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Water Level Monitoring and Dam Gate Control over IOT

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Abstract: The cradle of our project is based on methodology of IOT. Water level in a dam needs to be maintained effectively to avoid complications. 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 knowledge of exact water level and water inflow rate. We have designed a system in which real time things are interconnected to web. Water level sensors are placed in dam to serve the same purpose automatically and forward the status to raspberry pi. Raspberry pi unit checks that input and upload the status of water level on web. By this project each and every variation of water level is informed to control room through the internet (using blynk application) and nearby people can be informed in time thus saving lots of lives and avoiding the unpleasant scenarios.

Keywords- Raspberry-pi, IOT(internet of thing), Blynk Application, Particle.io(cloud server), level Sensors, twitter, Email.

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I.INTRODUCTION

Water level in a dam needs to be maintained effectively to avoid complications. This is generally performed manually which requires full time supervision by more number of operators. 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.

This system consists of a level sensor connected through raspberry pi. The water level will be analyzed using these sensors and updated in the web server using IOT module connected to the raspberry pi. Authorities can view this information using internet from any place and also they can make a decision to control the dam gate to avoid further complications.

Proposed System:

The main objective of this project is to develop a mechatronics based system. This system will detect the level of water and estimate the water inflow rate in a dam and thereby control the movement of gates using IOT in a real-time basis. It offers more flexibility over existing systems. Also the purpose of our project is to monitor the water level in dam using the advanced concept of IOT employing Raspberry pi. The Internet of Things (IOT) is a system in which real time things are interconnected to web. This system can also be used to sense the earthquake vibrations and explosive detection and as alert system.

We are using Raspberry Pi which is a fully featured micro-computer implemented onto a small circuit board. It by default supporting python as the educational language along with embedded C. Here we have installed updated version of operating system i.e. Raspbian-pixel and done programming in embedded C.

The Raspberry-pi unit checks that input and upload status on web. By this project each and every variation of water level is informed and then accordingly controlling action can be taken.

II. REVIEW OF LITERATURE

Various efforts have been made uptill now in monitoring water level & accordingly controlling dam gate. The contribution of work in this area is mentioned below-

1. IOT based water supply monitoring and controlling system:

Water is a basic need of every human being. Everyone needs to save the water. Many times with lack of monitoring,overflow of the water takes place. Overflow of tanks can occur because of this lots of water wasted. Another thing is because of overflow in the pipelines with more pressure there is possibility of pipeline damage. Leakage detection is one more problem. All these problems are because of lack of monitoring, manual work and less man power.

In this paper a survey of Aurangabad city and field survey have been done, to understand water supply distribution and related problems with the system. After taking a survey they observed that all the work is manual and need a better technology to make proper distribution. [1]

2. Automatic Gate Control And Water Level Reservoir using GSM technology:

A dam is a barrier that arrests water. Dam serve the purpose of storing water while other structures such as floodgates are to prevent water flow into specific land regions. The dam gate collapse when the water level in the

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dam exceeds certain level. To avoid this, dam level must be continuously monitored. Water is a scarce resource, it is necessary to preserve and maintain its quality. The water related parameters should be under constant check and evaluation. The main water pollution related parameters such as temperature and pH are to be monitored.

In this paper they have used the PIC16F877A Micro Controller which helps in continuously monitoring the water level in dam & also helps in indicating about flood.[2]

3. Wireless Disaster Monitoring and Management System for Dams:
This paper suggests architecture to control gate by monitoring high density and then communicate in real time. Considering the recent events that took place on June 2013, a destructible situation has taken place due to heavy rainfall and cloud bursting at various places. Many dams were out of knowledge on various parameters about the flow and discharge from the nearer dams which were affected earlier and due to lack of communication among these dams, lead to considerable damage of property and life.[3]

4. Dam gate level monitoring and control:
The main objective of this paper is to control the water Level in dam which was implemented using IOT(Internet of Things). The design implementation and control of the programmed monitoring system was developed by this project. The cradle of the project is based on methodology of IOT. For best results, the principle operation of the automatic gate control arrangement is subjected to dry running under various possible circumstances, with Proteus as the platform for working.[4]

5. Raspberry Pi Based Automatic Dam Monitoring and Alert System:
This paper deals with the automatic control of a dam river system. 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. 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.[5]

6. IOT Based Water Level Monitoring System For Lake:

In this paper they have introduced the idea of water level monitoring and management for lake water storage source for villages. More specifically, they have introduced the raspberry- pi as controller for water level sensing and controlling in a wired and wireless environment. Furthermore, it can indicate the amount of available water in the lake. This system is based on GSM technology. Moreover, cellular phones with relative high computation power and high quality graphical user interface became available recently.
From the users perspective it is required to reuse such valuable resource in a mobile application. Finally, paper has proposed a web and cellular based monitoring service protocol for monitoring available water in lake.[6]

III. METHODOLOGY

Block Diagram:
Our proposed system is represented in the block diagram shown below in Figure 1.
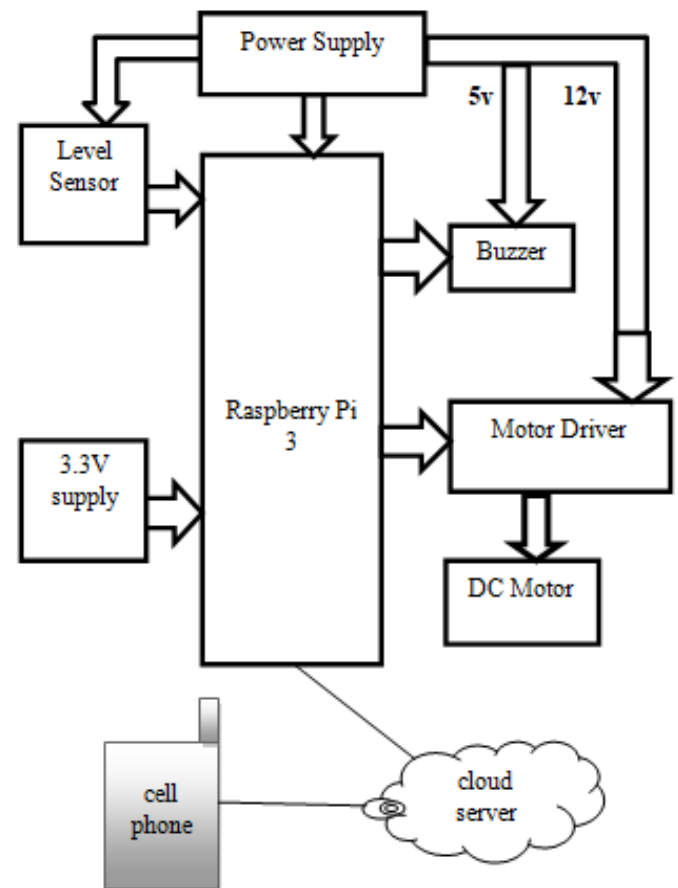

Figure 1: Block diagram of proposed system

Working:
Here we have made the system by using Raspberry pi over IOT. At the first stage of design a water level sensor is used for sensing water level accurately. Raspberry-pi is used to control the overall system automatically that reduces the design of system and control complexity. Raspberry pi takes input from the sensor unit which senses the water level through level sensors. When water level rises or decreases then the sensor circuit triggers the raspberry pi.

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We have designed the extra power supply for DC motor & buzzer. To drive the DC motor the driver IC(L293D) has been used. To drive DC motor large amount of current is required. Using Raspberry pi we don't get the sufficient amount of current to drive the DC motor. Driver IC increases the current and drive the DC motor.

The water level at different levels in the dam is sensed and then according to particular water level we can open or close the gate. When water level crosses 40ft then we will get message on our mobile phone. Here we have used the Blynk application to get the message. Blynk is an web application which is a third party server. When water level crosses 40ft then Blynk will notify itself and send it's notification and also send the mail. At the same time buzzer will turn on for a particular time period and also Blynk will send message on twitter. Using Blynk application we can check the water level indication. We have written the program on particlie.io. Particle.io is a cloud server which handles the data or information between Raspberry pi and Blynk application. Here we are using the twitter application because, if any case someone ignored the message from email or Blynk notification then through twitter all the people who follow that authorized person of dam gate can also take action. Twitter is an extra provision of our project.

When we will get message through mail or when we will get Blynk notification then we can control the dam gate by pressing the ON and OFF buttons in the Blynk. Then DC motor will drive in clockwise or anticlockwise direction and gate will open or close respectively. When we press ON button then gate will open. Similarly when we press OFF button then gate will close. We can control gate from any place of the world.

Result:

The main hardware circuit of the project is shown in figure 2 & figure 3 below. It consist of level sensor, Raspberry-pi kit, extra designed power supply, buzzer, driver IC and DC motor.

Figure 2: Prototype of proposed system

Figure 3: Prototype of proposed system

Output:

Here we have shown the graphical representation of the water level indication on the Blynk application as shown in figure 4 below. As level crosses 40ft, Blynk will give it's notification. Also Buzzer turns ON for particular time period. Also we get the message on twitter which we have shown in figure 5 below. Also E-mail will be send which is shown in figure 6.
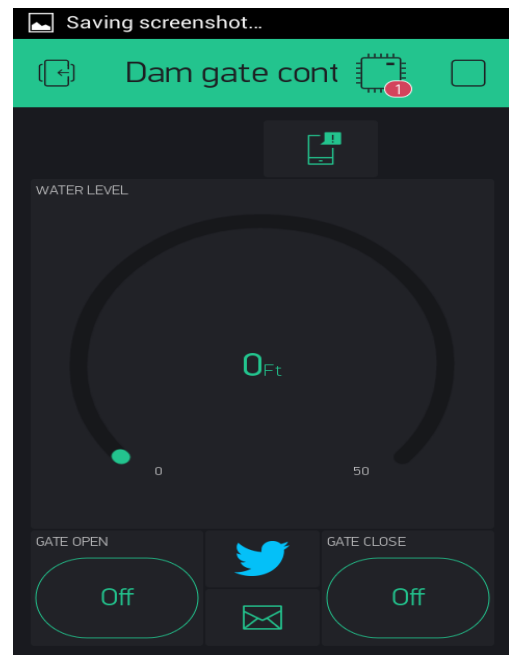

Figure 4: Level indication on Blynk application

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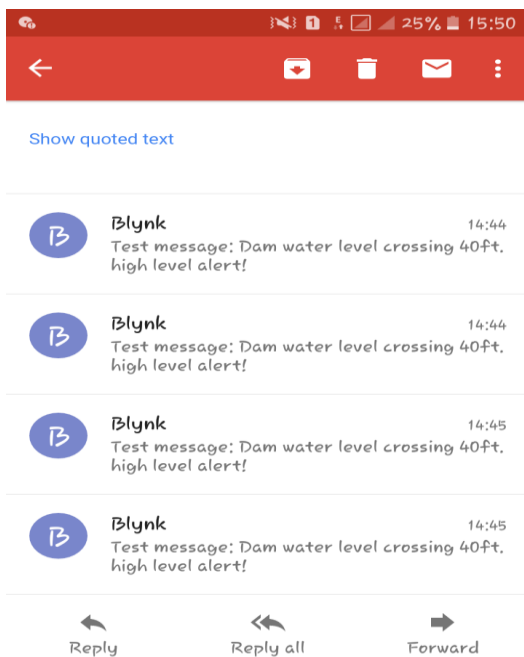
Figure 5: Message on Twitter

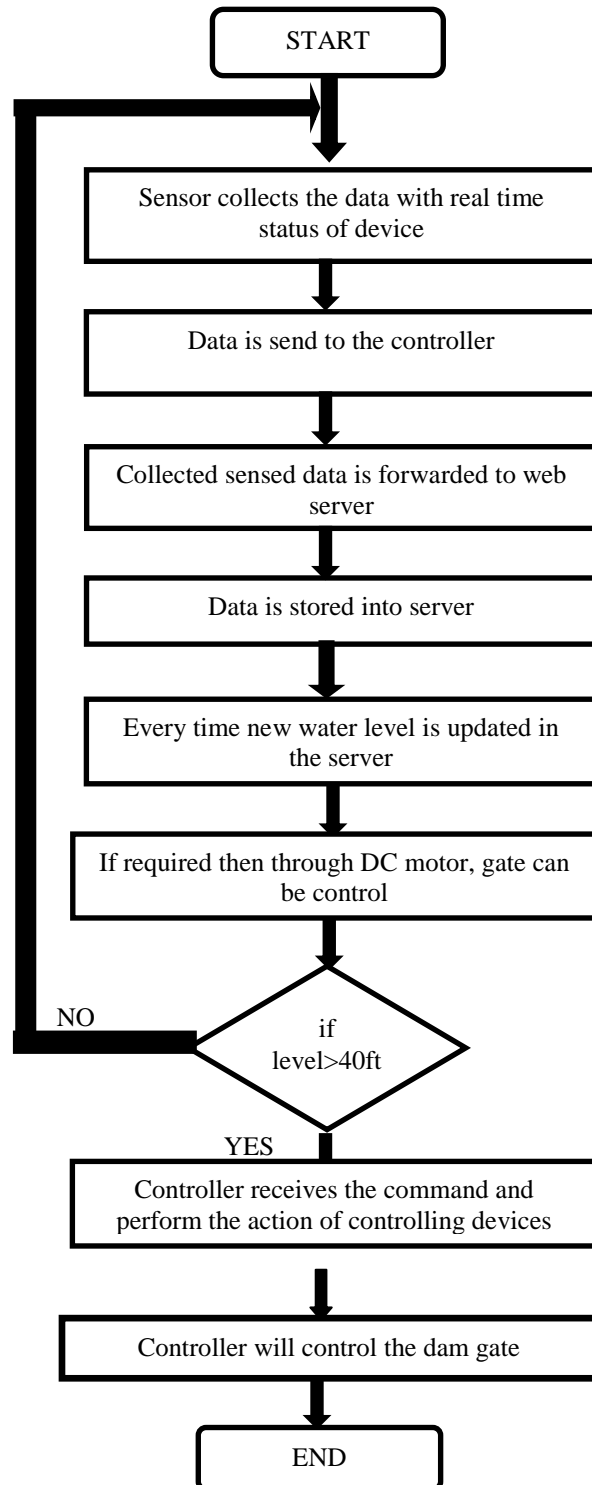Figure 6: Email of high level indication

Flowchart:

Figure 7: Flow chart of program

Flow sequence of program execution for controlling dam gate is shown in the flow chart above in figure 7.

IV. FUTURE SCOPE

This project is useful for large dam systems to control the overflow of water. We can control the dam gates

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from any place of the world. Also we can measure polluted water using pH sensor.

V. CONCLUSION

By this project each and every variation of water level is informed to web server through internet & nearby people can be informed in time. Thus, saving lots of lives avoiding unpleasant scenarios .It is possible to have real prototyping of this module in river by using float sensors which will monitor & control the water level & take necessary decisions according from any place.

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

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