Auto Controlled DAM with SMS Warning System

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ABSTRACT— ***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 there by water level management. Also it ensures the safety of people nearby and far by giving warning messages.***

Keywords— Level control, Gate or Shutter control, Dam safety

1. INTRODUCTION

Almost every water resources project has a reservoir or diversion work for the control of floods or to store water for irrigation or power generation, domestic or industrial water supply. A spillway with control mechanism is almost invariably provided for release of waters during excess flood inflows. Releases of water may also be carried out by control devices provided in conduits in the body of the dam and tunnels. In order to achieve flow control, a gate or a shutter is provided in which a leaf or a closure member is placed across the waterway from an external position to control the flow of water. Control of flow in closed pipes such as penstocks conveying water for hydropower is also done by valves, which are different from gates in the sense that they come together with the driving equipment, whereas gates require a separate drive or hoisting equipment.[1][2] Different types of hydraulic gates and hoists, working on different principles and mechanism are in use for controlled release of water through spillways, sluices, intakes, regulators, ducts, tunnels, etc. Right selection of gates and their hoisting arrangement is very important to ensure safety of the structure and effective control. A designer has to plan a gate and its hoisting arrangement together. [4] Separate planning of gates or hoists, sometimes results in unsatisfactory installation. Though the choice for the gates and hoists depends on several factors, primarily safety, ease in operation as well as maintenance and economy are the governing requirements in the same order.

So here we are introducing a new method to control effectively the water level in a dam, by automated opening and closing of shutters. We also provide warning messages and alarm to make the nearby people aware about the dam opening. It can ensure a complete protection system and also data base of people living near the river bank and thereby proper and effective warning system can be provided.

2. CONTROL STRATEGY

Here there are two different water levels L1 and L2.L1 is the lower level and L2 is the upper level. If the water level is below L1 then there is no need to open the shutter. [3] If the water level increases above L1 then the GSM module is

triggered and warning message is send to the nearby people. If the water level increases above L2 then the alarm circuit is triggered and alarm sound is generated to make people aware about the opening of dam.

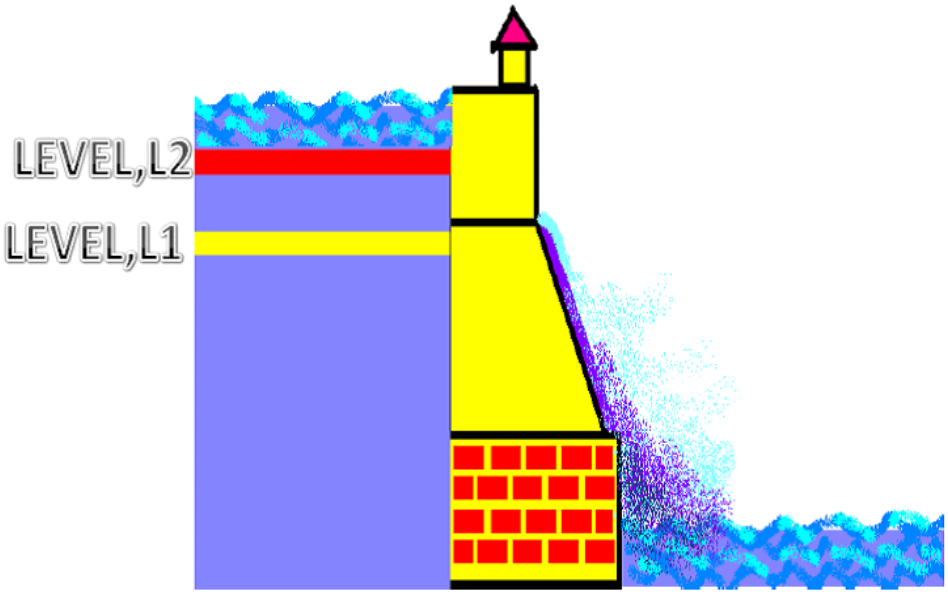

Figure 1: Preset levels

The alarm signal can be simultaneously transmitted by using RF to the receivers which are placed along the banks of downstream. The speakers which are connected to the receivers can make people alert and hence the earlier alert messages and warnings can provide the people enough time to clear out to safe locations. After waiting for some time the driver circuit will trigger the shutter opening mechanism automatically. As the shutter is in open position the water level decreases gradually and if it falls below L1 the shutter is closed automatically.

3. DESCRIPTION OF PROPOSED SYSTEM

3.1 Sensor

Our sensor module consists of two metallic strips arranged in parallel, insulated by using rubber bushing at consequent intervals. 5 V potential is applied at first strip and the other strip is connected to a microcontroller. Normally, since the electrodes are insulated the potential at second strip remains zero. [5] When the water level rises and enters between the strips, the conductivity increases and the potential gets transferred to the second strip which is sensed by the microcontroller. Similarly two sensors are mounted at levels L1 and L2.

3.2 GSM warning system

It consists of a GSM module with a SIM card. It can be used to send warning messages to the people who are living downstream. For proper operation of the warning system, we must ensure that data of all people with mobile number have been collected and saved to the memory location of our controller. It can be done through extensive and accurate surveys. In future this message warning system can be replaced by voice call broadcasting system in assistance with telecom companies.

3.3 RF warning system

It consists of an RF transmitter and many receiver modules. Receiver modules are placed at the vicinities of river banks with loud speakers, where the people may be under dangerous positions if warning is not delivered in proper time and places where manual warning system is difficult and is having time delay. The warning is given in advance so that people can clear out to safer locations.

3.4 Gate control system

Gate control is done by microcontroller algorithm. The output of microcontroller, to close or open the gate is amplified and delivered to huge driver motors which opens and closes the gate. Heavy hydraulic systems or electric motors are used to control the gate.

3.5 Algorithm

Step 1: Start

Step 2: Read the level sensor outputs L1 and L2

Step 3: If L1 is high go to Step 4 else go to Step 2

Step 4: Trigger the GSM module to send warning messages.

Step 5: If L1 and L2 are high go to Step 6 ; else step 5

Step 6: Trigger the RF module to transmit alert warning.

Step 7: Delay time

Step 8: Shutter opens

Step 9: If L1 is low go to Step 10; else Step9

Step10: Shutter closes

Step 11: Trigger the GSM module to send warning free messages.

Step 12: Go to step 1

3.6 Flow chart

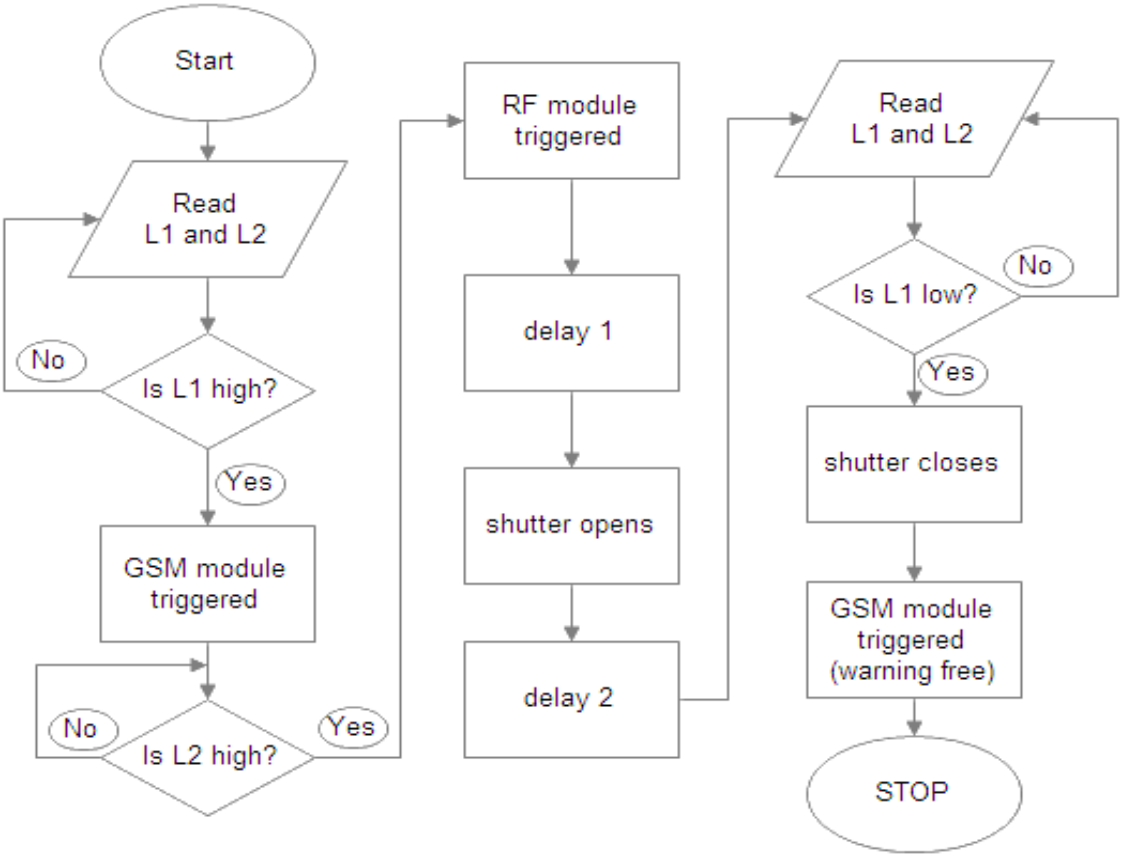

Figure. 2: Flow chart of the Proposed algorithm

4. EXPERIMENTAL PROTOTYPE

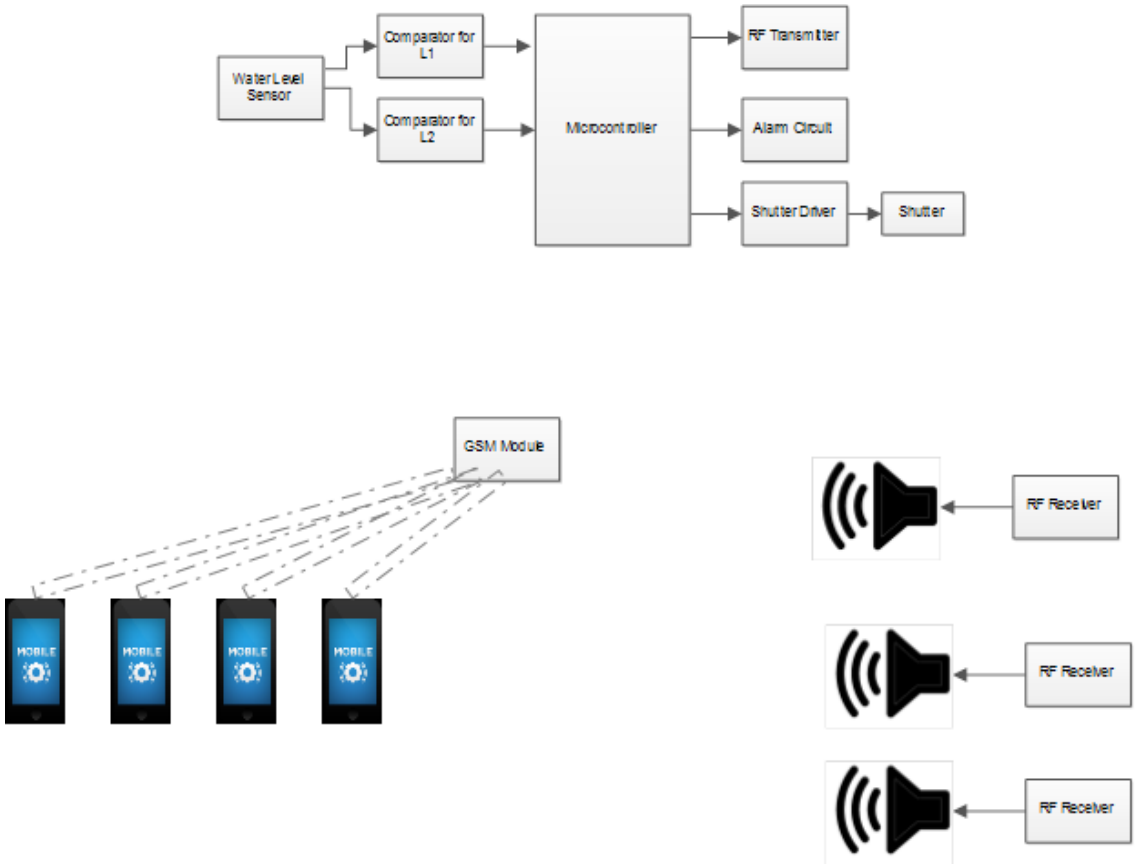

Figure 3: Block Diagram

The basic components used are a water level sensor (Resistive Voltage transducer), microcontroller 89s51, a GSM module, Driver for shutter, DC series motor, Alarm circuit, two comparators, RF transmitter and receivers.

The DC series motor is used to open and close the dam shutter according to the command given by the microcontroller in the prototype system. Before opening the shutter the microprocessor will send messages to the people living near the dam by using a GSM module. It also sense warning through RF transmitter. Prior to opening it gives an alarm to make the people alert about the opening of dam by using the alarm circuit.

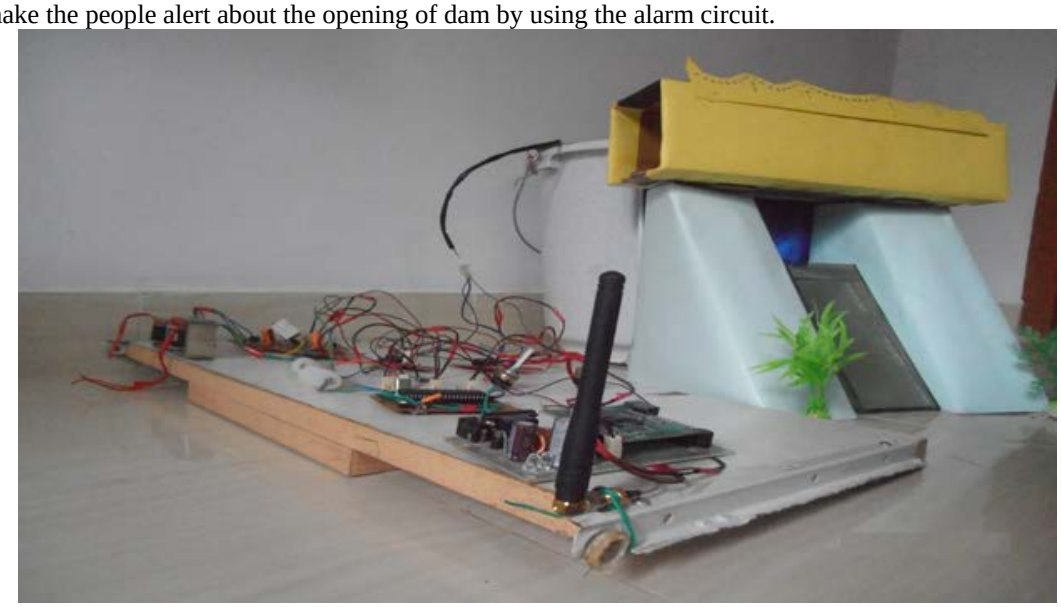

Figure 4: Experimental setup

As water level varies the sensor output also varies. The comparator-1 compares the sensor output with reference value and its output is fed to a microcontroller. The microcontroller we used here is 89s51 which is preprogrammed and it activates the GSM module to give warning message to nearby people, through network, whose data is already saved in controller memory. If water level crosses L2 comparator-2 gives high output to microcontroller. It triggers RF module, then alarm circuit followed by signal to open the shutter. Whenever the water level falls below a predetermined level then the comparator detects it and initiates the microcontroller to close the shutter and sends warning free messages to people.

5. CONCLUSION

The work was to control effectively the water level in a dam, by automated opening and closing of shutters and to ensure the safety of people through properly designed warning system. Algorithm and prototype was designed and was experimentally verified.

6. FUTURE SCOPE

Instead of providing warning messages to the people we can provide voice call to all.

7. REFERENCES

[1] Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rollin D.Mc Kinlay, "The 8051 Microcontroller And Embedded Systems", Second Edition -2008
[2] D .Roy Choudhury , "Linear Integrated Circuits" Fourth Edition-2011
[3] Prashant Bhardwaj, Yogendra Singh Rajawat, Satyaprakash Rajput, Satyaveer Singh Narvariya, Laxmi Narayan, "Automatic Dam Shutter Senses The Water Level and Control The Dam Door Using Servo Motor", Proceedings of 4 th SARC-IRF International Conference, New Delhi, India, 27th April. 2014
[4] Makesh Iyer, Shrikant Pai, Sneha Badri and Shubhangi Kharche, "Embedded Dam Gate Control System using 'C' and Visual Basic", International Journal of Computer Applications (0975 – 8887) Volume 69– No.2, May 2013
[5] S. M. Khaled Reza, Shah Ahsanuzzaman Md. Tariq, S.M. Mohsin Reza, "Microcontroller Based Automated Water Level Sensing and Controlling: Design and Implementation Issue", Proceedings of the World Congress on Engineering and Computer Science 2010 Vol I
[6] Sunantyo Tarsisius Aris, Suryolelolo Kabul Basah, Djawahir Fakrurazzi, Swastana Adin, Darmawan Adhi, and Adityo Susilo, "Design and installation for Dam Monitoring Using Multi sensors: A Case Study at Sermo Dam, Yogyakarta Province, Indonesia", FIG Working Week 2012 Knowing to manage the territory, protect the environment, evaluate the cultural heritage Rome, Italy, 6-10 May 2012

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