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Reservoir Water Level Checker

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***Abstract*—Depending on whether they are "service reservoirs" for local storage of treated water, "lakes" that occur naturally and are used for drinking water, or "man-made" reservoirs built by constructing a dam across a valley, water reservoirs vary substantially in size and shape. The technique used to gauge reservoir water levels will vary based on the kind of reservoir being observed. A service reservoir's capacity is often known, and level monitoring allows for control over the flow through the reservoir and the pace of water withdrawal to guarantee a steady supply of water. As reservoir water levels drop due to water demand, level monitoring may be used to activate pumps as necessary to replenish them. In India, there is a serious problem with access to clean drinking water. It could soon start to resemble a global emergency. Therefore, it is crucial to save water. Water waste is increasing daily as a consequence of the pervasive issue of regulating the water level of above reservoirs in home-based water tanks. We all understand the importance of water to us, however. By collecting data on previous water levels and providing a graph that forecasts the reservoirs' future water level, a simple water level checker may manage this issue. Measurement and management of reservoir water levels are done using a Reservoir water level checker(RWL).**

Keywords— gauge, service reservoir, level monitoring, forecasts, reservoir water level(RWL) checker

I. Introduction

Cities rely heavily on dams for their water supply, as well as for flood control and river navigation. The vast majority of dams are built to accomplish many goals and therefore have many benefits. It is necessary to create some kind of connection between metering systems and computer models in order to help regulate the intricate systems of hydropower plants. Dams are typically monitored via conventional surveillance methods and water management, with the exception of certain dams' automated monitoring of water levels. Because so many people depend on dams and mayhave opposing interests, managing water resources via dams becomes challenging. Areas that are densely populated are affected by this. Dam monitoring is a laborious and drawn- out process that has to be improved gradually. Areas that are densely populated are affected by this. Dam monitoring is a laborious and drawn-out process that must be improved gradually. Areas that are densely populated are affected by this. Dam monitoring is a laborious and drawn-out process that has to be improved gradually. Using data sent to a control panel, a water level checker may determine if the water level in a body of water is high or low. Some water level indicators use float switches and probe sensors to measure water levels. The level of water in a RESERVOIR is detected and shown by the Water Amount Checker using a straightforward technique.

A reservoir's water levels are monitored and controlled using a water level checker. When water levels drop below a certain threshold, the control panel may also be set up to automatically operate a water pump and top them up.

II. Literature Survey

There are many studies addressing fuzzy or neural network control in water level control systems, and the field of water or liquid level control is quite active. Water level monitoring and control are required.

Through a variety of sensors, the whole dam and major pipeline are monitored here around the clock. These interconnected wireless sensor nodes provide data to a gateway by connecting to one another. Information is stored and made available to the observer online using common storage space, or "CLOUD". The most valuable naturalresource, water, will be saved through the use of IoT for the aforementioned reason[1].

Given that they are commonly used for agricultural reasons, it is clear that Remote sensor systems are a dependable precedent. The use of the web and its applications has grown dramatically in recent years. Since everyone's job is impacted by it, it would be difficult without the internet. In the same way, as today's widely used remote sensor systems, which include a CPU, storage, power supply, a phone, and at least one sensor, are low-power devices. Both have been merged in this application with the aim of acquiring information on the state of the water[2]. There are many studies addressing fuzzy or neural network control in water level control systems, and the field of water or liquid level control is quite active. Water level monitoring and control are required.

Water level detection is made simple by the ease of installation and low maintenance requirements of submersible pressure transducers (wet sensors). They are

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therefore commonly used for temporary installations as well as deployments in far-off locations. They need to be installed permanently and kept submerged at all times. It works by providing hydrostatic pressure to a strain gauge, which converts mechanical motion into an electrical signal that the station can subsequently detect.

As we can see, significant dam safety control nowadays is mostly dependent on measuring crucial variables like absolute and relative displacements, strains, and stresses in the concrete discharges through the foundation, etc., as well as visual inspections of dam structures. In certain dams, the gathered data is analyzed and contrasted with the findings from mathematical or physical models that help with a structural safety assessment.

Artificial neural networks (ANNs) have been shown to surpass conventional methods in the creation of models for predicting river flow. They are quick and versatile. By taking into account the previous operations the structure was put through, these networks may be used to characterize the dams' typical structural behavior. The vast network of neurons in the human brain is analogous to an artificial neural network, which is nothing more than a network of linked nodes. In this network, each circular node stands for an artificial network, and each arrow represents a flow from one node's output to another's input.

A dam may experience extreme water level variations during its lifetime as well as seasonal temperature changes. Delivering the right quantity of water while keeping the water head over a certain threshold is the most important part of water delivery. It is critical to provide the final consumers with the required volume of water at a suitable pressure. The overhead storage tanks are built with a constant water level in mind in order to sustain pressure. The daytime fluctuations in client demand affect the tank's output flow rate. Overflowor pressure drops at the end user are possibilities if water is given at a constant pace.

One such project on the Nile entailed the establishment of national geographical databases, geographical layers, hydro- meteorological parameters, data on the usage of water, and information on land use, the amount of cover on the land, and soil kinds. Acoustic-based Doppler current profilers and automated weather stations are two examples of contemporary monitoring systems that were put into place. For monitoring water flow, this kind of apparatus is suitable. In most rivers, a boat with a Doppler current profiler mounted is used to operate it. As a result, there is no longer a need for an expensive cableway to be built. Additionally, this project includes two buoys that will be used to measure the amount of water evaporation on Egypt's Lake Nasser and to verify the accuracy of satellite-based evaporation estimations. This data format was created in cooperation with the national water resource agencies and has been used by the majority of basin states. This generated data structure enables smooth and rapid data exchange once proper data-sharing techniques are in place. The creation of instruments for basin-wide evaluation, like the Nile DST, also needs a uniform framework [3].

The South-East River Trust, on the other hand, controlled the Teise River's water levels using a weir technique. A weir is simply a wall built across a river to alter the properties of the flow. Weirs are often erected across the breadth of rivers as horizontal barriers that collect water behind them while yet allowing it to gently flow over the top. Weirs are widely used to prevent flooding and to keep track of discharge. Another water level monitoring system was developed, and it is made up of an ultrasonic sensor, a PIC microprocessor, and a GSM module. The distance between the ultrasonic sensor and the liquid's surface is measured. This method suggests using the GSM to create a system for monitoring water levels.

When the water level reaches a critical level, a module that uses Short Message Service (SMS) to alert the person in control switches the pump off automatically. The water level may be checked as needed [4].

China is using computing methods to cut down on water waste and increase financial gains. Additionally, it ensures environmental protection and water cycle stewardship so that water resources may be passed on to next generations. By employing sensors that measure the volume of water in the tank, they automated the pumping of water into tanks using Arduino-based devices. An LED display will alert the user of the condition while the pump mechanism will work automatically based on the water level. To automate water extraction from the sump tank, this system is simply expandable. The same technique may be used to monitor how much water is in the sump using sensors, but if the system notices that there is not enough water, it will stop the engine from running to prevent dry running. To alert the user of the issue in such a situation, an alarm sound may be enabled [5].

The handler commands the gate to open and shut under the manual dam control method currently in use. This permits both unequal water distribution between the two residences as well as human error, which might cause floods orexcessive water waste. Their proposed approach removes these possibilities by providing an automated dam control system. In part, the whole system is self-powered. Because of the architecture, the system is self-sustaining and uses energy collecting.

Systems for remote data collection and monitoring are practical and efficient instruments for monitoring and collecting data from bulk storage tanks. Such systems are helpful in businesses that are designated as safety essential systems and measure the liquid within the tank, which is of utmost importance. The design and preliminary testing findings of a low-power wireless system for tank-level monitoring using ultrasonic sensors are presented in this study[6].

In this system, the water pumping process has been automated using an Arduino board. The Arduino can sense the amount of water in a tank, determine whether to turn on or off the pump, and show the status on an LCD screen. The device further keeps an eye on the sump tank's water level (source tank). Low sump tank levels will prevent the pump from turning on, protecting the engine from dry running. When the sump tank's level is low or if there is a sensor issue, a beep sound is produced[7].

An inexpensive optical water level sensor based on the fibre bending effect and an elastomeric membrane is discussed in this work. The suggested sensor has a specific

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design that makes it easy to use, dependable, and affordable. It is appropriate for use in reservoirs, tanks, and the tubes of embankment dams. The sensor selects the suitable membrane and can measure the water levels up to 10 m or more using a typical single mode fibre. The creation of the sensor, a theoretical modelling, and the outcomes of lab and field experiments are all covered in this essay. A real-time monitoring system based on optical time domain reflectometry has been using seven sensors that were put in an embankment dam[8].

The system, which consists of several sensors, is used to measure the water's physical and chemical characteristics. They measure the water's characteristics, including its temperature, PH, turbidity, conductivity, and dissolved oxygen. The core controller is capable of processing the measured data from the sensors. They have used the raspberry PI B+ model as a core controller. Finally, cloud computing may be used to see the sensor data online[9].

In this project they have used Zigbee 802.15.4, a 74HC14 inverter, water level sensors, and GSM technology to monitor the water level. Water quality sensors like turbidity sensors and dissolved oxygen sensors may also be used to check the water's quality. In this monitoring system, sensors check the pH level, temperature, turbidity, dissolved oxygen, and water level at predetermined intervals. This strategy would aid in lowering household energy usage and water overflow[10].

In this research, they suggest an Internet of Things (IoT) based real-time water level monitoring system. Their prototype is founded on the notion that, particularly in disaster-prone locations, the water level might be a crucial factor in determining the likelihood of flooding. The requiredparameter is detected using a water level sensor, and if the water level meets the parameter, a real-time signal is sent to a social network like Twitter. Data repository configuration was made on a cloud server. On the remote dashboard, the water level measurements are shown[11].

In order to monitor the water level, the system employs an ultrasonic sensor, an AT89S51 microcontroller, and a SIM300C GSM modem. When asked through SMS, the system may test the water level and provide a measurement report. This system may be installed in a variety of locations since, depending on the installation requirements at those locations, it just requires the first configuration through SMS[12].

An ultrasonic sensor, PIC microcontroller, and GSM module were used to construct a monitoring system for measuring water levels. The distance between the ultrasonic sensor and the liquid surface is measured. With the integration of a GSM module, this system shows the construction of a water level monitoring system that will send a Short Message Service (SMS) alarm to the person in charge when the water reaches the critical level, which will cause the pump to automatically switch off. At any time, it is possible to check the water level[13].

In order to prevent many steps and make the process simpler and faster, they utilised a control approach in this study that validates the hardness of the supply water at the very first phase. The typical process station will also squander a significant quantity of water at each stage of the filtration process. Such wastages can also be reduced in the planned job by employing an effective control method. The experimental investigation carried out using the suggested technique investigates the water saved during the clear water operations as well as the processing time needed for the feed water[14].

This study uses the Linear Discriminant Analysis (LDA) method to show an assessment of the water quality. The Water Quality Index is calculated using a weighted arithmetic index approach (WQI). The final major WQI dynamics are known at that point, and the LDA is connected to the dataset. The LDA then performs Light Gradient Boosted Machine (LGBM) classification after forecasting the WQI. The LGBM classifier is then engaged to assign a water quality label. On a dataset connected to Gulshan Lake, the suggested LGBM with LDA approach is shown and assessed. The results reveal 100% classification accuracy for the Light Gradient Boosted Machine classifier system and 96% prediction accuracy for the LDA, which indicates consistent interpretation connected over the futuristic models[15].

III. Basic Schematics

The main goal of this project is to completely automate the regulation of water levels near all dams using a centralized server [7]. Each dam is first considered to be a single node. Acentral command center, which can keep track of each node's activity, is connected to several of these nodes.

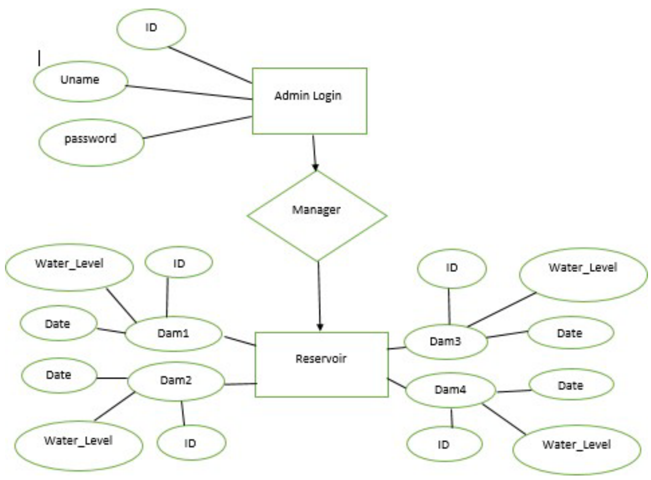

Fig. 1. Basic Schematic diagram

From the Figure 1, we can see that initially, we will have an Admin node with its own ID, Uname, and password. Only the admin will have total access to the database and the data being entered. All scraped data will be placed into the local host to preserve it and utilize it to anticipate water levels.

The admin node is then linked to a common manager, which collects all scraped data, saves it, and manages Dams data on the local host. At regular intervals, it collects all of the IDs, water level data, and dates. This is used to forecast reservoir water levels.

The manager is then linked to numerous nodes, each of which has information on a Dam. Details such as water

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level, ID, and date are required to assess and anticipate before a calamity occurs in the near future using the old stats.

Because the project is modular, we can add additional modules and use them on a large scale. This device is so simple to use that it can assist individuals in the area to evacuate promptly in the event of a disaster.

IV. Water Level Tracking Implementation

The monitoring of reservoir water levels is required for assessing and forecasting a disaster-avoidance plan. The water level was calculated at four distinct sites to test the treatment's efficacy. The procedure consists of four steps:

A. Web Scraping using BeautifulSoup

Web scraping, web harvesting, or web data extraction are all terminology for an automated technique of obtaining vast amounts of unstructured data from websites. The user can extract all of the data on specified sites or specific data as needed. The obtained data can be saved in a structured manner for further study.

Web scraping Using BeautifulSoup involves the following steps:

- Locate the URL of the webpage you wish to scrape.
- Examine the specific elements before selecting them.
- Write the code to obtain the content of the chosen components.
- Save the data in the appropriate format.

With this, we collected the required Table data regarding the Dam. The Data collected is stored in a local host called Phpmyadmin using an Apache distribution called Xampp.

B. GUI Designing using Tkinter

Tkinter is a typical Python interface for the Python-bundled Tk GUI toolkit. Python was chosen to build the GUI since it is the fastest and most straightforward way to develop GUI apps. Making a GUI using Tkinter is a straightforward process.

To make a Tkinter app, follow these steps:

- The module is being imported Tkinter
- Make the primary window (container)
- Add as many widgets as you like to the main window.
- On the widgets, use the event Trigger.

The Figure 2 , shows the GUI we designed to project.

Fig. 2 GUI of login page

We first created a login page for both admin and user to access the app. In the Figure 3, after login we have options to choose between reservoirs .

Fig. 3 Options tab for reservoirs

V. Results

After all of the reservoir data has been web scraped and saved on the local host, we can examine the reservoir information in the GUI. We will initially have a login for admin and user, then after logging in, we will be able to pick between reservoirs and click go. This is seen in Figure 4.

Fig. 4 Data regarding the lake

After clicking go, the newly created page will display reservoir data and give us the choice to "see prior water levels." Using this option, we may view the water level plot for the previous 100 days. This is seen in Figure 5.

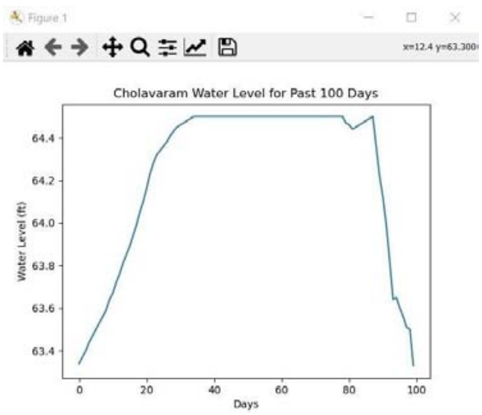

Fig. 5 Plot for water level for the past 100 days

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The Figure 6 shows the output of the reservoir water level.

CHOLAVARAM DATAS

Date,Water_Level

26/10/2020,79.14

27/10/2020,79.30

28/10/2020,79.45

29/10/2020,79.61

Fig. 6 Shows the data collected from the last 100 days

VI. Conclusion

This project is intended to suit the needs of a reservoir water level checker. It was created in Python with the backend DBMS so that the data input is saved in the DB file and the data stored is utilised in the rwl checker while keeping thesystem specifications in mind. We utilised a simple data entity relationship diagram to create the system. The rwl checker has all of the characteristics of a true water level indication device. This short project taught us how to connect to a database using Python.Overall, the project teaches us important skills such as:In creating the system, system analysis and design approaches such as data flow diagrams are used.

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