# Real Time Water Monitoring System For Dams Using IoT

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*Abstract :* Water is one of the most important substances on earth and is a crucial part of everyday life. Therefore, efficient use and water monitoring are potential constraint for home or dam water management system. Due to global environmental situation, water management and conservation is vital for human survival. Water quality is affected by both point and non-point sources of pollution and other sources of water contamination include floods and droughts. In this project we are monitoring and controlling water level and quality of water in dam with IoT and android application. We have developed system to automatically turn on and turn off the lights of dams during night and day time respectively. We have also developed system to detect vibrations caused due to the visitors which will be converted into voltage in order to turn on a led. The model developed is used for testing water samples and the data is uploaded over the Internet are analyzed. The system also provides an alert to a remote user, when there is a deviation of water quality parameters from the pre-defined set of standard values.

***Index Terms*** **- NodeMCU8266, Water level sensor, Turbidity sensor, LDR, Vibration sensor, Blynk Application.**

## I. INTRODUCTION

Dams are very useful for irrigation, human consumption, industrial use, aquaculture, and navigation. Though dams have many advantages, failure of dams can cause severe destruction of human life. The causes of dam failure includes geological instability caused by changes in water levels during filling, poor maintenance, extreme rainfall and human, computer or design error. Regular operation and maintenance as well as thorough and consistent inspection must be practiced throughout the lifetime of a dam in order to prevent failure of dam. It is necessary to develop a system which helps to monitor the water level of dam throughout the lifetime of dam. This can be achieved with the help of IoT. Using IoT dam water level can be monitored continuously. Dam water flowing through channel may become turbid due to addition of suspended particles while flowing between different locations. When this water is used for irrigation and for drinking purpose in rural areas, the suspended particles can cause plant death and severe health issues respectively. It is very essential to develop a system which can detect the turbidity change of water in the channel so that one can take corrective measures before using the water for irrigation, and drinking purpose.

This paper is organized in the following ways. Chapter two concentrates on the basic concepts used in designing the entire project. Chapter 3 concentrates on system design and its implementation with all sub units. Chapter four is about conclusion and future scope.

## II. BASIC CONCEPTS

### 2.1 NodeMCU8266

NodeMCU is an open source IoT platform which has firmware which runs on the ESP8266 Wi-Fi SoC and hardware. The Wi-Fi module of NodeMCU can be programmed to connect it to internet via hotspot by using its SSID and Password. The water level sensor, turbidity sensor are interfaced with NodeMCU to continuously read data and send it to Blynk app to generate notification. Based on the notification the gates of dams can be controlled.

### 2.2 Water level sensor

Water level sensor is used to detect and indicate the water level in dams. It relays information back to a control panel to indicate whether a body of water has a high or low water level. The water level sensor can easily change the water size to analog signal, and output analog value is directly used in program to achieve required function.

### 2.3 Turbidity sensor

Turbidity sensor is used to measure the amount of suspended particles present in water. A turbidity sensor probe works by sending a light beam into the water to be tested. Then this light will be scattered by suspended particles. A light detector is placed at a 90-degree Angle to the light source, and detects the amount of light that is reflected back at it. The amount of light reflected is used to determine the density within the water. The more light that is detected; the more particles are present in the water.

### 2.4 Light dependent resistor

LDR sensor is used to detect the light. LDR sensor works on the principle of photoconductivity. When there is light the resistance of the LDR decreases and if there is no light the resistance of LDR increases. This principle is used to automatically turn on and turn off the lights of dam.

### 2.5 Vibration sensor

Vibration sensors are used to measure, display and analyze linear velocity, displacement and proximity, or acceleration. Power generation is one of the applications of vibration sensor. In this paper, the use of vibration sensor to detect the vibrations caused due to the movement of visitors in the dam is proposed, the sensed vibrations are converted to voltage and an LED is turned on.

### 2.6 Blynk Application.

Blynk is a new IoT platform that allows to quickly build interfaces for controlling and monitoring hardware projects from iOS and Android device. Blynk is one of the most user-friendly and it's also free and open-source under an MIT license. Using Blynk app it is possible to get data from sensor and can be stored in database. It supports widgets which can even control the working of the hardware. The proposed project has been created using this application. In this app the current water level is displayed also notification is generated regarding the water level. The sliders are used to control servomotor which in turn controls dam gates. The app uses Auth token, using which one can have access over the project. This ensures security.

## III. SYSTEM DESIGN AND IMPLEMENTATION

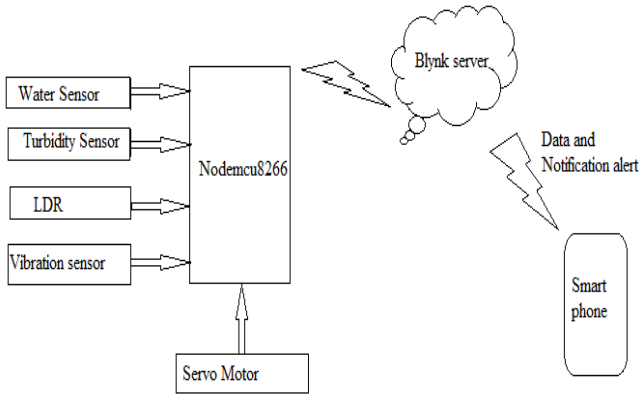


Figure 1. Basic block diagram of the proposed system.

Water level sensor and turbidity sensor are interfaced with NodeMCU. These sensors continuously monitor dam water. NodeMCU is connected with Blynk App through Wi-Fi. Data is continuously transmitted to Blynk cloud and is stored there. Notification is sent to Blynk app. Based on the notification the authorized person can control gates of dam. LDR is used to automatically turn on and off dam lights during night and day time respectively. Using vibration sensor, a small voltage is generated by the vibrations caused due to the movement of visitors. This voltage is used to turn on a small LED.

In this paper, NodeMCU8266 has been used as microcontroller. Water level sensor, turbidity sensor, LDR and vibration sensor are interfaced with the microcontroller.

Arduino IDE is used to program NodeMCU. The water level sensor and turbidity sensor continuously monitors water level and quality of dam water respectively. The Blynk App is installed in the smart phone. An account has been created in Blynk using E-mail id. In Blynk app the project is designed by adding widgets, provided by Blynk app. The NodeMCU is connected with Blynk app by programming the Wi-Fi module of NodeMCU using SSID, password and Auth Token. Auth Token is unique and is sent by Blynk app via E-mail. Auth Token is required to access the particular project in Blynk App.

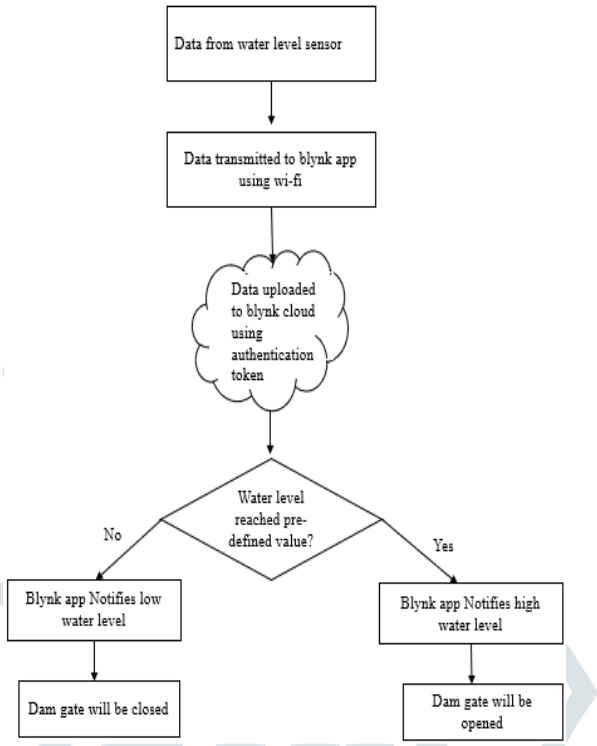


Figure2. Flow diagram for implementation of Water level

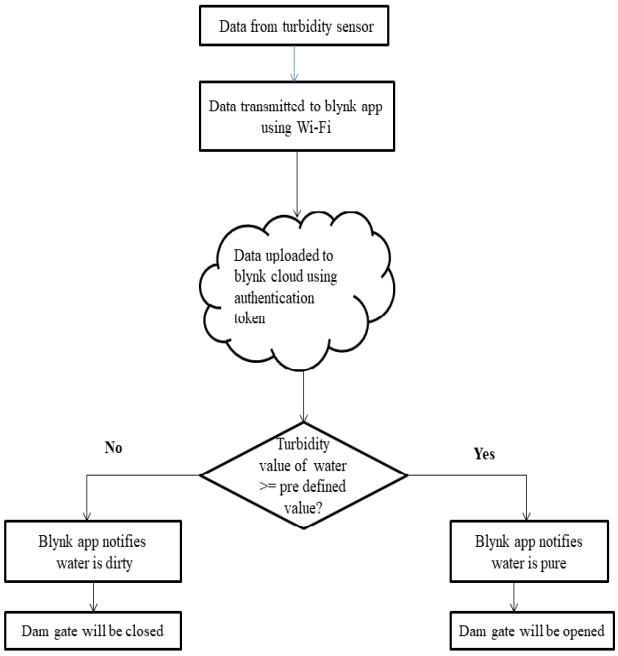


Figure3. Flow Diagram for implementation of Turbidity Sensor.

After establishing connection between hardware and Blynk app, the data read by sensor are sent to Blynk app where they are displayed using gauge widget supported by Blynk app.

In Blynk app notification widget is used to generate notification about the dam water level and turbidity of water continuously. A slider widget is used, with which an authorized person can control the opening and closing of gates by sliding the slider. The slider controls the servo motor action. The degree of servo motor rotation is decided by the amount by which the slider slides.

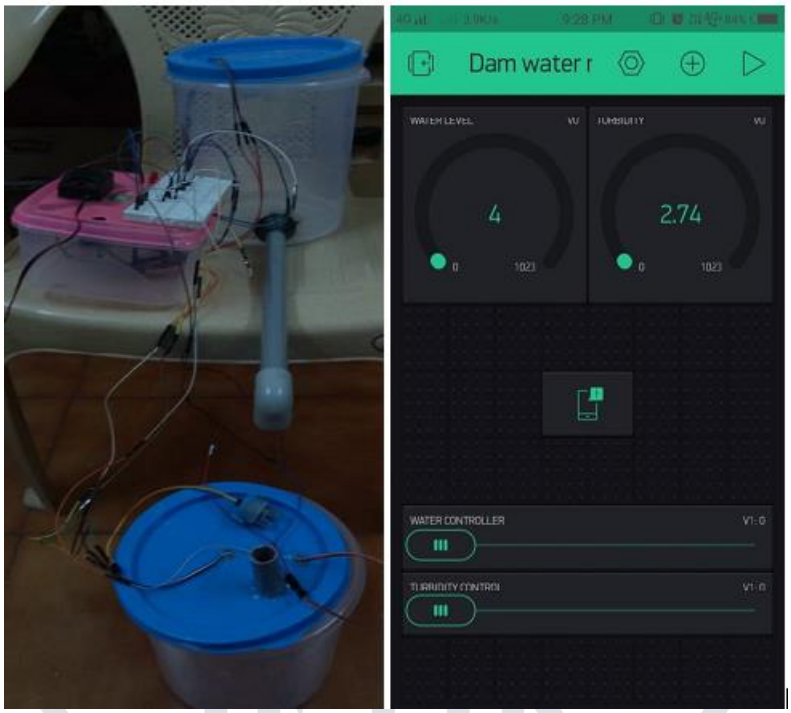


Figure4. (a) Shows over all model of proposed system, (b) shows Blynk workspace for water level indication, notification and control for gates

The LDR sensor is connected to LED to test the working of LDR. In the presence of light LDR gives low output, it gives output as high in the absence of light. This LDR values are used to program the LED. The LED turns on when light does not fall on the LDR and vice versa. The vibration sensor has been connected with NodeMCU which detects the vibrations caused due to the movement of visitors and these sensed vibrations are used to turn on LED present in vibration sensor.


Figure5. (a) Image showing off state of LED due to exposure of LDR to light, (b) shows on state of LED as LDR not exposed to light.

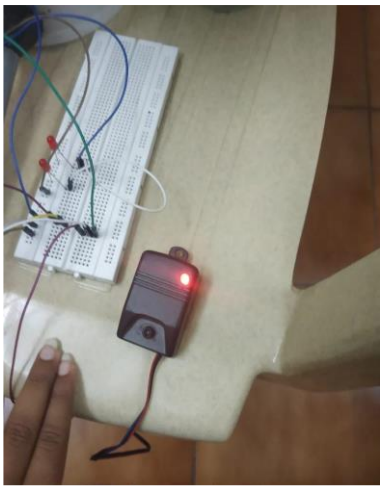

Figure6. Image showing working of vibration sensor.

## IV. CONCLUSION AND FUTURE SCOPE

A system has been developed which can continuously monitor water level and turbidity of dam water and transfer data to the Blynk app, where widgets are used to analyze and control the action of dam gates. The prototype is designed and the working of the sensors and Blynk app is tested. In Blynk app Super chart widget can be used, which plots the real time data with time. This chart can be converted to excel sheet and can be shared. This helps researchers to get the information about the annual variation in dam water level and turbidity. Any change in turbidity indicates the addition of new contaminant to water body. By using LDR the lights of dams are automatically turned on during night and turned off during day time. With the help of Vibration sensor a small LED is turned on due to the vibration caused by the visitors. In future, the system can be added with the water purification technique to automatically purify water when detected as impure. Techniques to generate large amount of power by vibrations caused by visitors should be found and added to the proposed system.

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