

Automatic Dam Gate Control System Using Raspberry Pi

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ABSTRACT

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. This project is a Raspberry pi BCM2835 based dam gate control system which helps in keeping an eye on the frequent usage of water resources from dam for irrigation purposes and efficient operation of dam gate according to the level of water and also helps in indicating about flood to people living in the surrounding. This proposed mechanism of dam gate control reduces the water wastage and efficient usage of available water is ensured. Also there are heavy load shedding problems in the villages in almost all states of India. To overcome these problems the proposed dam gate control system can be combined with the operation of the geothermal and nuclear power plants for generation of electricity.

Keywords : Raspberry pi, GSM, Motor driver, Buzzer.

I. INTRODUCTION

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. This system consists of a set of sensors connected to a stepper motor through an 8-bit microcontroller. This microcontroller operates the H-Bridge which controls the operation of the DC motor i.e. switches on the DC motor moving it in a clock wise direction. The water level and rate of inflow is detected based on the feedback from the sensors used. Based on this data, the level of dam gate can be automatically controlled using a DC motor.

The Raspberry Pi is a credit-card-sized single-board computer developed in the UK by the Raspberry Pi Foundation. The Raspberry Pi has a Broadcom BCM2835

system on a chip which includes an ARM1176JZF 700 MHz processor Video Core IV GPU and was originally shipped with 256 megabytes of RAM, later Upgraded to 512 MB. It does not include a built in hard disk or solid-state

drive, but Uses an SD card for booting and long-term storage.

This project uses regulated 5V, 1A & 7805 three terminal voltage regulators are used for voltage regulation. Bridge type full wave rectifier is used to rectify the ac output of secondary of 230/12V step down transformer. 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

ARTICLE INFO

Article History

Received 22nd March 2016

Received in revised form :

24th March 2016

Accepted : 27th March 2016

Published online :

30th March 2016

gates without the knowledge of exact water level and water inflow rate.

II. LITERATURE SURVEY

[1] Xavier Litric, 'Robust IMC Flow Control of SIMO DamRiver Open-Channel Systems', 'IEEE Transactions On Control Systems Technology.

This paper deals with the automatic control of a dam river system, where the action variable is the upstream discharge and the controlled variable the downstream discharge. The system is a cascade of single input-single output (SISO) systems, and can be considered as a single input-multiple output (SIMO) system, since there are multiple outputs given by intermediate measurement points distributed along the river. A generic robust design synthesis based on internal model controller (IMC) design is developed for internal model based controllers. The robustness is estimated with the use of a bound on multiplicative uncertainty taking into account the model errors, due to the nonlinear dynamics of the system. Simulations are carried out on a nonlinear model of the river.

[2] Syed Sheraz Mohani, Syed Muhammad Umar Talha, Syed Hassan Ahmed and Mansoor Ebrahim, 'Design for Irrigation and Monitoring System of an Automated Dam'

In this paper explain the industry has always focused to devise engineering methodologies for establishment and modification of relatively easier Controlling and Automation methods for any scrupulous process. This paper presents the design and implementation of a control system by means of microcomputers and data transmission networks. To verify the principle operation of the Controlling design to be presented a miniature Automated Dam model is experimentally tested using a PC-based system

III.SYSTEM ARCHITECTURE

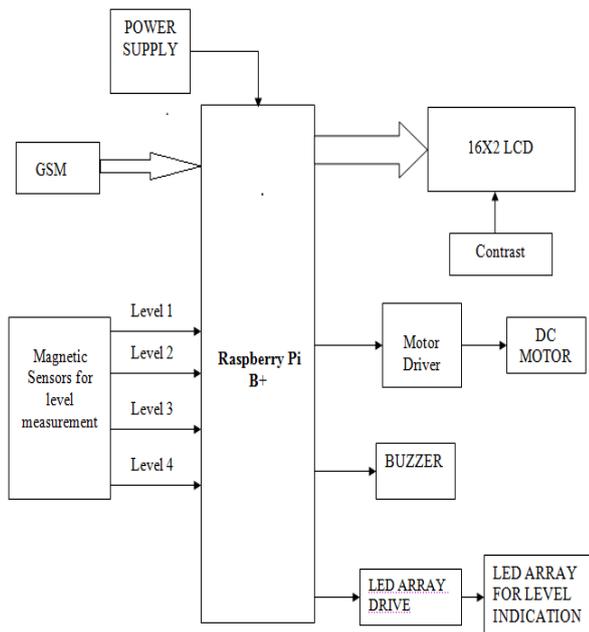


Fig 1. Block diagram

The water level at different levels is sensed according to which the gate is closed or open. That is when the water is filled to level 3 the closed dam shutter is fully opened, for level 2 gate is partially closed while for level 1 the gate is fully closed. Dams are typically constructed with a drain or similar mechanism to control water levels in an impoundment for normal maintenance or emergency purposes. Sensors senses the various levels of water Whenever the water level rises or decreases and comes in contact of any sensor then the circuit is complete. The water level rises above the highest level or decreases below the lowest threshold level then the sensor circuit triggers the raspberry pi. Raspberry pi will drive the DC motor through the motor driver relay circuit. The dam gate connected to the DC motor will also move and it will get opened or closed according to the water level.

IV.ALGORITHM PROCEDURE

Step1:

A sensor senses the various levels of water.

Step2:

Whenever the water level rises or decreases and comes in contact of any sensor then the circuit is complete.

Step3:

The water level rises above the highest level or decreases below the lowest threshold level then the sensor circuit triggers the raspberry pi.

Step4:

Raspberry pi will drive the DC motor through the motor driver relay circuit.

Step5:

The dam gate connected to the DC motor will also move and it will get opened or closed according to the water level.

V. ADVANTAGES AND APPLICATION

Advantages:

- The water wastage can be reduced.
- Efficient utilization of water resources can be done.
- We can keep the record of the water usage and indications can also be given to the people at various situations.
- Example, during heavy rainfall the chances of flood can be indicated.

Application:

- Use of Dam Gate System in Power Plants.
- This dam gate control system operation can be combined with the operation of the geothermal and nuclear power plants for generation of electricity.

VI.RESULT

This paper we have to show the 30 % work. We found that the time taken for the dam gate to open and close is accurately synchronized with the increase or decrease in the water level because of the use of Low Speed High Torque DC Reduction Gear Motor having 100 rpm. Due to the use of GUI operator control panel the dam gate can be opened or closed at any time as and when we require which increases the system reliability and flexibility. A graph is plotted continuously on the panel indicating the change in the water level every second which makes the system operator friendly and reduces his job of continuously monitor the water level in dam.

VII. CONCLUSION

As we have followed through detail execution of our project with the help of raspberry pi along with advance features of it. We can take full advantage of raspberry pi in any application of automation and electro mechanics area. Although we can extend our work in the sense that we can achieve more precise and accurate results. The components circuitry we can replace for achieving better operation is less time and less water use using raspberry pi.

Raspberry pi we can also design in conjunction with GSM so as to we can achieve the important feature i.e. security for our system.

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