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WATER LEVEL MONITORING AND DAMGATE CONTROL UNDER IOT

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Abstract: Dams are one of the major water sources for irrigation, electricity generation etc. in India. Dams play a vital role since the time of colonialism. Lack of proper dam management system have been causing several losses including the recent floods. Inspired by the existing rural and socio-economic problems, an innovative and feasible automatic control system can be developed for dam management purposes. This paper also proposes a novel idea of collecting and sharing real-time information about water levels to the people living nearby its bank. Highly precise water level monitoring system and timely report to the locality is also developed. When the water level crosses the threshold condition, alert messages will be sent to the people and the shutters will open automatically, retaining water to its normal level. Timely warnings to every person living in the locality and timely opening of shutters can thereby reduce the risks of loss of life and prevent disasters. Hence, automation of dam system using Arduino, ultrasonic sensor, GSM module and motor, creates a new eye for both the Government as well as the people in the locality for creating mitigation plans.

1.INTRODUCTION

Dams are the major sources of water supply to cities; they also play a vital role in flood control and can assist river navigation. Most of the dams are built to serve more than one purpose and their benefits are manifold. It is necessary to implement some sort of communication between the metering systems and computer models to provide support in managing the complex systems. In India nearly 4000 major/medium dams are constructed and many more are in a pipeline. Normally, the range of dam storage capacity of 185 billion cubic meters of water with a surface area of 5,580km (93.4TMCft). During rainfall, for every 9.6mm the rise of water level increases by 0.3ft. In the recent analysis by the BC dam safety annual report, from the year 2011-2016 number of dam incidents, dam alerts and dam failures are decreased respectively. With the growing interest in Internet of Things has become a right choice for the pre-alert system for monitoring the rise in the water level in dams. The risk rate of sudden flood occurrence opened up a way for the way the need of the real-time dam water level monitoring and prior alerting system which ensures the public way.

2.LITERATURE REVIEW:

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

i. IoT based water supply monitoring and

controlling system:

Water is a basic need of every human being. Everyone needs to save the water. Manytimes

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.

ii. 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.

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 methodologies for establishment and modification of relatively easier controlling and automation methods for any scrupulous process. 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 model is experimentally tested using a PC-based system.

iii. IoT based water level monitoring system for lake:

The idea of water level monitoring and management for lake water storage source for villages. More specifically, they have introduced the 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 user's 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.

3. EXISTING SYSTEM:

Dams did not have any automation systems. Dam gates were only controlled manually. A person was allotted to operate the dam gates. The water level of dams was only measured using a scaling measure fitted at dam ends. The person who is responsible for monitoring water level monitors and intimates when to open or close dam gates to the person who is responsible for opening the dam gate. Intimations about opening or closing of dam gates weren't given to the people who live nearby the dambanks. The disadvantages include

- Needed human resource for operating dam gates.
- Continuous monitoring of water level of

damrequired.

- People do not know about opening of dam gatesthat may result in loss of livelihood.

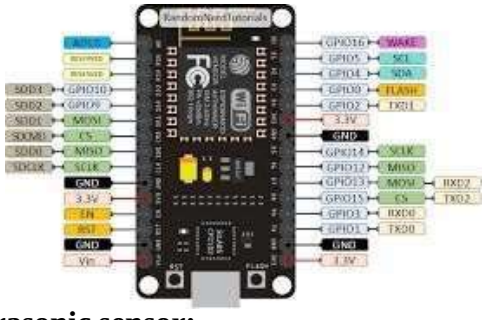
i. COMPONENTS:

1.Node MCU:

Node MCU is a development board which runs on the ESP8266 with the Espressif Non-OS SDK, and hardware based on the ESP-12 module.

The device features 4MB of flash memory, 80MHz

of system clock, around 50k of usable RAM and chip.



2. Ultrasonic sensor:

Ultrasonic ranging module HC-SR04 includes ultrasonic transmitters, receiver and control circuit. The basic principle of work: 1. Using IO trigger for at least 10us high level signal 2. The Module automatically sends eight 40 kHz and detect whether there is a pulse signal back. 3. IF the signal back, through high level, time of high output IO duration is the time from sending ultrasonic to returning.

Test distance= (high level time x velocity of sound)

3. MOTOR:

An electrical machine that converts electrical energy into mechanical energy. A motor driver is used to control the DC motor. It is used as a gate, it will rotate and stops.

4.POWER SUPPLY

The power supply board is a basic essential interface for regulating and supplying power to the connected components Power supplies are designed from the output back to the input. DC power supply provides direct current voltage to power a device under test such as a circuit board or electronic product.

4. WORKING:

Here we have made the system by using 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 .

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 Rasberry Pi we don't get the sufficient amount of current to drive the DC motor. Driver IC increases the currentand drive the DC motor. The water level at differentlevels 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 40 ft 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 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.

The sensor senses the water level and compares with the setup threshold value.

- If the sensor value is greater than threshold value, dam gate is opened and SMS is sent to people nearby.
- If the sensor value is less than the threshold value, dam gate is closed and SMS is sent to people nearby.

5.MODULES:

- Component Module
- GSM Module

A. Component module:

1) Determining the Level of Water In this stage getting the data on the level of water using ultrasonic sensors is done. The ultrasonic sensors are interfaced with a micro controller which transfers the data to a local base station using far field/near field communication. Components required: Ultrasonic sensors, NODE MCU

B. GSM MODULE:

- Short Range Communication In this stage we deal with transferring the data at shorter

distances i.e., nearby areas. The distance might range from few hundred meters to one or two km. The short data transfer modules like Bluetooth. Are interfaced with the Arduino and used to transfer the data. Components required: Bluetooth module.

- Long Range Communication In this stage we work on transferring the data to long distances of order of several hundred kilometers. These helps us in gathering the data from all the nodes to a central base station which in turn reads the data and send the commands based on it. The technologies required to achieve this are yet to be finalized. Some types of communication which can be used for such purposes are LoRa, NB-IoT.

Low Power Wide Area Network: (LPWAN) intended to provide long range.

- connectivity for wireless battery operated Things in a regional, national or global network. LoRaWAN meets the key requirements of Internet of Things such as secure bidirectional communication, mobility and localization services.

Narrow Band IoT (NB-IoT) is a category of Low Power Wide Area Network (LPWAN) technology standard developed to enable a connection using cellular LTE.

bands between wide range of devices and services. NB-IoT is a narrowband radio technology designed specifically for the Internet of Things (IoT) applications. NB- IoT focuses primarily on indoor coverage, low cost, long battery life, and enabling a large number of

connected devices.

The prototype of the proposed idea has been implemented using Ultrasonic sensor, GSM, NODE MCU and motor. The first stage of the implementation was to determine the level of water using ultrasonic sensor. The ultrasonic sensor was mounted on top of a water container to determine the distance between the top of the container and the surface of the water. If the distance goes below a certain point it indicates that the water level in the container has reached a threshold value that is setup and the GSM module sends message to inform the concerned authorities as well as the residents near the dam warning them that the shutters will open soon. After that the shutters are opened by servo motor. When the water level goes below the threshold value that is setup the shutters are closed.

ADVANTAGES:

1. We won't be requiring man force to operate thedams.
2. Possible manual errors are avoided.3.Readuce in water wastage.
4. No possibility of pipelining damage.
5. Every variation pf water level can be informed intime.

APPLICATIONS:

1. Used in dams.
2. Used in Domestic tanks.

6.FUTURE SCOPE & CONCLUSION

It is useful for large dams systems to control the overflow of water. We can control the dam gates from any place of the world.

In this each and every variation of water level informed to web server through internet and nearby people can be informed in time. Thus saving lots of lives avoiding unpleasant scenarios.

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