector and conjointly exploitation tiny drones to acknowledge the sickness of plants by exploitation sensors & WSNs in a very drone. Then data can send to ranchers mobiles concerning the knowledge concerning the sickness of a plant. Agricultural specialists area unit able to gauge the crop's condition to sickness supported soil and weather (humidity, temperature, and rainfall) parameters. anticipate plant stress, weed germination, persecutor infestations and different factors, we'll use less water to flush salts from the profile.

2. THE LITERATURE SURVEY

In this section, we discuss the various Automatic irrigation methods as shown in table 1.

S. No	Title	Process	Future work
1	ENERGY EFFICIENT AUTOMATED CONTROL OF IRRIGATION IN AGRICULTURE BY USING WIRELESS SENSOR NETWORKS	The proposed scheme uses Novel routing protocol for Wireless Sensor Networks (WSNs), named ECHERP. The system takes into consideration of historical information and therefore the modification of the climatic values to calculate the quantity of water that is required for irrigation.	Due to upcoming technology The proposed model can be further extended to consider the effect of the field characteristics on the quantity of water required for irrigation.
2	GSM BASED AUTOMATED IRRIGATION CONTROL USING RAINGUN IRRIGATION SYSTEM	The planned system enforced GSM is employed to report the elaborated concerning irrigation. The report from the GSM is causing the humanoid mobile. The Keil computer code is employed for the simulated result.	Designing an analytical model for the proposed method to prove its efficiency.
3	AUTOMATED IRRIGATION SYSTEM USING SOLAR POWER	This paper model the automatic irrigation system that relies on the microcontroller and alternative energy was used just for a source of power supply. Various sensors are used to measure paddy field. Sensors sense water level and provide the information to the farmer through a mobile phone.	Adding of raingun sensor helps in rain water harvesting and when it rains there won't be floods and this shield the field and evades floods
4	AUTOMATED IRRIGATION SYSTEM WITH WEATHER FORECAST INTEGRATION	The main aim of this paper is to develop such a system which would facilitate any farmer/gardener to provide the best possible nourishment to the crops We also integrated an IR sensor to save the plants or crops from any possible damage by animals.	Detection mechanism if developed which can immediately alert the farmer if any part of his field is infected by pests.
5	DESIGNING AND SIMULATION OF AN AUTOMATED IRRIGATION MANAGEMENT SYSTEM DEPLOYED BY USING WIRELESS SENSOR NETWORKS (WSN)	Describes an application of wireless detector network in coming up with an automatic irrigation management system that monitors real-time water content within the soil. The system can permit water to flow to the soil only the soil is within the state of "Water hungry".	Future work is to implement an automated irrigation management system by mistreatment the wireless detector networks and take a look at within the real surroundings by observance its performance
6	AUTOMATED IRRIGATION SYSTEM USING WIRELESS SENSOR NETWORKS AND GSM MODULE	This paper implements the demonstration of the automatic irrigation system which can be used to optimize /reduce water usage. It can also be a photovoltaic irrigation	Rain gun sensor can be added Hooters can be used so that it gives siren on various occasions such as intrusion detection, floods

		system which consists of a wireless network that is the soil moisture sensor and a temperature sensor placed under the soil where plants roots are reached which is a distributed network. The system has a water level sensor which will indicate the presence of water level in the tank.	etc. Using IR sensors any object passing into fields can be detected and alerted.
7	AUTOMATIC IRRIGATION SYSTEM FOR AGRICULTURE FIELD USING WIRELESS SENSOR NETWORK (WSN)	The system generally monitors the paddy crop field in a wireless manner. The analog value from the sensors is converted to digital format by the ADC. The AT-mega controller gets the output from the ADC.	The future work is attempting to boost the topology structure to form all nodes communicate with one another, conjointly to boost the steadiness of wireless sensors in communication by higher package and hardware style.
8	AUTOMATED IRRIGATION SYSTEM USING WEATHER PREDICTION FOR EFFICIENT USAGE OF WATER RESOURCES	In this paper, the AISWP algorithm is done where the water supply to the field is based on moisture in the soil, and weather conditions	Further work is necessary to make these type of investigations and to make the usage of water more efficient by using automatic irrigation systems.
9	AUTOMATIC FIELD IRRIGATION SETUP USING MATLAB	The idea behind this project is to optimize the use of water efficiency and the motor will be pumped on and off based on the texture of the leaf. The healthy leaf image will be already stored in the PIC16f877a microcontroller in the SD card.	The future work of the project also extends in providing the information in finding out the calorie of the plant which also serves the user the user to turn on or off the motor
10	GSM BASED AUTOMATIC IRRIGATION CONTROL SYSTEM FOR EFFICIENT USE OF RESOURCES AND CROP PLANNING USING MOBILE	The system uses Bluetooth for remote monitoring which reduces the problem of range with GSM network and saves SMS cost for the farmer. One of the most important sensors used is smoke sensors which send emergency information to the user in case of fire in field or burning of the motor. The advantage of the system is low power, low cost, small size, robust and highly versatile an also avoids overirrigation, under irrigation, top soil erosion and reduce the wastage of water.	In future web-based communication, mobile alerts and weather adaptive systems can be used.

Table-1: Automatic Irrigation Method

3. CONCLUSION

In this paper, we have discussed various automatic irrigation methods which can be used for irrigating the fields using Wireless Sensor Networks. These mentioned methods conclude fixed water allocation is convenient for engineers but prevents the flexible delivery required for crop-based irrigation scheduling.

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