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Real-time Implementation of IOT based Smart Dam System and Safety of Inhabitants through Live Footage

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Abstract*: The water assets accessible from dams assume an essential job in the improvement of a nation. The critical exercises related with it are industrial works, domesticated animals, cultivating and irrigation. Water level in dams must be overseen legitimately with the goal that it doesn't prompt any unsafe outcomes. Subsequently there is a need to build up a productive framework that can screen the dimension of water and take important choices progressively with no human obstruction. This framework can be actualized utilizing the innovation called Internet of Things i.e. IoT incorporated with wireless sensors. This framework depends on nodal communication in which each dam is viewed as a node which are interconnected to one another and consequently associated with a central command center. These nodes use the Wi-Fi module to communicate with the central command center. The primary function of the central command center is to choose whether to keep the gate open or shut. Another function incorporates directing of water considering the water level in various dams. Remote cameras are joined for the surveillance of dam regions so that there is no risk to human or creature life.

Index Terms*: Water, Water level monitoring, IoT, Surveillance of dam area.

I. INTRODUCTION

In urban communities, dams are the major source of water supply. Hence, they can assumed to have an important job of controlling the flood complex in nature. It is necessary to have a efficient relationship between the metering facility and the PC processing. In most of the areas the techniques used for water level monitoring in dams are quite basic and traditional in nature. There are only a few dams in which automated systems are used. The usage of dams differs according to the interests of people hence, making the management more complex. The complexity increases in case of natural calamities such as droughts and floods, this mainly affects largely populated areas. Dam monitoring is a multistep phenomenon which needs improvisation.

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We need a water level monitoring system which can take decisions in real time and which is interconnected. Internet of Things (IoT) is a technology which interconnects different sensors and devices wirelessly and gives precise information every now and then through the communication channel and takes into consideration, the information exchange among clients and the associated devices. This system can be used to make the dams function automatically without any human interference. This will be used to gather data regarding water levels throughout the nation and route water depending on the needs. We can route the water from an area which has excess of water to an area where there is scarcity of water. Using remote sensors facilitates programming for dam security, helping in efficient functioning of dams. Surveillance of areas close to dams is done using cameras which will transmit the live feed to the base station. The wireless camera transfers the feed to an adapter, the adapter sends the audio and video signals to the TV tuner card which thus shows the pictures on a PC or a screen.

II. LITERATURE REVIEW

One of the easiest methods to monitor the level of water is by using submersible weight transducers. They are usually applied in remote areas and temporary set-ups. They should be static and completely submerged at all times. It uses the idea of use of hydrostatic weight which gives out an electrical signal and is thus estimated. At present, the security control of expansive dams depends on the estimation of outright and relative locations and strains and stresses in the solids. In specific dams, the investigation of the deliberate information is contrasted and consequences of numerical or actual models and is useful in the basic security check. Artificial neural systems (ANS) give brisk and adaptable methods for making models for stream forecast, and have proven to execute well in correlation with traditional strategies. ANS can be used for portraying the typical auxiliary conduct of the dams by considering likeliness of the previous activities. An ANS is only an interconnected gathering of hubs , like the tremendous system of neurons which are present in a cerebrum.

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Every round hub of this system shows a counterfeit system and the directions shows the yield of one hub to the contribution of another. Noteworthy water level varieties and occasional ecological changes in the level of water can be observed in the entire lifespan of a dam. The most essential element of supplying the required amount of water is to keep a water head over a base farthest point. The fabrication of the overhead storage tanks is done with a goal to keep the value of the water weight consistent.

There is a change in the interest of the consumer during the day and that brings about a change in the rate of yield stream of that tank. Water is provided at a steady rate in that particular event over stream of water or weight drops at consumer's end may occur. This arises the need for administration of the level of water. The kind of hardware used in the present day advancements is intelligent for estimation of water stream. The vessel in the hardware is mounted with a profiler in most of the waterways. This pieces the requirement for the development of a costly cableway. This task likewise establishes two floats to gauge the degree of vaporization of water. A large portion of nations having basins have received the information about the structure. This structure of information guarantees fast and consistent information trade. The other checking framework which was created to estimate the level of water and consisted of ultrasonic sensors, PIC controller, GSM module. The estimation of the separation of the sensor from the surface of the fluid is calculated by the ultrasonic sensors. This framework promotes the advancement of level of water observing framework by coordinating the module of GSM to warn the individual in the control room using SMS when the level of water has reached the minimum dimension and then the pump will be turned off. It is good to screen the water dimensions at all times [4].

III. BASIC SCHEMATIC

The fundamental thought here is to computerize the administration of the level of water in dams by using a central command center [7]. To accomplish this, IoT and cloud services are utilized together. A single dam is considered to be a solitary hub. Numerous such hubs are connected together and hence connected to the central command center which can analyze and manage the whole system.

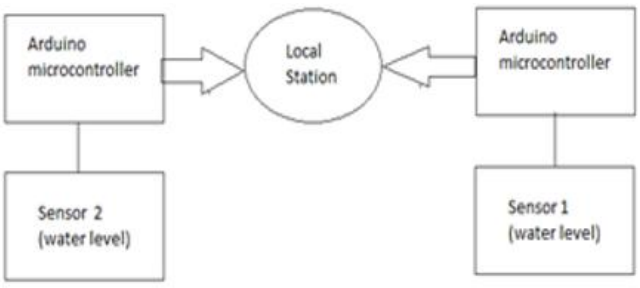

Fig 1: Schematic of each node

Firstly, the set-up close to the essential hub consists of sensors which are ultrasonic and are present at both the sides of the gate. To get the water level at both the sides of the gate, these sensors are used. Each hub has one base station, which consists of all the information related to the level of water and then it is transmitted to the central command center. The base stations must be equipped with a controller. The data is sent to the cloud by the base stations and then retrieved by the central command center. This technique is used by the central command center to check the level of water continuously and to decide if the gate should be open or closed. Once the collection of data from both the water sensors is done, the base station sends the information to the central command center by means of cloud. The information from each base station is transferred to the cloud and the central command center can check the water level continuously by utilizing this information and can choose whether the dam entryways must be kept open or shut. Every one of the dams will have base stations like these which accumulate information and transmit it to the cloud. So, the command center has the constant information of the considerable number of dams across the nation.

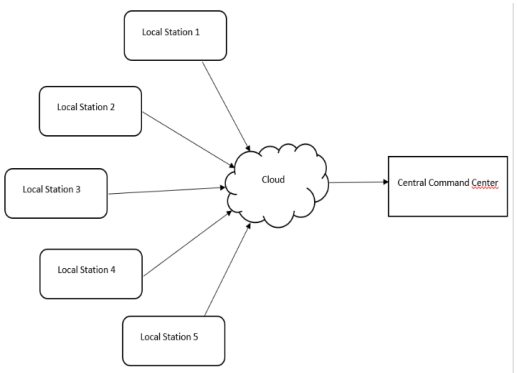

Fig 2. Schematic of the collection of nodes

IV. IMPLEMENTATION

A. Water level determination

In this stage, the information regarding the level of water is obtained using probe sensors. A small scale controller which is interfaced with these sensors, exchanges the information to the nearest base station using Wi-Fi module. Components required: Probe sensors, Arduino.

B. Data Processing

In this stage, the signals from the sensors are given to the base station where the decision of opening and closing of the dam gates is taken by the microcontroller. The water levels are shown on an LCD in real time and a buffer alarm is triggered whenever the gates are about to be opened or closed.

C. Information Analysis

In this stage, information analysis is done in the Central Command Centre. All the information is

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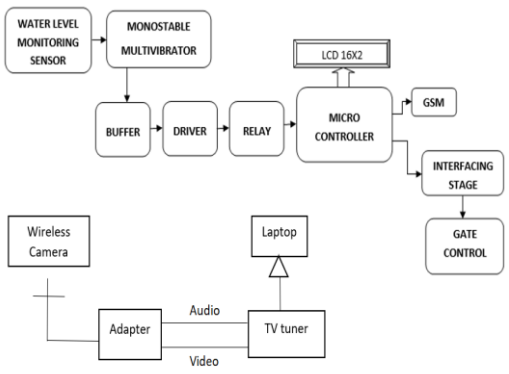
uploaded to the cloud servers using a Wi-Fi module, from there the information is retrieved by the Central Command Centre. This information includes the level of water in a particular dam at all times, the time for which the gates were open or closed, and the volume of water which was let in or out of the dam.

V. BLOCK DIAGRAM

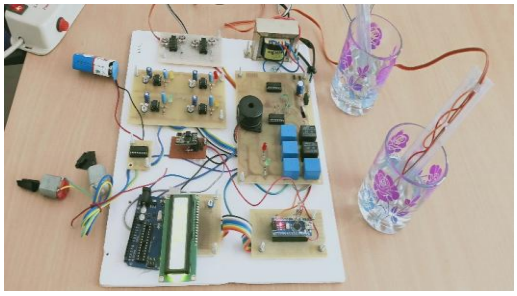
The water level observing sensors have two probes i.e. more elevated probe and the lower level probe. These two probes choose the greatest and least breaking point of the level of water. The multivibrator has three states i.e. Monostable, Astable and Bistable. At the point when the water level crosses the upper probe, the multivibrator goes to the Astable state. The signal is then exchanged to buffer which is utilized to store the information briefly. The signal at that point goes to the driver which is utilized for sending and receiving information. At that point the signal is passed to relay which is utilized to open and close an externally connected circuit. At that point the signal is passed to the microcontroller which chooses whether the doors should be opened or shut. The LCD additionally takes the signals to show the water levels. In this stage we manage exchanging the information to nearby base stations and afterward to Central Control Center. The separation may go from couple of hundred meters to 250 kilometres. GSM is utilized for information exchange and correspondence between the Nearby Base Stations and the Central Command Center. For live surveillance, a wireless camera is utilized which sends the live feed to an adapter. The adapter sends the sound and video signals to the TV tuner card which in turn shows the pictures on a laptop or a screen.



VI. APPLICATIONS

The principle use of this framework is to productively deal with the water level in dams to prevent droughts and floods. The programmed methodology makes the framework work in real-time and subsequently lessening the conceivable outcomes of disappointment of the framework. This likewise helps in lessening labor which anticipates human error. The proposed framework additionally helps in directing of water to several areas according to their need. In the event that the level of water in a specific dam is found to surpass the ostensible level, the dam doors will be shut consequently and that water can be steered to different dams with less water. Thus, this technique productively helps in taking care of water issues on a substantial scale by maintaining a strategic distance from disputes. The Central Command Center contains all the information with respect to water dimensions of numerous dams which facilitates the procedure of decision making. This technique keeps the manual strategies for observing which has poor productivity. By the utilization of live surveillance method, the zones close to the dam can be checked with the goal that any dangerous conditions can be counteracted by sending a moment alert, along these lines sparing human lives.

VII. RESULTS AND DISCUSSION



The above figure shows the prototype model of the proposed idea. Here, the plastic containers have been used to represent two dams and the motors have been used to represent the gates of these two dams. The sensors are dipped inside these containers filled with water. The signals from the sensors are passed to the base station where the processing of data takes place and microcontroller decides whether to open the gates or close them. An LCD is interfaced with the microcontroller to display the water level at all times. All the information related to opening and closing of the gates is uploaded to the cloud servers (Thingspeak has been used for this prototype model). From there, the information is retrieved by the Central Command Centre (A laptop is used for demonstration). A Wi-Fi camera is placed near the dams to demonstrate live surveillance in dam areas.

Therefore, by using the above discussed idea, automatic opening and closing of dam gates, proper routing of water according to the requirements, live surveillance of the dam areas can be easily achieved.

VIII. CONCLUSION

Water is a standout amongst the most vital assets for presence of life. A lot of water is being wasted because of unconstrained utilization. Numerous other automated water level administration frameworks have been actualized, however none of them have demonstrated to meet the genuine necessities. Subsequently, we have thought of this plan to meet the prerequisites productively. The entire motivation behind this proposed strategy is to assemble a versatile, minimal effort and simple to

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arrange framework that can adequately resolve the issue of water circulation between different regions and prevent floods in the adjacent areas. This conveyance technique helps in the state of floods as well as droughts via programmed steering of water. A microcontroller is utilized to compose the information which is both economical as well as practical. This cloud-based framework is built such that it can be controlled from wherever.

This framework does not require any human obstruction and works continuously to check the water levels and takes necessary actions. The opening and shutting of dam entryways occur by checking the water level. The live surveillance framework screens the adjacent dam regions and aides in saving lives.

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