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### SMART WATER LEVEL AND LEAKAGE MONITORING AND MANAGEMENT OF DAM SHUTTER USING IOT

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#### ABSTRACT

Dams are one of the primary water sources for irrigation, electrical energy technology etc. in India. Dams play a vital role on account that the time of colonialism. Lack of ideal dam management machine have been inflicting countless losses which includes the recent floods. Inspired by using the current rural and socio-economic problems, an modern and viable computerized manage gadget can be developed for dam administration purposes. This paper also proposes a novel notion of amassing and sharing real-time information about water ranges to the humans dwelling close by its bank. Highly unique water stage monitoring gadget and well-timed document to the locality is additionally developed. When the water stage crosses the threshold condition, alert messages will be dispatched to the humans and the shutters will open automatically, preserving water to its normal level. Timely warnings to each character residing in the locality and timely opening of shutters can thereby minimize the dangers of loss of life and stop disasters. Hence, automation of dam gadget using Arduino, ultrasonic sensor, IOT module and motor, creates a new eye for each the Government as properly as the humans in the locality for developing mitigation plans.

**Keywords:** Arduino, Buzzer, Dam, IOT, Real-time information, Ultrasonic sensor, Water level management.

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#### I. INTRODUCTION

Dams are the main sources of water furnish to cities, they additionally play a imperative position in flood manage and can aid river navigation. Most of the dams are constructed to serve extra than one motive and their advantages are manifold. It is critical to put into effect some type of verbal exchange between the metering structures and laptop fashions to

supply assist in managing the complicated structures of the hydro energy plants. Generally, the dams are monitored via usual surveillance strategies and the water administration without the monitoring of stage of water in some of the dams which is automatized. Management of water assets via dams turns into complicated as the wide variety of customers relying on dams is massive and these customers can also have conflicting interests. This state of affairs receives

plenty complicated with the truth that the accessible sources are constrained with excessive chances of droughts and floods. This influences the densely populated areas. Dam monitoring is a tedious and lengthy time period procedure which has to be accelerated step by means of step. A new device for dam water monitoring and administration need to be mounted which can furnish water stage in actual time and can permit us to come to speedy conclusions concerning the security operations of the dams. Internet of Things (IoT) can be described as a community of gadgets which are interconnected. It consists of a set of sensors, verbal exchange community as properly as software program enabled digital units that permits cease customers to accumulate correct information from time to time thru the conversation channel and approves for records interchange between customers and the linked devices. This machine can be used to automatize the manipulate of dams barring human interference. This can additionally be used to accumulate data on the degree of water at some point of the usa and can be used to route water primarily based on the requirements. We can get facts on the water availability in a specific area and route the water to that region if there's scarcity. This helps a lot in irrigation. Keeping a test on the protection of dam from time to time is one of the essential measure to make sure the security of dams. Use of Wireless sensors community with software program for dam security administration helps in enhancing the performance of dams. All the sensors in the cluster of dam such as Water Level Sensor ,Vibration Sensor and Pressure Sensor can be used to feel Water stage Vibrations on the wall of dam and Pressure exerted on the wall of dam from the dam into the principal pipeline in Litres per minute respectively[1]. Differential Pressure sensors are outfitted at equal areas alongside the most important pipeline which can feel the stress distinction due to the fact of the breaking or leakage of the pipeline and will at once be communicated to the observer. In case of floods the routing of flood water can be performed greater effectively thinking about the stage of water throughout extraordinary dams. Surveillance of areas close to the dams can be achieved the use of cameras which transmit stay pictures to the base station and will be useful in figuring out the presence of humans close to the dams and can assist in making sure security whilst releasing water all through flash floods. Internet of Things science focusses on making the ecosystem of sensors greater and greater clever with the aid of setting up a connection to the internet. Collecting the statistics related to the failed sensors allows us to generate greater dependable gear which in flip improves the reliability of the dams. Integration of Internet of Things with large data, cloud computing and WSN will decorate the operation functionality to

dams to a higher extent [2]. The whole processing of facts will be completed on the cloud which will make sure that the facts retrieval and issuing of instructions can be made quicker with greater reliability.

## II. LITERATURE REVIEW

Various efforts have been made till now in monitoring water degree and therefore controlling dam gate. The contribution of work in this location is stated below,

1) IoT based totally water grant monitoring and controlling system Water is a simple want of each human being. Everyone needs to retailer the water. Many instances with lack of monitoring, overflow of the water takes place. Overflow of tanks can occur because of this plenty of water wasted. Another factor is because of overflow in the pipelines with extra stress there is possibility of pipeline damage. Leakage detection is one more problem. All these issues are due to the fact of lack of monitoring, manual work and much less man power. In this paper a survey of Aurangabad town and subject survey have been done, to understand water provide distribution and associated issues with the system.

After taking a survey they found that all the work is manual and want a higher technological know-how to make perfect distribution.

2) Wireless catastrophe monitoring and administration machine for dams This paper suggests structure to manage gate by monitoring excessive density and then talk in actual time. Considering the current activities that took vicinity on June 2013, a destructible state of affairs has taken location due to heavy rainfall and cloud bursting at a range of places. Many dams have been out of knowledge on quite a number parameters about the glide and discharge from the nearer dams which have been affected before and due to lack of verbal exchange amongst these dams, lead to considerable damage of property and life.

3) Dam gate stage monitoring and control The primary goal of this paper is to manipulate the water Level in dam which was once applied the usage of IoT (Internet of Things). The layout implementation and manage of the programmed monitoring gadget was once developed via this project. The cradle of the mission is based totally on methodology of IOT. For fantastic results, the precept operation of the computerized gate control arrangement is subjected to dry strolling below quite a number possible circumstances, with Proteus as the platform for working.

4) Raspberry Pi based totally water monitoring and alert system. This paper offers with the automated manage of a river system.

The machine is a cascade of single input-single output (SISO) systems, and can be viewed as a single input-multiple output (SIMO) system, considering the

fact that there are more than one outputs given with the aid of intermediate dimension factors dispensed alongside the river. A generic sturdy sketch synthesis primarily based on inner model controller (IMC) graph is developed for inside mannequin 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 mannequin of the river. The industry has usually targeted to devise engineering methodologies for establishment and change of extraordinarily less complicated controlling and automation strategies for any scrupulous process. This paper presents the format and implementation of a manipulate device by means of microcomputers and records transmission networks. To verify the precept operation of the Controlling graph to be presented a miniature mannequin is experimentally examined the usage of a PC-based system.

5) IoT primarily based water stage monitoring gadget for lake In this paper they have brought the thinking of water level monitoring and administration for lake water storage supply for villages. More specifically, they have delivered the raspberry as controller for water degree sensing and controlling in a wired and wi-fi environment. Furthermore, it can indicate the quantity of on hand water in the lake. This machine is based on GSM technology. Moreover, cell telephones with relative high computation energy and excessive nice graphical user interface grew to be handy recently. From the user’s perspective it is required to reuse such treasured useful resource in a mobile application. Finally, paper has proposed a net and cellular primarily based monitoring provider protocol for monitoring available water in lake.

### III. EXISTING SYSTEM

Dams did not have any automation systems. Dam gates were only managed manually. A man or woman used to be dispensed to function the dam gates. The water degree of dams was once solely measured the use of a scaling measure equipped at dam ends. The character who is responsible for monitoring water stage video display units and intimates when to open or shut dam gates to the man or woman who is responsible for opening the dam gate. Intimations about opening or closing of dam gates weren't given to the humans who live close by the dam banks. The risks include

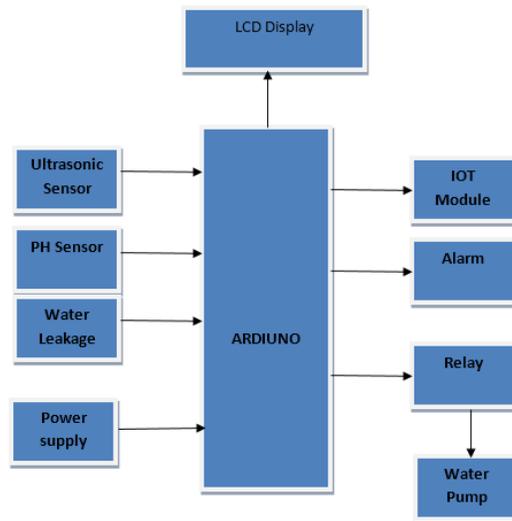
- Needed human useful resource for running dam gates.
- Continuous monitoring of water degree of dam required.
- People do no longer comprehend about opening of dam gates that may end result in loss of livelihood

### IV. PROPOSED SYSTEM

The ultrasonic sensor is used to measure the water level. As the water level reaches the first sensor message is displaying in LCD for the admin.

In this proposed system the complexity reduces and the performance increases by collecting the data of the water parameters like water leakage, water level, PH. The information collected is updated on the web server that can be retrieved from anywhere in the world.

### BLOCK DIAGRAM



### 1. PH SENSOR

A PH is an digital gadget which is used for measuring the pHlevel in the water. It consists of three sorts of probes

- (i) Glass electrode
- (ii) Reference electrode
- (iii) mixture of gel electrode.

pH is described as the “negative logarithm” of hydrogenion awareness in water.

$$pH = -\log[H^+]$$

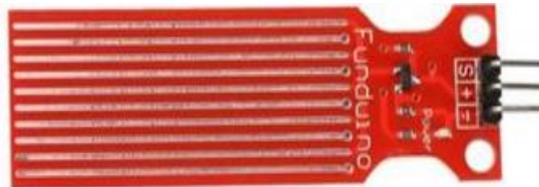
A pH meter consists of specific probes which are linked to an electronic meter that would show the reading. If the pH degree is greater than 7 then it is alkaline in nature, if the pH degree is less than 7 then it is acidic in nature, and commonly the vary of pH is 0-14pH.



## 2. WATER LEAKAGE SENSOR

“Water leakage sensor” is designed for detecting the water leakage in the reservoir and overhead tanks. This is usually utilized in sensing the water leakage, water leakage, and the rainfall. It consists primarily three parts:  $1M\Omega$  resistor, an digital brick connector and several traces of naked conducting wires. It works by using having a series of “exposed traces” that are

related to ground. This is also interlaced between “grounded traces and the sunstrokes”. A weak pull-up resistor of  $1M\Omega$  is present.  $1M\Omega$  resistor pulls up the sensor cost until a drop of water shorts the sensor hint to the grounded trace. This can measure the water droplet/water measurement by using a collection of “exposed parallel wires”. The traits are it has excessive sensitivity and low electricity consumption.

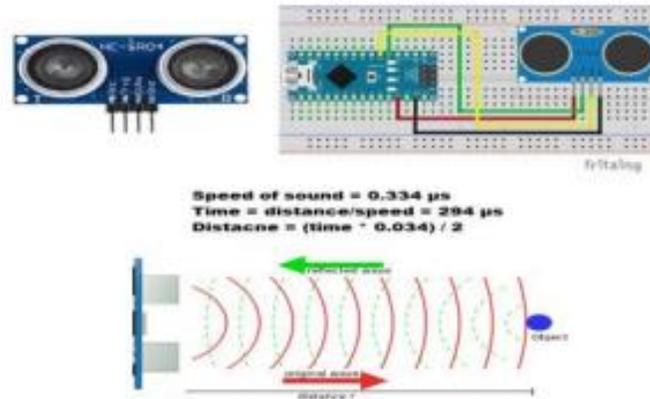


## 3. ULTRASOIC SENSOR (LM35)

Water Level Monitoring

The Ultrasonic sensor is used to monitor the level of the water. It is achieved by measuring the distances. The distance can be calculated using the given formula

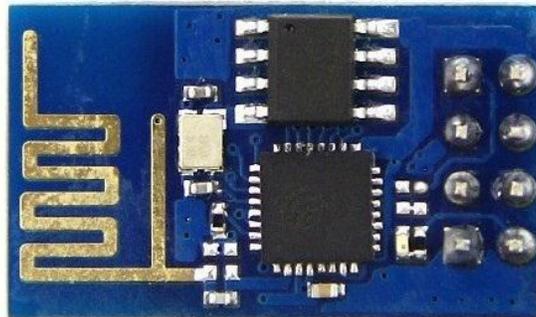
$$\text{Distance} = (\text{speed of sound} * \text{time taken}) / 2 \text{ objects}$$



#### 4. *ESP8266 WIFI MODULE*

The receiving internet records via ESP8266 modem when interfaced with microcontroller or PC is tons much less tough as differentiated and Ethernet module when you consider that ESP is a SoC and Integrated TCP/IP way of life stack. AT firmware is supplied convenient to use bearing set with which it will in accepted be orchestrated or labored at a variety of Baud Rate (Supported 9600, 115200 or 57600). Plain Text may additionally be despatched via the

modem via interfacing solely three warning signs of the successive interface of modem with microcontroller (TxD, RxD and GND). In this arrangement RTS and CTS symptoms of successive port interface of ESP Modem are associated with one another. The transmit banner of successive port of microcontroller is associated with of the consecutive interface get sign (RxD) of ESP Modem whilst get banner of microcontroller successive port is associated with transmit hail (TxD) of successive interface of ESP Modem.



#### 5. *MICROCONTROLLER ARDUINO*

Arduino Uno is primarily based on AVR microcontroller referred to as Atmega328. This controller comes with 2KB SRAM, 32KB of flash

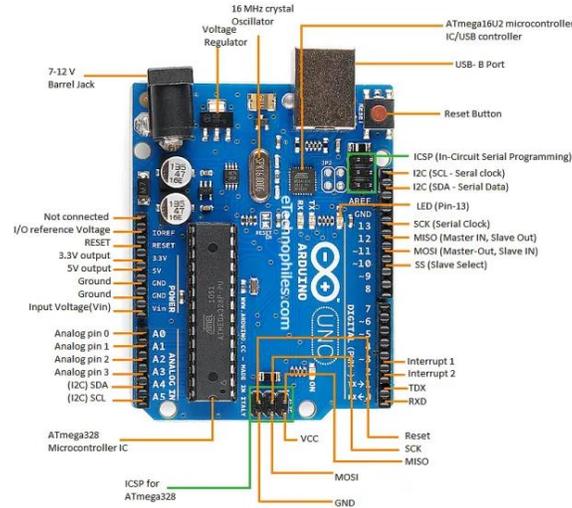
memory, 1KB of EEPROM. Arduino Board comes with 14 digital pins and 6 analog pins. ON-chip ADC is used to pattern these pins. A sixteen MHz frequency crystal oscillator is geared up on the board. Following parent indicates the pinout of the Arduino Uno Board.



### *Pin description*

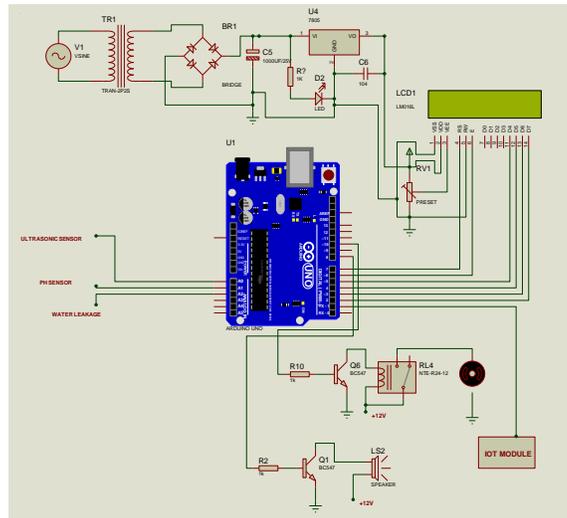
There are various I/O digital and analog pins positioned on the board which operates at 5V. These pins come with fashionable running scores ranging between 20mA to 40mA. Internal pull-up resistors are used in the board that limits the modern-day exceeding from the given running conditions. However, too lots enlarge in present day makes these resistors vain and damages the device.LED. Arduino Uno comes with built-in LED which is related thru pin thirteen Providing HIGH price to the pin will flip it ON and LOW will flip it OFF. Vin. It is the enter voltage supplied to the Arduino Board. It is unique than 5 V provided via a USB port. This pin is used to grant voltage. If a voltage is supplied via electricity jack, it can be accessed thru this pin.5V. This board comes with the capability to grant voltage regulation. 5V pin is used to furnish output regulated voltage. The board is powered up the usage of three approaches i.e. USB, Vin pin of the board or DC energy jack.USB helps voltage round 5V whilst Vin and Power Jack guide a voltage stages between 7V to 20V. It is endorsed to operate the board on 5V. It is vital to notice that, if a voltage is furnished thru 5V or 3.3V pins, they end result in bypassing the voltage law that can injury the board if voltage surpasses from its

limit.GND. These are floor pins. More than one floor pins are supplied on the board which can be used as per requirement. Reset. This pin is integrated on the board which resets the application walking on the board. Instead of bodily reset on the board, IDE comes with a characteristic of resetting the board via programming. IOREF. This pin is very beneficial for supplying voltage reference to the board. A protect is used to examine the voltage throughout this pin which then pick the applicable strength source.PWM. PWM is furnished via 3,5,6,9,10, 11pins. These pins are configured to provided 8-bit output PWM.SPI. It is acknowledged as Serial Peripheral Interface. Four pins 10(SS), 11(MOSI), 12(MISO), 13(SCK) grant SPI verbal exchange with the assist of SPI library. AREF. It is referred to as Analog Reference. This pin is used for imparting a reference voltage to the analog inputs.TWI. It is known as Two-wire Interface. TWI verbal exchange is accessed via Wire Library. A4 and A5 pins are used for this purpose. Serial Communication. Serial conversation is carried out via two pins known as Pin zero (Rx) and Pin 1 (Tx).Rx pin is used to acquire information whilst Tx pin is used to transmit data. External Interrupts. Pin two and three are used for imparting exterior interrupts. An interrupt is known as by means of offering LOW or altering value.



## V. RESULT

The hardware implementation of the IOT Based Coal Mining safety for Workers Using Arduino is shown below



## VI. CONCLUSION

The device can reveal water first-rate automatically, and it is low in price and does not require humans on duty. This system is used to keep away from the big quantity of water is being wasted by uncontrolled use of home/offices etc. The water

quality testing is possibly to be extra economical, handy and fast. As ever and each and every variant of water stage is knowledgeable to the cloud thru the web and nearby human beings can be informed in time. Thus saving loads of lives averting unpleasant scenarios.

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