Water Canal Distribution System using IOT

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***Abstract*—Now days, in canal water distribution system, there is a lot of corruption at water distribution points. It is managed manually and decentralized way. A key man with canals inspector is responsible for delivering water to local farmers as per their demand. To avoid such corruption, we are developing a computerized system, which will give the proper distribution of water to the farmers and avoid the corruption. As per the requirement specified by farmers, the computerized system will open the valve for given time span as per farmer request and after the time bound the valve will close automatically. Farmer will get the message before supplying water.This approach eliminates the manual control traditionally exercised by the keyman and canal inspector, thereby minimizing the opportunities for corruption and ensuring a more transparent and accountable process.The Canal Water Distribution System using IoT integrates modern technology to optimize water distribution in agricultural fields.**

***Keywords*—Arduino, IoT, Fault diagnosis, Water Channel Distribution.**

I. INTRODUCTION

The world is increasingly looking forward to automation and the use of new technologies to improve the quality of life as well as reduce the impact of human activities to make their life easier. The growing number of internet-connected devices can be the second revolution of the internet which will allow for connected objects to play an active role in the smart environment. In the case of IOT, it makes the devices more user-friendly and the user can access device from anywhere. In the case of a canal water distribution system, it makes the distribution process of water easier. This system basically making the digital form of water distribution through a canal. Typically, in the existing system distribution of water is manual. The gates are present on the canals. A key man with canal inspector is responsible for delivering the water to the specific or demanded farmer's canal. Most of the time, if a farmer has demand 70% of the water then only 30% water is discharged and remaining 40% is given to the person or company which don't have right on that water. Due the corruption done by the key man, he can able to distribute that water to other and may get benefited to himself by charging extra amount. As we know, because of such kind of things corruption gets increased. Farmers are unable to get water supply as per his need. It is also easy for irrigation department to discharge the water by The objective of this system is, provide the same amount of water requested by farmer as per their right. Design canal water distribution system automatic so transparency remains between the opening the gates of canal from their

place. They can immediately generate the bill of that water and farmers can also make payment online which is also called as pani-patti. The whole process follows the mission of digital India. All the farmers get online message of bills and date of payments. So, no corruption is happened, as there is transparency between the farmers and department bills and date of payments. So, no corruption is happened, as there is transparency between the farmers and department.

II. ARCHITECTURE OF PROJECT

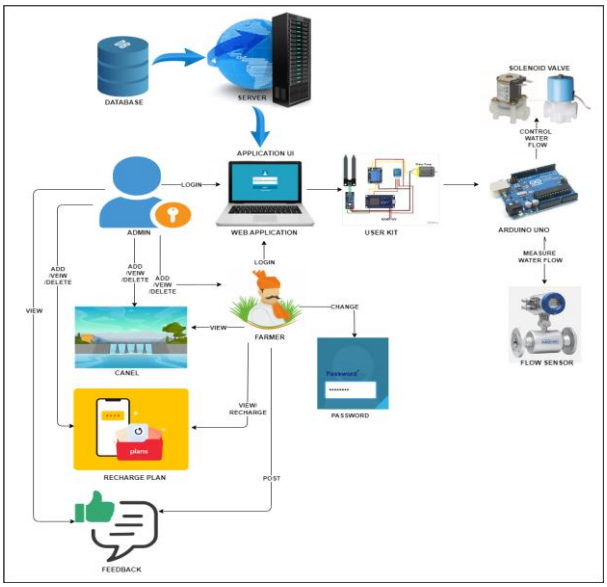

Fig:System Architecture

The system architecture of the IoT-based canal water distribution system is structured to facilitate comprehensive management for both administrators and farmers. At its core, the architecture utilizes an Arduino microcontroller, which serves as the central processing unit, interfacing with flow sensors to monitor water usage and solenoid valves to control water distribution. The architecture includes a web-based or mobile application that enables administrators to manage the entire system efficiently. Through this interface, admin can add, view, and delete information related to canals and farmers, manage recharge plans, and update farmer details. They also have access to feedback submitted by farmers, allowing for continuous improvement of the service. On the farmer's side, the application provides a user-friendly login portal where they can view available canals and recharge plans, recharge their accounts, post feedback, and update their passwords. This dual-interface architecture ensures smooth communication and operation, enhancing transparency and accountability while empowering both administrators and farmers to manage their water distribution needs effectively.

III. BLOCK DIAGRAM

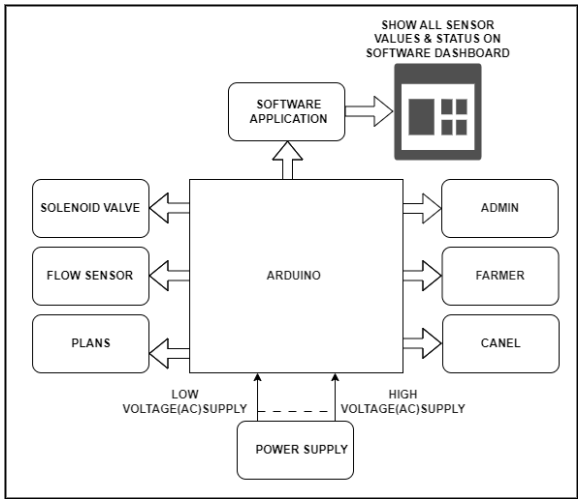

Fig :Block Diagram

IV. PROBLEM STATEMENT

The current canal water distribution system faces significant challenges, including inefficiency, manual operation, and corruption, which result in unequal water distribution among farmers. The reliance on keymen and canal inspectors to control the flow of water leads to inconsistent water allocation, often allowing for favoritism or bribery, leaving many farmers without the necessary water supply for their crops. Additionally, manual management is labor-intensive, prone to human error, and lacks real-time monitoring, leading to water wastage and poor resource management. To address these issues, an IoT-based canal water distribution system is proposed. This system automates water distribution using sensors, Arduino controllers, and solenoid valves, ensuring accurate, transparent, and equitable water allocation,

while also enabling remote monitoring and efficient resource usage.

V. PURPOSE

The purpose of implementing an IoT-based canal water distribution system is to modernize and automate the water distribution process, ensuring fair, efficient, and transparent allocation of water to farmers. By leveraging IoT technology, such as flow sensors, Arduino controllers, and solenoid valves, the system eliminates manual intervention and reduces the risk of corruption, human error, and unequal water distribution. The system allows for precise control of water flow based on real-time data, ensuring that farmers receive the exact amount of water they request. It also supports sustainable water management by reducing wastage and promoting efficient use of this vital resource, ultimately improving agricultural productivity and supporting the livelihoods of farmers.

VI. PROPOSED SYSTEM

The proposed canal water distribution system using IoT leverages Arduino technology, solenoid valves, and flow sensors to create an automated and efficient water management solution. At the core of the system is the Arduino microcontroller, which serves as the central processing unit that monitors and controls the entire water distribution process. Flow sensors are installed along the canals to measure the rate of water flow in real time, providing accurate data on how much water is being delivered. When a farmer requests water, the system processes this request based on the flow sensor data and automatically opens the corresponding solenoid valve for the specified duration to ensure that the farmer receives the required volume of water. The solenoid valves act as electronically controlled gates that can be operated remotely, allowing irrigation authorities to manage water distribution efficiently from a centralized location. Additionally, the system includes a user interface for farmers to submit requests and receive notifications about water delivery and billing, fostering transparency and accountability. By automating the water distribution process, the proposed system not only reduces manual intervention and the potential for corruption but also promotes sustainable water usage and improves agricultural productivity.

VII. OBJECTIVES

- To ensure proper water distribution among all the farmers and to provide the data of water distribution through canals, to the irrigation department for surveying and to take future decisions.
- To Control all the canal gates from a single main control room and to provide water distribution information (Date & Time) to farmers, so they can know when the water will flow through canal in their agricultural land, resulting proper use of water by farmers.
- To Collect and analyze all the information of water distribution and to provide proper data for more effective water distribution in canal system.
- To automate the water distribution process, reducing reliance on manual intervention and minimizing human error.
- To ensure that water is allocated based on real-time demand, providing farmers with the exact amount of water they need for their crops.
- To enhance transparency in water distribution by providing clear data on water usage and allocation, reducing opportunities for corruption.
- To promote sustainable water management practices by minimizing wastage and ensuring efficient use of water resources.
- To enable remote access and management of the canal system, allowing irrigation authorities to monitor water flow and make adjustments as needed.

- To provide farmers with real-time updates regarding their water supply, including delivery times and billing information.
- To explore the integration of additional IoT applications, such as weather forecasting and soil moisture sensors, for a comprehensive water management solution.

VIII. LITERATURE REVIEW

1) In their 2022 study, Akhund et al. propose an IoT-based automated irrigation system designed to enhance smart farming practices while minimizing costs. The authors outline a system that utilizes sensors to monitor soil moisture levels and environmental conditions, enabling precise irrigation control. By integrating wireless communication technologies, the system facilitates remote monitoring and management, significantly improving water usage efficiency and crop yield. The research highlights the potential of low-cost IoT solutions in addressing agricultural challenges and promoting sustainable farming practices.[1]
2) Yousif and Abdalgader (2022) present a comprehensive study on an IoT architecture for real-time monitoring and automated watering systems, combining experimental and mathematical modeling approaches. Their research focuses on the development of a framework that integrates various sensors to assess soil moisture and environmental parameters, allowing for timely irrigation adjustments. The authors emphasize the efficacy of their model in improving water management and optimizing agricultural productivity. By validating their findings through experiments, they demonstrate the practical applicability of their IoT solution in enhancing smart farming operations.[2]
3) In their 2022 paper, Sinitsa et al. introduce an innovative optical sensor system designed for the early detection of organic matter inflows in large-scale irrigation and water treatment systems. The authors detail the system's capability to monitor water quality in real time, providing crucial data that can prevent potential breaches and ensure effective management of irrigation resources. By employing advanced optical sensing technologies, the research addresses significant environmental challenges and enhances the reliability of water management systems. The study underscores the importance of early warning mechanisms in safeguarding water quality and optimizing agricultural practices.[3]
4) Aditya et al. (2021) present an IoT-based water level monitoring system specifically designed for dams, showcased at the 12th International Conference on Computing Communication and Networking Technologies. The authors highlight the system's architecture, which incorporates various sensors to continuously monitor water levels and environmental conditions, facilitating timely data transmission to a central control unit. This real-time monitoring capability enhances decision-making processes for water resource management and flood prevention. The study emphasizes the significance of IoT technologies in improving the safety and operational efficiency of dam infrastructures, ultimately contributing to better water management practices.[4]

IX. SYSTEM NECESSITY

Hardware:

1. Processor – i3
2. Hard Disk – 5 GB
3. Memory – 1GB RAM
4. Solenoid Valve
5. Arduino Board
6. Flow Sensor

Software:

1. Operating System:Windows XP and later versions
2. Front End:HTML,CSS
3. Programming Language: Java
4. Dataset:Mysql
5. Domain:IOT

X. HARDWARE NEEDED

1) Arduino :

Arduino is an open-source electronics platform based on easy to use hardware and software. A developer can send a set of instructions to the microcontroller. All Arduino boards are open-source, empowering users to build them independently, and ultimately adapt them to their particular needs. Arduino/Genuino Uno board consists of an ATmega328P microcontroller chip. It has 14 digital input-output pins, 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, and a reset button. The ATmega328 on the Arduino Uno comes programmed with a bootloader that allows uploading new code.

Fig:Arduino Uno

2) Flow Sensor

The Flow Sensor is a device that detects and measure water flow through pipes. The water flow meter works with the flow sensor to calculate water flow. The water flows through the rotor blade; Rotor will start to rotate. Thus, pulses produce an output frequency that is directly proportional to the volumetric flow rate/total flow rate through the meter. Figure shows the Turbine of Flow Meter diagram.Flow sensor is used to measure the flow of water through the flow sensor. This sensor basically consists of a plastic valve body, a rotor and a Hall Effect sensor. The pinwheel rotor rotates when water / liquid flows through the valve and its speed will be directly proportional to the flow rate. The Hall Effect sensor will provide an electrical pulse with every revolution of the pinwheel rotor.

Fig:Flow Sensor

3) Solenoid Valve:

A solenoid valve is used as a water controlling valve, it is a simple electromagnetic device that converts electrical energy directly into linear mechanical motion. A solenoid valve is the combination of a mechanical valve and basic solenoid. So a solenoid valve has two parts namely-Electrical solenoid and a mechanical valve. Solenoid converts electrical energy to mechanical energy which operates a mechanical valve that is to open, close or to adjust in a position. The solenoid valve is shown in figure

Fig:Solenoid Valve

XI. ACKNOWLEDGEMENT

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XII . CONCLUSION

In conclusion, the IoT-based canal water distribution system utilizing Arduino, solenoid valves, and flow sensors represents a transformative solution to the longstanding challenges of manual water management in agriculture. By automating the water distribution process, this system enhances efficiency, transparency, and sustainability, ensuring that farmers receive the precise amount of water they need while minimizing wastage. The integration of real-time monitoring and data analytics not only improves resource allocation but also empowers farmers and irrigation authorities to make informed decisions. As this technology continues to evolve, it holds the potential to significantly improve agricultural productivity and water management practices, contributing to the overall well-being of farming communities. By addressing issues of corruption and inefficiency, the system paves the way for a more equitable and sustainable approach to water distribution, ultimately supporting the goals of modern agriculture in a rapidly changing world.

XIII . REFERENCES

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