Auto Shutter Control System for WLAN using Reservoir (Auto Dam Shutter)

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Abstract—Automatic dam system is a system which does not require to operate by manual. Proposed as an automatic dam gate system has been proposed to automatically control dam gate without human effort and also proposes an idea of collecting and sharing real-time information about water levels to an authorized remote user through far field communication .If water reaches the threshold level, gate opened automatically without any command. Based on the water level, the authorized remote user then provides the command whether to release the water by opening dam gates or keep them closed. By doing so, the operation of dams all over the irrigation canal, power plant, factories etc. By sensing drain water, it controls a pump to irrigate excessive water. DC motor are used to control the movement of dam gates. Arduino NANO is used as the processor. Here we uses the access point by operating the manual method using WLAN connection.

Keywords—Automatic gate, Arduino NANO, DC motor pump, Relay, Node MCU

I. INTRODUCTION

Dams are the major sources of water supply to cities, they also play a vital role in flood control . Most of the dams are built to serve many purpose and their benefits are different. Generally, the dams are monitored through traditional surveillance techniques. The dam becomes complex as the number of users is huge . This situation gets much complex with the fact that the available resources are limited with high possibilities of droughts and floods. This affects the densely populated areas. Dam monitoring is a tedious and long term process which has to be improved step by step.

A new system for dam water monitoring and management should be established which can provide water level in real time regarding the safety operations of the dams.Internet of Things (IoT) can be defined as a network of devices which are interconnected. It consists of software enabled electronic devices that enables end users to acquire accurate data from time to time through the communication channel and allows for data interchange between users and the connected devices.

This system can be used to automatic the control of dams without human interference. This can also be used to gather information on the level of water throughout the country and can be used to route water based on the requirements. We can get information on the water availability in a particular region . route the water to that area if there's scarcity. This helps a lot in irrigation.

Integration of Internet of Things with big data, cloud computing will enhance the operation capability of dams to a greater extent [1].

Water management system is currently an issue of growing concern. Faced with the rising demand in case of saving water, hydraulic engineers employ automatic control techniques to acquire a better performance in the real-time functioning of open-channel systems./Three phase induction motor was utilized to use for gate movement which enhances the complexity of the system. , an automatic dam gate system has been proposed and developed in this paper that will be able to open and close gates automatically when it is necessary and subsequently .An Arduino based automatic dam gate technique has been designed using anode MCU which offered better water level detection as well as consequently will be utilized to protect lowland areas from excessive water during the flood as well as proper drainage issue [2].

2.0 LITERATURESURVEY

Phaneedra babu[1] describes the paper and sharing real time information about water levels to an authorised central command centre through far field communication. The authorized Central command center then takes a call whether to release the water by opening Dam gates are keep them closed . Faisal [2] tells an automatic dam gate system has been

proposed to automatically control dam gate without human effort. DC motors are used to control the movement of dam gates. Arduino Uno is used as a processor .An autonomous dam gate system has been developed which can be used to protect the low-lying area from The tidal water as well as it can also be used to an irrigation canal ,power plant ,factories etc.

K.Runi Tanishka Sharma [3] shows the system to indicate about the water level in the dam through Wi-Fi Modem and controls the dam gate by sending reply to the same Wi-Fi device from the android device according to the level of the water The project emphasises on saving of water by determining the exact level to which the water level in the dam has reached using WIFI modem. We use the concept of mechatronics here in order to regulate the working of dam gate by observing the water inflow rate. Sensors are used to indicate the level up to which the water has reached. Case study by Matthew S.Maxwell [4] explains piute dam is being developed as a test bed for automation technology. This technology is designed to collect data from sensor along the river, use these data to calculate a desired reservoir release according to a hydrologic model ,and autonomously adjust the outlet gate on the dam to reach the desired release For the purposes of this paper, 'dam automation' will refer the process of changing the reservoir release gate to accommodate a change in downstream demand without human intervention.

S.K .Bhatia et.al,[5]describes as Water level in a dam needs to be maintained effectively to avoid complications. This is generally performed manually which requires full time supervision by the operators & have fairly large staff complements. Moreover, the quantity of water released is hardly ever correct resulting in wastage of water & it is impossible for a man to precisely control the gates without the knowledge of exact water level and water inflow rate. The main objective of this project is to develop a mechatronics based system, which will detect the level of water and estimate the water inflow rate in a dam and thereby control the movement of gates automatically in a real-time basis which offers more flexibility. SreeKanth [6] tells that Water level control and safety of people are the most challenging and important facts when hydroelectric projects are considered. Lack of innovations and implementations of ideas in this field are the key factors which lead to this paper. This paper presents an efficient idea to control the flow of water by controlling the shutter or gate and thereby water level management. Also it ensures the safety of people nearby and far by giving warning messages.

3.0 EXISTING METHOD

3.1 MANUAL METHOD

Floodgates also called stop gates, are adjustable gates used to control water flow in flood barriers, reservoir, river, stream systems. They may be designed to set spillway crest heights in dams, to adjust flow rates in sluices and canals, or they may be designed to stop water flow entirely as part of a levee or storm surge system. Rain on hilly areas flows down as river. In order to produce electricity, a high rise dam is built to stop the flowing water. This results in the formation of a large reservoir behind the dam. As the water level rises behind the dam it gains potential energy. The sluice gates at half the height of the dam are kept opened for the water to escape from it. This water is taken through pipe to the turbine installed at the bottom of the dam. This water flows very fast, flowing water rotates the blades of the turbine rapidly which is connected to a generator through a shaft. When the turbine rotates, it's shaft also rotates and drives the generator and hence electricity is produced.

Manual method

The aim of this project is to develop an automatic dam shutter system and the main theory of this paper is to demonstrate a system to control the dam automatically and manually using LAN connection so that it can control the water flow autonomonously to make an effective use of water in the irrigation system as well as to control floods.
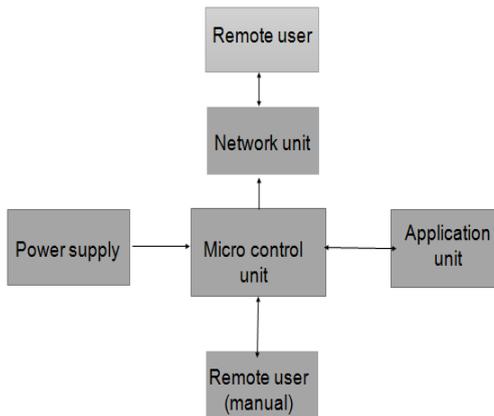
3.2 PITUE DAM

Piute Dam in the Sevier River Basin of Utah has been equipped with an automatic gate to regulate releases into the downstream irrigation delivery system. This system has allowed the water commissioner to remotely set the desired flow target. The gate then automatically adjusts itself to provide the specified outflow. Although this has been very convenient, the determination and setting of the target release flow rate has remained a human initiate action. Recent improvements to the system have now automated this part of the process to provide a greater degree of convenience and efficiency. Currently, Piute Dam is being used as a test bed for automation technology. In conjunction with the Sevier River Water Users Association (SRWUA), the Bureau of Reclamation's Provo Area Office developed software to enable automation of the Piute Dam outlet gate. Software used in this process includes the Open Basin software package for real-time data acquisition, a model developed for Piute Reservoir by Abedalrazq Khalil and Mac McKee of Utah State University, and other software used to develop Internet-based control and reporting. Furthermore, the software developed to provide supervisory control, policy enforcement, and diagnostics was integrated into the Open Basin available for free. This allows other water districts to apply these tools to their own automation projects.

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4.0 PROPOSEDSYSTEM

4.1 BLOCK DIAGRAM AND METHODOLOGY

- In this project, Arduino NANO is employed as the micro processor
- In the system to open or close gates. A DC pump has been utilized to use to pump water whereas Micro switch and push
- Microcontroller unit passes the data through the router.
- The router takes the data to the mobile user by the shortest path to reach the destiny.
- Then the data is send into the remote user through the WLAN.
- The mobile user send the command to Microcontroller.
- Based on the command the shutter will open or close.
- If the water reach the threshold level , the shutter will open automatically.
- After that the water level is decreased below threshold , the gate closes automatically.
- Meanwhile the manual method is been used ,when the water needed for irrigation purpose when it is in the average.

5.0 CIRCUIT DIAGRAM
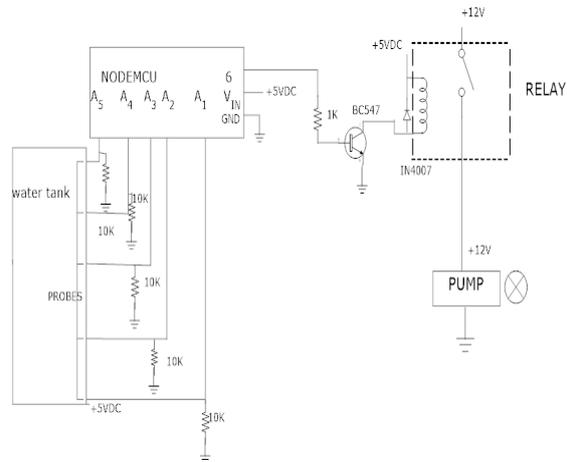
. 5.1 CONNECTIONS

- ◆ The five different levels are connected to the analog pins in Arduino nano.
- ◆ Vc is introduced in to the water tank for power supply.
- ◆ Ground connection is connected to the ground.
- ◆ The different levels are connected with 10k resistor to control the flow of current.
- ◆ The D6 pin is the output connection connected to the pump where we see the result.
- ◆ The relay is used to resist the supply to the DC motor to pump the water when the water reached the threshold level.
- ◆ By using Node MCU the LAN connnection is introduced for manual method to switch on and off the pump when it requires.

5.2 WORKING

First we are taking the water tank , the different levels of the water percentages were been noted. Initially the water tank connected to Arduino nano with the input connection as analog(pin,A1,A2,A3,A4,A5).
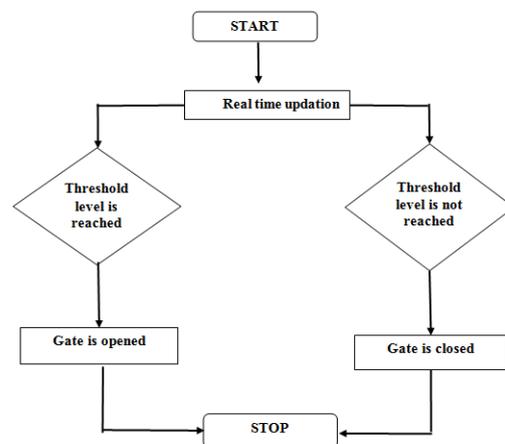
FLOWCHART OF THE IMPLEMENTATION

First stage is when there is no water the output will be TANK IS EMPTY(WATER PUMP IS **OFF**).
Second stage will be 20% when it reaches its level the result showing as TANK IS 20% FULL(WATER PUMP IS OFF).
Third stage will be 40% when it reaches its level the result showing as TANK IS 40% FULL (WATER PUMP IS OFF).
Fourth stage will be 60% when it reaches its level the result showing as TANK IS 60% FULL(WATER PUMP IS OFF).
Fiveth stage will be 80% when it reaches its level the result showing as TANK IS 80% FULL(WATER PUMP IS OFF).
Final stage will be THRESOLD LEVEL when the tank is full the result showing as TANK IS 90%FULL (WATER PUMP IS **ON**).
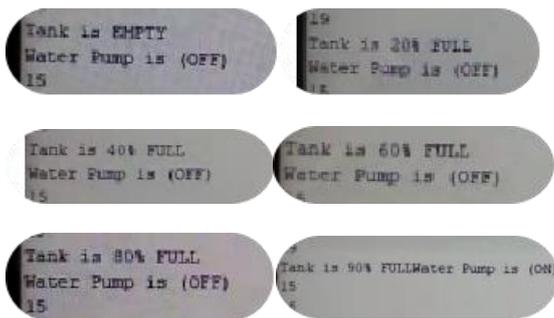
After the process , Node MCU is connected with LAN to operate by remote user , it is for manual use these are resisted by relay.

6.0 HARDWARE SPECIFICATION

A) Relay
B) DC motor
C) Arduino Nano
D) Node MCU

RELAY-Relays are switches that open and close circuits electro mechanically or electronically. So here we using as a switches to pass the signal.

DC MOTOR- A DC motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy. So here we uses dc motor to pump off the water out to reduce the threshold level of the dam.

ARDUINO NANO- Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software that runs on your computer, used to write and upload computer code to the physical board. Here it is used to upload the coding of the project and also to see the output through serial monitor.

NODEMCU-The Node MCU (Node MicroController Unit) is an open source software and hardware development environment that is built around a very inexpensive System-on-a-Chip (SoC). We are using this device for WI-FI Connection to connect the mobile user with the monitoring device to notify the level of water. And it is utilized for send the command to the user to react to it.

6.1 SOFTWARE SPECIFICATION

A) Arduino

ARDUINO- Functions allow structuring the programs in segments of code to perform individual tasks. The typical case for creating a function is when one needs to perform the same action multiple times in a program. Functions help the programmer stay organized.

7.0 CONCLUSION

Water is one of the primary resource for human survival. But unfortunately a mammoth amount of water is being squandered by uncontrolled use. There are certain automated water level monitoring systems in practice but they are used for various applications and have some shortness in practice. We tried to suggest ways to tackle this problem and implement an efficient water level monitoring and management system. The main motto of this research work is to establish a flexible, economical and easy configurable system which can solve our water distribution problem between two regions and safeguard the low lying areas from floods etc. among many other issues. We have been using a micro controller to manage the data and to reduce the cost. We have been successfully conducting the experiments in lab and therefore proposed a cloud based water level monitoring and management network whose flexibility would offer us to control the system from any place via access to cloud data with different type of devices. This type of system is more helpful in situations like floods where the automated gate lifting system will check the water levels and react according the situation. This could have a substantial benefit to the research work related to the efficient management of water at dams by reducing the manual work. It will be great step against the manual method to avoid the timing of the gate opening and avoids the wastage of the water while opening the dam.

8.0 FUTURE WORK

As we are going towards the project for the auto and manual operation of dam.The next research is about the work of SMS notification to the every person that can be safe guide the people nearby the dam. And this system can be enhanced in the field of IOT. Our aim is to reach the real time information to the people behind or beyond the dam.

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