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Automation in Canal Irrigation System

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Abstract—Dam automation provides efficient control and monitoring of water. By automating the canals and dams the wastage of water can be prevented to a greater extent. The main objective of this project is to control and monitor the distribution of the water to the areas according to their requirement. Floods are also avoided because the gates are operated automatically when the level increases. Presently manual control is employed to control the gates of the dams and canals. When they are automated the water is released automatically. It prevents over flow of the water which causes flood in some areas. In this project, we are using Texas Instruments microcontroller board which controls and monitors the water flow. Various sensors are used which provide the values of the level of water according to which control action is taken. The gates are operated automatically by using gear motor. When the level decreases the gates are opened automatically, the gates remain open till the itreaches a certain level. By employing automation in dams and canal irrigation many complications can be avoided.

Index Terms—Floods, Overflow, Microcontroller, Gear Motor, Gates, Irrigation.

I. INTRODUCTION

In India, approximately 3200 dams are present and it cover 1,70,000 sq.km for collecting water. Dam are manmade or artificial barriers usually constructed across to impound water. There is also 2067.68 km long and complex canal networkthroughwhichabout10lakeshectarelandgetswater for irrigation and drinking purpose. The farmers are dependent on seasonal ran and after that bore well water for their crops. Recently, all the farmers use in flood irrigation system for plant their crops which needs more water. The biggest advantage of automation is that it saves man power however, it is also used to save energy and waterfalls and to improve quality, accuracy and precision. Various literature surveys stated the controlling procedure using different modules by sensing the level, sending it to the controller where the corresponding gates are open. Already proposed methods include Arduino programming, Raspberry Pi programming, PLC programming and SCADA monitoring to actuates the motor to open and close the gates. For transmitting the water level, in flow rate and momentary status of the gates, RF module have been used. In our project, we have come up with Texas Instruments microcontroller programming with GSM data transmission. The additional feature of our project is sensing the soil moisture and controlling the flow of water as per the requirement of fields.

II. LITERATURE SURVEY

[1] V. Rajendran, J. Shilpa, S. Veeravalavan, and M. Anbarasan, "Dam Automation Using Arduino" International Journal of Innovation and Scientific Research ISSN 2351-8014 Vol. 30 No. 3 May 2017, Pp. 364-369. This paper deals with the automatic open and close action of gate to control the level and flow of dam using Arduino microcontroller. The control action is reported periodically through Remote computer or mobile by RF module.

[2] Mukul S. Mahajan and Swapnili P. Karemore, "Design and Development of Smart Automated Door Control System for Dam" International Journal on Recent and Innovation Trends in Computing and Communication ISSN: 2321-8169, Volume:5February2017Issue:2239241.Thispaperillustratesabo utcontrol and monitoring system for dam automation using Programmable Logic Controller and Supervisory Control and Data Acquisition.

[3] Prof. Mrs. S.K. Bhatia, Navale Ravindra, Gawade Ashwini, Shisode Raghuvansh, "Automatic Dam Gate Control System Using Raspberry Pi" International Engineering Research Journal (IERJ) Volume 2 Issue 1 Page 389-391, 30th March 2016, ISSN 2395-1621.This paper has introduced a mechatronic based system which detects water level in dam, estimates the inflow rate in dam and control gate movement automatically. This flexible system is Raspberry based gate control system which alsohelpsin water wastage, indicating about flood to people and ensures efficient usage of water.

[4] Rajat R. Sorte, Rahul R. Sonwane, Nikhil L. Thakur, Swapnil A. Akhade, Shashwat N. Kawale, Nikhil R. Dusawar, Kapil K. Lalwani" PLC based Dam Automation System" International Journal of Engineering Research in Electronics and Communication Engineering (IJERECE)Vol 2, Issue 3, Mar 2015. This paper describes about PLC based control system for automating dam gate. This system saves

labour, is energy efficient, and control action is highly precise, has high accuracy and is of high quality.

[5] Mahesh Nandaniya "A Review Paper of Automatic Canal Gate Control of 3-ø Induction Motor with PLC and VFD, Powered by Solar System and Monitoring by SCADA" International Journal of Emerging Trends in Electrical and Electronics(IJETEE)Vol.1,Issue.1,March2013.Thispaper symbolizes a PLC controlled compact system with SCADA monitoring solution to prevent water wastage from dam as well as provides an effective solution for power in sufficiency. This system has dam gate control by dc motor for which its speed is controlled by Variable Frequency Drive.

[6] Syed Muhammad Umar Talha, Syed Sheraz Mohani, Syed Hassan Ahmed and Mansoor Ebrahim "Design for an Irrigation and Monitoring System of an Automated Dam" Proceedings of the International Multi conference of Engineers and Computer Scientists Vol II, IMECS March14.-16,2012. This paper presents the design and implementation of a control system by means of microcomputers and data transmission networks. Experimental test is undergone in order to verify the principle operation of the miniaturized controlling design of the automated dam. In the dry season with the upper reservoir holding very little amount of water the lower reservoir can still provide the water stored in the previous season.

III. PROPOSED METHOD

In the existing system of the canal water distribution network the canal gates are operated manually. During some days, certain area may require less water due to rain. In such cases the water distributed in that area may wastage of water. The canal gate sareoperated manually but this project aims to automate the canal gates.

Based on the sensor values from the field the canal gates are made to operate automatically. Whenever there is rainfall in the canal the water level in the canal rises so the water from the reservoir needn't be distributed in this area. The rain water in the canal itself can be used. The canals level is also monitored continuously when the level rises beyond the specified value the canal gate opens automatically. The levels of the branch canals, distributaries, minors are also monitored continuously. They also have gates which are manually controlled presently. Based on the level of the water in these canals and distributaries the gates are controlled automatically. The dam gates are operated manually using hydraulic system. In this project, our main objective is to automate the dam gates. Usually sluice gates are used in dams. In this project, we are considering a sluice gate.

The sluice gates open close in a shutter mechanism. According to the level of the reservoirs and the canals the gate is opened or closed. We are providing water based on the requirement of the area so here wastage of water is prevented.

IV. WORKING PRINCIPLE

The soil moisture sensor measures the soil moisture content in the field and sends to the micro controller board. The water level in the canal is measured at various points using float level sensor. The suspensors act as feedback devices for the closed loop system. The micro controller board receives the feedback signal and compares both. The water requirement in the field and the availability of water in the canal is compared and the gates are opened accordingly. The sluice gates are driven by the motor which is activated by the micro controller. The micro controller acts as both error detector and controller. The motor is the final control element. The readings from soil moisture sensor and level sensor and the gate opening and closing messages are sent to the control room via GSM module. The block diagram depicting the whole system is shown below.

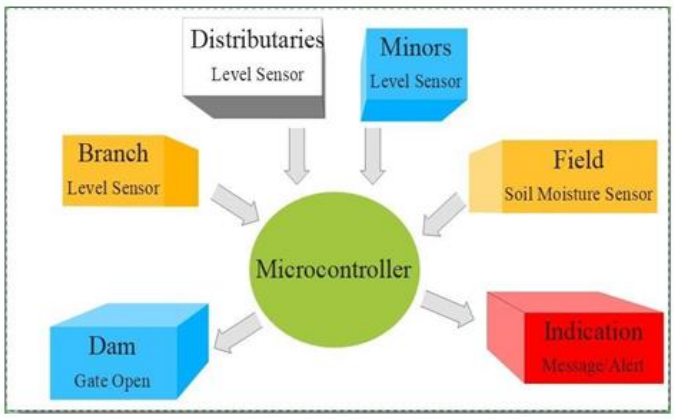

Fig. 1 The Block Diagram

Hence the open and closure of dam gates are done automatically using closed loop control system.

V. FUTURE WORK

Our project has provided solution for automating sluice gate. Our future studies deal with automating the open and close operation of other gates too. Future work of our project aims at improving the accuracy of time of open and close action of gate, water quality and focuses in introducing Bluetooth modules in the localities where there is unavailability of proper mobile network. Our research and development studies are main in transmitting data updates through satellites instead of IoT for increased effectiveness in reporting water level and action of gates. The alternate solution for efficient energy is that our system can be powered by solar energy, hydro power, etc., In addition to monitoring and controlling the water level in dam, reporting it periodically and alerting people in that locality regarding flood is also focused. The further studies are

being done regarding implementation of image processing for emergency indication of human or animal if accidentally drowned in water. Water quality monitoring serves as a key for pollution control. The forthcoming proposal work is to concentrate on dam water temperature and water quality control and monitoring which will be a measure for protection of aquatic life as well as support their breeding.

VI. CONCLUSION

Automation in Canal Irrigation system using Texas Instruments Microcontroller board serves to be cost effective. Our proposed method conserves water and ensures efficient utilization and proper distribution based on requirement in the respective areas by focusing soil moisture at various fields; Thus, proving to be the welfare key for irrigation purpose. Above all the ultimate aim of replacing manual operation of canal gates by automation has improved accuracy and efficiency.

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