AUTOMATIC ELECTRIC DAM WATER READING SYSTEM USING IOT

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ABSTRACT:

Automatic meter reading (AMR) is the technology of automatically collecting consumption, diagnostic, and status data from water meter devices (electric) and transferring that data to a central database for troubleshooting, and analysis. The rule "the more expensive the better" is not necessarily always a rule that is valid because it all depends on the[characteristics and capabilities of the device and the customer’s needs. The device was used to measure water levels of the dam and the water we want for the feature is also predicted and measured, on which a virtually unlimited number of sensors can be added, and the device is assembled of components available on electronic components Internet. In this Paper the App is used to display the three parameters to the user on mobile that can lively be monitored using IoT

Keywords: Ultrasonic sensor, Esp8266 Wi-Fi module, Alert system

INTRODUCTION

Dams are the significant wellsprings of water supply to urban communities, they likewise assume an essential part in flood control. The majority of the dams are worked to fill an overabundance and their advantages are complex. It is important to execute a type of correspondence between the metering frameworks and PC models to offer help in dealing with the perplexing frameworks of the hydropower plants. By and large, the dams are checked through customary reconnaissance strategies, and the water the executives except the observing of the level of water in a portion of the dams which is automatized[1]. The executives of water assets through dams get perplexing as the number of clients relying upon dams is immense and these clients may have clashing interests. The present circumstance gets a lot of complexity with the way that the accessible assets are restricted with high prospects of dry spells and floods. This influences the thickly populated territories.

Dam checking is a drawn-out and long-haul measure that must be improved bit by bit. Another framework for dam water checking and the board ought to be set up which can give water level continuously and can permit us to reach brisk resolutions in regards to the security activities of the dams. Web of Things (IoT) can be characterized as an organization of gadgets that are interconnected[2]. It contains a bunch of sensors, and a correspondence network just as programming empowered electronic gadgets that empower end clients to gain precise information now and again through the correspondence channel and takes into account information exchange among clients and the associated gadgets.

Observation of regions close to the dams should be possible by utilizing cameras that communicate the live film to the base station and will be useful in recognizing the presence of individuals close to the dams and can help in guaranteeing wellbeing while at the same time delivering water during streak floods. Web of Things innovation focuses on making the environment of sensors increasingly smart by building up an association with the web[3], [4]. Gathering the information in regards to the bombed sensors empowers us to create more dependable hardware which thusly improves the dependability of the dams. Incorporation of the Internet of Things with enormous information, distributed computing, and WSN will upgrade the activity ability to dams positively.

RELATED WORK

In the existing method, we can get the water level data manually. For manual assumption, there were problems created and people get suffered by the last stage of water opening and many croplands were also spoiled[5].

Manual Mode :

In our paper existing solution, is in manual mode, the values are calculated with the help of a worker who can go see what is water the level in dams or lakes so in many there is a failure on rainy days, the people are suffered because of this condition in many ways during rainy days, The current dam control technology is manual wherein the handler operates the gate on command. This gives room for irregular water sharing between two properties, human error which can result in floods or unnecessary wastage of water[6]. We can get data on the water accessibility in a specific district and course the water to that territory if there's a shortage. This aids at deal with the water system. Keeping a mind automatic electric meter reading system is prepared, by sing that we can see the values in digital mode by meter by using the water level indicator.

Automatic electric reading meter :

Originally AMR devices just collected meter readings electronically and matched them with accounts. As technology has advanced, additional data could then be captured, stored, and transmitted to the main computer, and often the metering devices could be controlled remotely. This can include events alarms such as tamper, leak detection, low battery, or reverse flow[7], [8]. Many AMR devices can also capture interval data, and log meter events. This framework can be utilized to automatize the control of dams without human impedance. This can likewise be utilized to accumulate data fair and square of water all through the country and can be utilized to course water dependent on the prerequisites.

Water-level are calculated manually in the existing system. Manpower is also required for measuring and calculating purposes. Even though the calculation is being done, it will not be accurate to the maximum since humans can make errors[9].

How to calculate Dam Water Storage Capacity:

To manage water supply for livestock, spraying, and other uses, land managers need to know how much water is stored in their dams. Summer and autumn are key supply periods because evaporation is high and demand from livestock, irrigation, and home consumption increases[10]. If you plan to construct or grow an existing or new firm on the land, you'll need to know the storage capacity of your dam(s). This page explains how to determine dam capacity and water volume accurately in small farm dams (excavated tanks)[11], [12].

Measuring the Dimension of your Dam:

This method delivers a good estimate of dam capacity with a few tools and considerable preparation. You will require:

- Surveyor tape (20–30m) (depending on the size of the dam)
- Lightweight rope that can be used to cross the dam from one side to the other
- Binoculars
- An Assistant
- Notebook and Pencil or Pen

Step 1 - Make loops every metre with half the length of rope. The rope has two functions: it supports the surveyor's tape and acts as a measurement device. The loops should be large enough to thread the tape through easily.

Step 2- Thread the tape through the loops such that it can be supported by the rope for the majority of the way across the dam's longest side. Avoid twisting the rope and tape, since this will prevent the tape from freely moving through the loops.

Step 3- To assist the tape sink, attach a weight to the end.

Step 4 - Request that your assistance take one end of the rope and walk to the dam's opposite side. The loops and threaded tape will be on your end.

Step 5- When the tape is in place, pull it out until it reaches the dam's bottom. Using the binoculars, read the water depth on the tape at the water's surface.

Step 6 - Move the equipment around and measure the depth until you reach the edge of the dam's deepest part (the rectangle/square base). Count the number of rope loops dangling above the water.
Step 7 - Rep the technique until you reach the edge of the base on the opposite side of the dam, which is closer to your assistant. Count the number of loops floating over the water once more.
The length of the dam's base is determined by the difference in the number of loops stretched above the water from one side of the base to the other.
Step 8 – Record the length and depth of the base.
Step 9- Steps 4–8 should be repeated at a right angle to your first measuring line.
Step 10- Take measurements of the water's surface area. For rectangular or square dams, measure the length and breadth of the bank at the water's surface.
The circumference of the bank at water level can be used to measure round dams. The diameter is then calculated by dividing the distance by 3.142 (π).
Step 11 - To calculate the current water volume, plug the figures into the equations below. The calculations change depending on the dam's kind and shape.
The information of dams being opened is known only through mass media and that too is not accessible, whenever needed. Mass Media cannot reach in every parts of the state. The Time that mass media has is also not sufficient to reach out people.
In flood times, People were affected due to the slow spread of information.
When the Public Water Department is ready to reveal the water content, they use the media to spread the word. The news is spread as quickly as possible by the mass media[13].
Manpower is being used to measure the water level. Data on water levels is collected on a daily basis[14]. The following measurement would be available the next day once the water is measured by the man present.

PROPOSED METHODOLOGY:

The primary idea behind our suggested solution is to totally automate water level management near all dams. This can be accomplished by utilizing IoT-connected cloud service apps. Initially, each dam is treated as a single node by IEEE.
Dams are made up of ultrasonic sensors and Wi-Fi modules that are connected to a central command center that can monitor the operation of each node. In the first step, an ultrasonic sensor is used to determine the current water level in a dam or lake. Every dam has a single base station value from which the sensor and Wi-Fi module connects to the server and retrieve data.
After collecting values, the data is sent to a web server through an IP address that retrieves the value from the module. The values are then routed to a website where they may be viewed and calculated. These types of base stations will be installed at all dams to collect and transmit data. As a result, the command center has real-time data on all the dams in the Country.

Water Level in Dam:

People can see the water level physically, but in our module, we designed an automatic sensor that can display the water level for the entire Public Water Department. We used an ultrasonic sensor to measure the water level of the dam. A device that employs ultrasonic sound waves to calculate the distance to an item is known as an ultrasonic sensor.
In an ultrasonic sensor, a transducer emits and receives ultrasonic pulses that communicate information about an item's vicinity.
Different echo patterns are created when high-frequency sound waves bounce off barriers. The HC-SR04 ultrasonic range module has ultrasonic transmitters, receivers, and a control circuit. Work's fundamental principle:
1. Using an IO trigger for a high-level signal of at least 10 seconds
2. The Module sends eight 40 kHz signals and detects whether a pulse signal is returned.
3. If the signal returns at a high level, the time of high output IO duration is the time between sending ultrasonic and receiving it.
(High level time sound velocity (340m/s)/2 test distance

The ESP8266 Wi-Fi module is utilized to transfer sensor values, which allows us to present the value in real time on our app.
The ESP8266 Wi-Fi Module is a self-contained SOC with an inbuilt TCP/IP protocol stack that can provide access to your Wi-Fi network to any microcontroller. The ESP8266 can either host an application or offload all Wi-Fi networking functionality to a separate application processor. Each ESP8266 module comes pre-programmed with AT command set firmware, so you can just plug it into your Ardunio and receive about as much Wi-Fi functionality as a Wi-Fi Shield.

UPDATE in Database

Every one hours, the values of water in the dam are kept in a database for future processes. People or the Public Water Department can easily complete their tasks and calculate an average number using this method. Every day, the values are posted to an excel sheet. There will be a threshold value for each dam. If the value approaches the threshold, the database saves it and sends an alert to the Public Water Department.

Warning Message

On wet days, the dam may reach its maximum capacity. So, before we go close to the threshold, our app sends a pop message to the Public Water Department and the general public. Manpower could never be as effective as our modules.People may be able to get to a safer location and relocate their belongings to a safer one by receiving this alert message.This popup message appears at the appropriate time when the water level falls below the threshold level

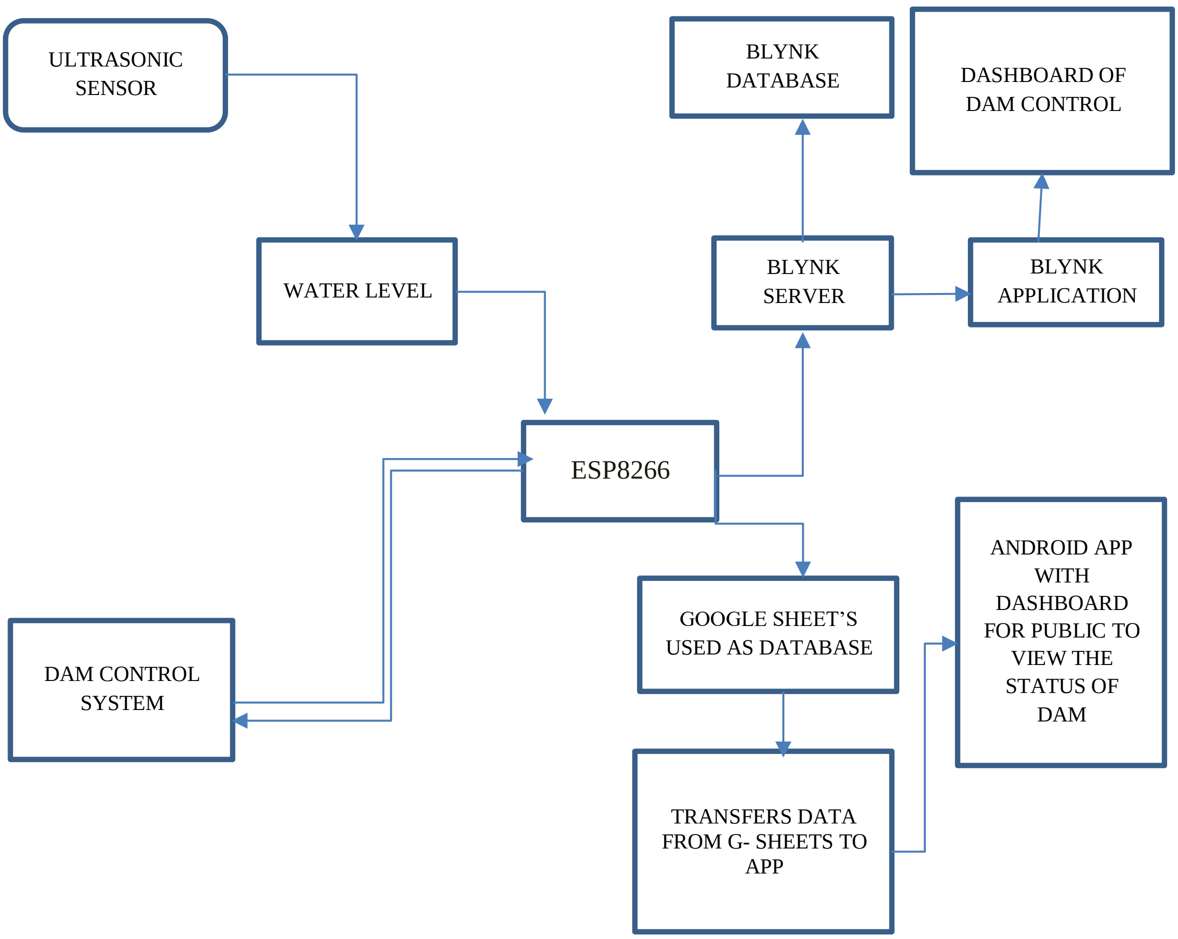

Figure 1.The Framework of water reading system using IoT

The architecture diagram shown in figure 1 represent the paper module which is designed using hardware and software, which is useful for people and the government. Measuring of water level in dams and maintainingthose records with accuracy is hard. with blynk app we can achieve this, which helps in not only giving the water level but also notes its values in a dabase for every 1 hour.

The working mechanism in module one(water level in dam):

The water level is identified using the ultrasonic sensor. this value will be sent to a ESP8566 WiFi module. The ESP8266 WiFi Module is a self contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your WiFi network. The ESP8266 is capable of either hosting an application or offloading all WiFi networking functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command set firmware, meaning, you can simply hook this up to your Arduino device and get about as much WiFi-ability as a WiFi Shield offers .This wifi module will connect the data secured from the ultrasonic sensor to a web server. This web server used here is the blink mobile application's server. This mobile application has all the previous readings of the dam water level.

The working mechanism of module two (an hour once updating database):

All the readings which were observed from the dam were updated into a google sheet. This sheet contains the previous readings which were noted for every 1 hour. This will be really helpful for future uses. For example, for calculating the maximum threshold value the dam ever hold, for knowing the amount of water varying from time to time to know the climatic water flow in the near rivers which help to calculate the water distribution to the nearby city or towns. This not only helps the official people but also helps the public people. This can be achieved by an mobile application called Blynk. This mobile app will be made available to all the people who are in the surrounding words of the dam. People can be always be well aware of the water level so that, if they sense any danger, they can take shelter without waiting for the official's call.

The working mechanism of module three(pop up message):

Blynk mobile application is an android application that note downs the values every one hour in the database ,but that's not all it does. A threshold value is set by calculating the size, depth and the strength of the dam. This threshold value is to know the average breakage value of the dam. When the value of water level comes near the threshold value, the blink app will send a pop up warning message to all the officials. This will say that the water level is going to cross the threshold value and will show the current reading of dam water level.

Data-set

The water level pai dataset contains 808,580 questions each having its dam water level id in the dataset. In the pre-processing step,the dataset of water level will be updated for every day morning . In addition, the pre-processed are divided three types of dams categories the water level. The dataset has been divided into two parts: training and testing. In our pre-processed dataset, the water level is lower than the number of factual and opinion water level reading . The length water level may varies for every one hour also.so we trained our dataset and model according to that. The trained and updated dataset,will update the water level for every one hour in our database,and it will give live tracking value for every seconds to the public work department to track the value on flood times,so that they may know the water level priorly by this process the time will be saved,they can give the correct value to the people and tell the information as soon as possible.

EXPERIMENTAL RESULT:

The prototype has implemented using ultrasonic sensor and ESP8266 Wifimodule,The first stage of the implementation was to determine the level of ultrasonic sensor,The ultrasonic sensor mounted on a top of the water container to determine the distance between the top container and the surface of the water.If the distance goes higher than the certain point and reaches its threshold level it will be indicated and sends message to the concerned authorities,so that the dam doors will be opened,after this process doors will be closed ,and dam water level be indicated.The fig 2 shows the realtime experimental setup and fig 3 shows the app which finds the water level.

Fig 2: Prototype Module

Fig 2: water gauge and pop message

CONCLUSION:

Water is one of the most important resources for human survival. In any event, uncontrolled use is unfortunately wasting a massive amount of water. In practise, there are a few computerised water level monitoring systems, although they are used for different applications and have some shortness. We attempted to propose solutions to this problem and implement a successful water level checking and executive system. The main goal of this research is to provide a flexible, practical, and simple configurable framework that can address our water dispersion issue between two locations, as well as safeguard low-lying areas from floods and other issues.

To cope with the data and save money, we've been using a small regulator. We were able to successfully direct the tests in the lab, therefore we offered a cloud-based water level checking and executive network, whose versatility would allow us to control the system from any location using cloud information and many types of devices. This type of framework is more helpful in situations like floods, when the mechanised entryway lifting framework will monitor the water levels and respond appropriately. This could have a significant impact on the research industry related to the efficient management of water at dams by reducing human labour.

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