IOT-Enabled Water Level Monitoring For Smart Farming

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Abstract: The rate of population growth in the world is alarming. It is quite difficult to meet the needs of such a large population. Good nutrition is the most fundamental requirement for each human being. The old and conventional farming techniques, however, are proving insufficient for supplying food in large amounts due to the growing population. Fortunately, by utilizing cutting-edge agricultural techniques and smart electronics technology, we can raise efficiency and productivity to higher levels. Additionally, this will guarantee us access to food. An IOT-based smart agriculture monitoring system project using Arduino is presented to improve the effectiveness and productivity of agricultural crops. One of the most crucial aspects of our society is agriculture. Every day, farmers generate food. Water is a key aspect of successful agriculture. Technology has played a crucial role in developing agriculture. The world's largest water user is the agriculture industry. Since water is used so extensively in agriculture, which makes up the majority of the Indian economy, it is disappearing day by day. One answer to this issue is irrigation, as plants are fed with water by drip irrigation. Water is well conserved by irrigation. The agricultural land must be consistently watered while being continuously monitored. In many parts of the world, manual irrigation is still used to deliver water for agriculture.

Keywords: ESP8266 (Wi-Fi module), Smart Agriculture, Automation of Irrigation System, Sensors, Internet of Things (IOT), Crop Monitoring

1. RELATED WORKS

Smart Agriculture Farming was introduced as an emerging technology in the Agri field, to procure more crops and yields in a quick time. Moreover, the monitoring and controlling process has been done by IoT framework with cloud storage. The minerals and contaminants present in natural water resource is not constant value in all land of the farmers. To make efficient about this water management, water treatment has considered for purifying or recycling the water from the sources. More resources are providing water to the farmers for their land but the minerals added in the water for cultivation is varied depending on the farmer's economy [12-15]. Small scale customers and village peoples are not ready to spend more amounts for water treatment and minerals adding procedure. In that situation, industries and Agri companies are taking initiative to produce water treatment plans and separate units to do water contaminants maintenance using the IoT framework [16-18]. These frameworks help to control and monitor the contaminants percentage in the water while doing farming process and inform the disaster or loss of minerals in the water to the centralized controller. All type of development has been done in the water management process to improve the crop health in the land as well as cultivation time also. Optimization principles helped in this process for minimizing the cost of the entire principal to do.

2. PROPOSED ARCHITECTURE

The proposed architecture contains three units to do the water management process in a single processing method. They are water resources from the ground, rain, dug well; bore well, river water, and storage water. Next IoT sensors are used to detect the water levels and contaminants present on that such as pH Chlorine, Oxygen contents. The water distribution unit is the deciding part that delivers the water with minerals and full contaminants to the farmers' land. All connections made with PVC pipes in the respective units and power will be given to each separately. Water resources collected from sources and checked with minerals initially then distributed to the lands with the help of a water pump motor through solenoid valves. Any leakage in the pipes can detect using the IoT framework and all data must be stored in mobile app and cloud storage for analytics. The following figure illustrates the architecture of water management.

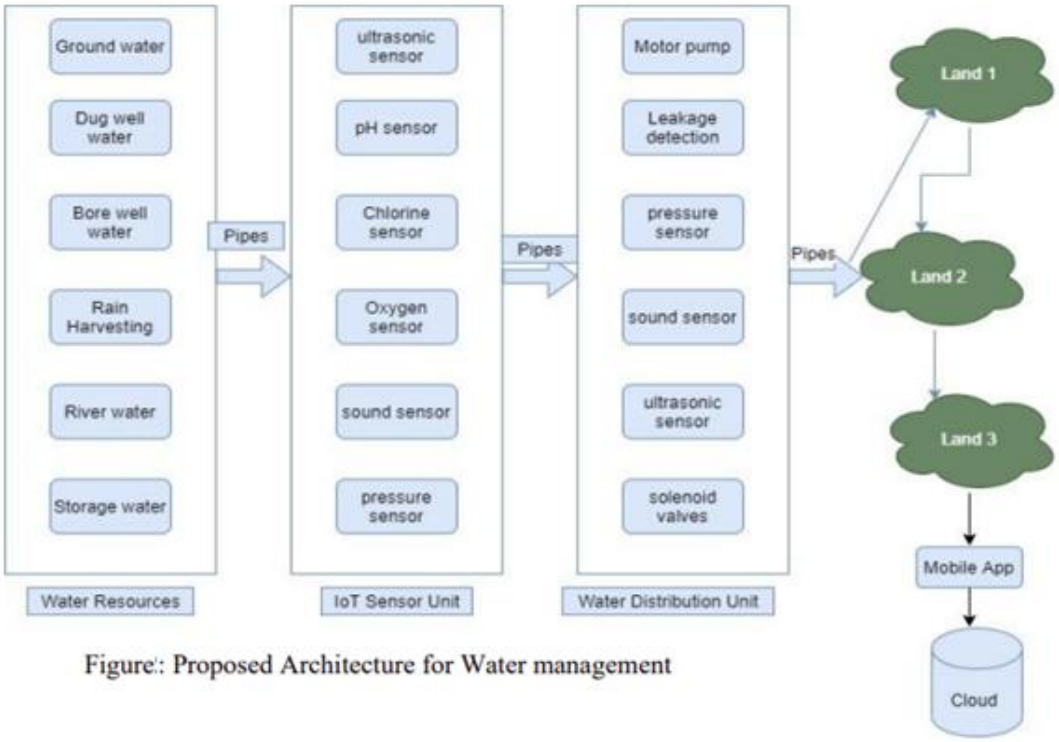

Figure: Proposed Architecture for Water management

In this architecture, several sensors are used to detect the minerals and contaminants present in the water such as an oxygen sensor, chlorine sensor, pH sensor. A sound and pressure sensor is used to control the pressure and watch the sounds coming from water sources since the volume of the water is high. A microcontroller acts as a centralized controller unit and Nodemcu is used to make connectivity between devices and controller vice versa. The ultrasonic sensor is used to find the water level in all units and solenoid valves are connected for releasing water at a minimum level if required. GSM unit is used to send notifications of the entire unit from the controller to the users. The mobile application has been developed for storing all the values and once it will be accessed then be transferred to cloud storage for analytics. The following table 1 is listed out all the sensors and their purposes used in this system.

Table 1: Sensors used in water management

S No	Sensors	used Purpose
1	Arduino	centralized controller
2	Oxygen sensor	Levels of oxygen in water
3	Sound sensor	Measure sounds in pipe
4	Chlorine sensor	Calculate the chlorine in water
5	Pressure sensor	Calculate the pressure in pipes
6	pH sensor	For water purity level
7	Mobil app	Store land details
8	GSM module	Notifications sent
9	Ultrasonic sensor	Measure water levels
10	Solenoid valve	Provide limited water level

3. RESULTS AND DISCUSSION

Since the sensors and units managed heavily this experiment has taken in a testbed and their results have been taken into considerations. The main testing part has processed the minerals percentage in the water and the contaminants used. It is varied based on the sources of water collected from various places located. The samples of water taken from all sources and tested with our experiments it has shown rainwater contaminants are good when compared with all other sources.

4. CONCLUSION

The Water Management in smart agriculture farming for the development of crop health was developed and tested in a testbed for collecting data as output results. It is visualized using the modern tools available for cloud and big data platforms in different aspects.

There must be a centralized controller is used to monitor all the activities of this system by IoT framework. The water distribution unit helps this approach to deliver the water in a proper time and level to the testbed for crop health improvement. The total environment has been settled up in an IoT framework for easy monitoring and controlling purposes. It is used to avoid disaster and water leakage problems in the water management process effectively. Also, the water treatment procedure is used to recycling the wastewater from the industries and companies. Water contents like minerals and contaminants have been watched closely about their levels used by the various lands if any discrepancies will be removed immediately in this system. Suppose water leakage between the pipes is created a major problem from the water distribution unit will also be rectified and solved using pressure and sound sensors present in the units. Water management technique is used as the best solution to increase the productivity of the crops to help the crop health monitoring on various types of lands. It will give lead the small-scale farmer's economy to the highest level within their usage limits.

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