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SMART RAINWATER HARVESTING UTILIZING IOT TO OPTIMIZE WATER CONSERVATION

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ABSTRACT

Lakes can provide water by collecting precipitation naturally in a valley or other catchment area, storing it in the lake's reservoir, or directing it to another reservoir. The yearly rainfall and evaporation pattern, the current usage and runoff coefficient of the catchment region, water demand, as well as the geology and geography of the catchment area and building site, are all significant factors in lake development. An electronics-based technology uses motors to regulate movement by measuring the water level and estimating the pace of inflow into lakes. It will then store in the water tank. Extra water will drain into the sea after this operation. The IOT web server will get all parameters.

INTRODUCTION

The correct collection of water during rainy seasons may be managed with the use of rainwater harvesting for smart water management. India is a big country with several homes that are linked to a large enclosed roof and have a catchment on it. Every year during the rainy season, water is gathered on the roof and poured through the boundary pipes to flow down.Water is wasted by being airlifted to soiled areas. In the past, the roadways were composed of mud or sand, and as the rainwater began to overflow, it was stored underground [1].

Yet, the roads of today's age are constructed of materials like wood, cement, and dumber. The roads need to be strengthened to support the weight of the rising number of cars as a result of population growth [2]. From this point on, rainfall is flowing in its own direction and collecting in corners rather than being immediately stored in the earth. Many bacteria and gems will begin to develop in the rainwater that has been collected but has been tainted or poisoned. As a result, rainfall must be managed for better utility and stored in a way that allows for optimal collection.

Water conservation has an unmistakable influence on a sustainable environment as the need to combat climate change becomes more urgent. The principal supply of freshwater for the nation's expanding household, agricultural, and industrial sectors is groundwater. It has been noted over time that the requirement to utilize groundwater resources for varied daily purposes, such as urination, bathing, cleaning, agricultural, drinking water, industry, and ever-changing lifestyles with modernity, is resulting in significant water waste.

IOT

IOT makes it possible for people to successfully manage their lives and businesses while also bringing about significant societal changes that have the potential to totally reshape trade and industry. The aerospace and aviation, automotive, telecommunications, medical, healthcare, independent living, pharmaceutical, transportation, manufacturing, retail, logistics, and supply chain management sectors are just a few of the industries where the IOT has the potential to produce a wide range of applications.

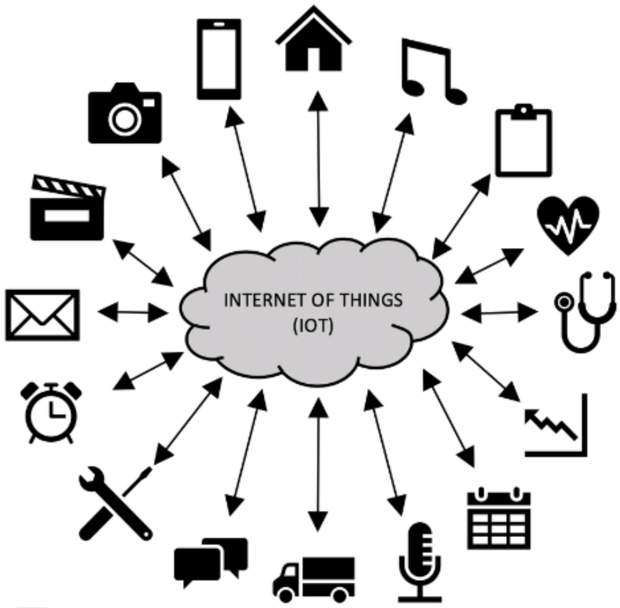


Figure 1: Schematic of IOT

Remaining paper is organized as Literature Survey in Section II, Section III consists of proposed system, Section IV concludes.

LITERATURE SURVEY

The management of dam safety has been conducted in stationary climatic and non-climatic situations. Yet, the predicted changes brought about by climate change are anticipated to have an impact on several elements that influence dam risk [3].

An approach of concentric marking points is suggested as a design strategy to adapt the system to field slope monitoring. The least squares approach, k means clustering, and Zernike moment edge extraction are utilized to build a sub-pixel precision localization method for marker pictures [4].

This type of engineering construction is susceptible to deformation because of things like variations in reservoir water levels, seat structures, climatic changes, etc. Dam monitoring often entails readings both within and outside the structure[5].

In paper [6], we model the inferred deformation and solve for change in volume for simple tensile dislocations using a Markov chain Monte Carlo method. Geodetic datasets from the recent past and the present yield results that the volume.

The high steep pit slopes would be impacted by both open-pit mining and underground mining during the transition from open-pit to underground mining, which would result in more complicated deformation characteristics [7].

One of the greatest ways to meet such needs is through rainwater collection. The technical components of this study include the collection of rainfall from Mumbai's highways, which are regarded as catchment areas. The necessary information, including as catchment regions and hydrological rainfall data, are first gathered [8].

There are several methods used now to collect rainwater, but we must devise a better one if we want to save human energy and time. The project idea offers a practical means of conserving water that may be utilized for both domestic and agricultural applications. The soil moisture sensor, water level sensor, proximity sensor, soil temperature sensor, and pH sensor were all utilized in this study [9].

In paper [10], we discuss an agricultural-based system in which, based on our observations, the cultivated crops are harmed by significant rainfall during the rainy seasons. The primary goal of this initiative, as it is outlined in the report, is to protect crops from intense rain and conserve water. The automated roof uses a rain sensor and a soil moisture sensor to function.

The act of collecting, storing, and purifying rainwater that naturally falls on a roof is known as rainwater harvesting. Management of water resources is crucial to the growth of agriculture. It is essential if there is no centralized government supply system and there is a lot of rainfall [11].

As an Internet of Things application, the paper [12] suggests designing a smart water management system based on Arduino. The ultrasonic sensor in the suggested design measures the water level after the water has been collected in the ground tank. An android application receives updates from the detected data.

EXISTING SYSTEM

An ultrasonic sensor and an 8051 micro controller were used in this setup. Water level in a tank is detected by an ultrasonic sensor. Buzzer will turn on if the water tank is full. Water level is shown on LCD. A human must be close to the hardware to verify the conditions, and the system is sluggish and inaccurate.

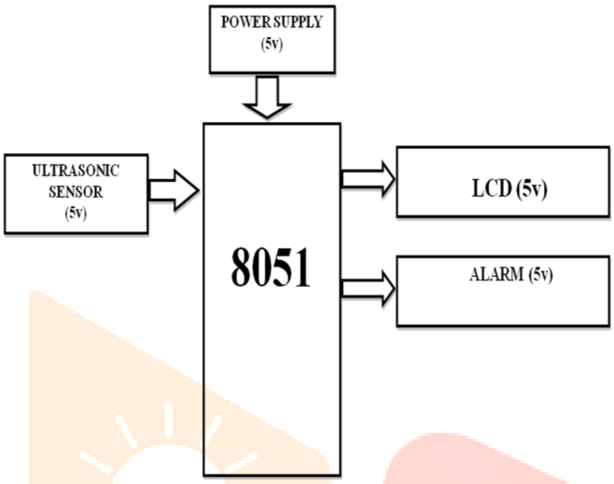


Figure 2: Block diagram of existing system

PROPOSED SYSTEM

Step 1: Ultrasonic sensors are connected in this project. four-pin ultrasonic sensor. VCC, GND, Trigger, and Echo are the four. VCC is coupled to 5 volts, while GND is coupled to ground. Arduino is linked to the trigger and echo pins. The water level will be read and shown on an LCD.

Step 2: We will put an alarm system in place at this time. The buzzer is here. Buzzer and Arduino are coupled. Alarm will sound if ultrasonic detects excess of water.

Step 3:This stage will see the implementation of the project's motor control and alert message modules. When the water level is high, the water motor will turn on and an alarm message will be sent to individuals through GSM. With IOT, all data parameters will be transferred to a web server.

WORKING OPERATION

We began working on our project's power supply board. Working voltages for electronics devices are 5, 3.3, or 12 volts. Hence, we first create a power supply board. 230vAC is transformed by a step-down converter to 12vAC. 12v AC to 12v DC conversion using a bridge rectifier. Voltage regulators 7805 and 7812 are being used. The 5v Dc converter 7805. 12v Dc to 5v linked to an Arduino UNO via 7812. Arduino UNO operating voltage is 5 volts. thirteen GPIO pins on an Arduino Uno. Ultrasonic trigger and echo pins are attached to pins 7 and 6, respectively. Ultrasonic with 4 pins and 5 volts for vcc.

Gnd and gnd are linked. Arduino is linked to the trigger and echo pins. LCD has sixteen pins. linked to 5v through vcc. Ground pin and Gnd are linked. En pin is linked to pin 12, whereas Rs pin is connected to pin 13. D4 to D7 are linked to pins 11, 10, 9, and 8. The Arduino 5th pin is linked to the buzzer. Motor is attached to pin six. When an ultrasonic sensor detects the presence of water, a buzzer, an LCD display, and a water motor are all turned on.

BLOCK DIAGRAM

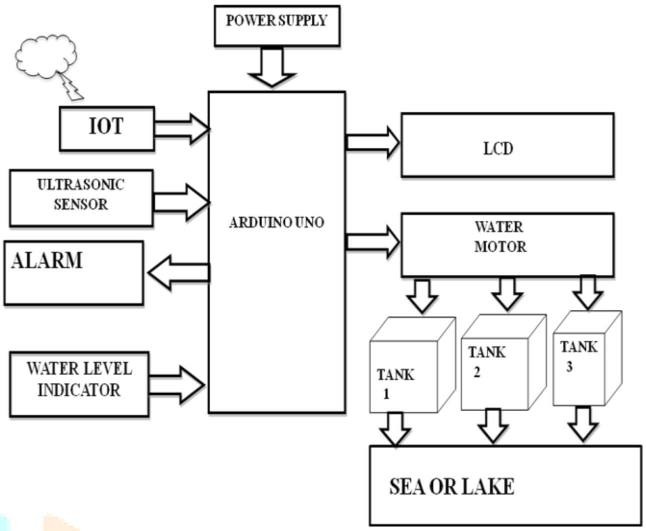


Figure 3 : Block diagram

SOFTWARE AND HARDWARE REQUIREMENTS

ARDUINO IDE

The compiler is Arduino IDE 1.8.3 is shown in Fig 4.

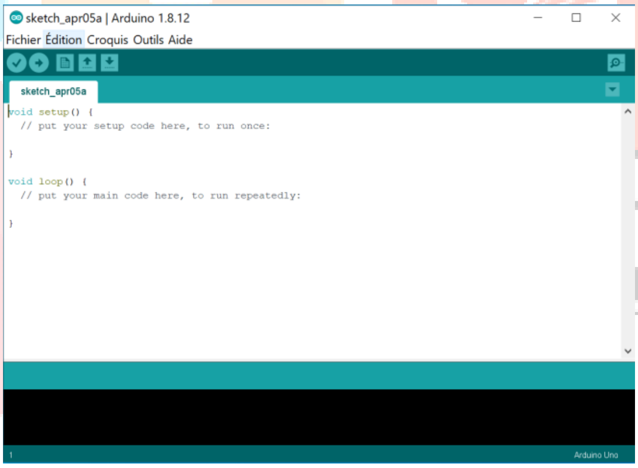


Figure 4: IDLE of Arduino

It is used to write and upload programs to an Arduino board. Arduino is an open-source electronics platform with straightforward hardware and software. An Arduino board may be used to take inputs like light on a sensor, a finger on a button, or a tweet, and then be used to start a motor, switch on an LED, or post anything online. You can control your board's operations by giving its micro controller a set of instructions.

PROTEUS

Simulation tool used is Proteus before being implemented into a real-time application.

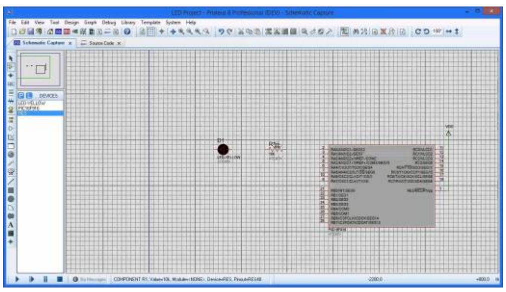
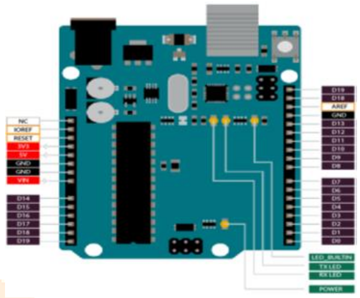


Figure 5: Proteus Application

The circuit is simulated at ordinary speed using the "Run simulator" option (If the circuit is not heavy). The "Advance frame by frame" option waits until you click this button once more before moving on to the next frame. This is useful for debugging digital circuits. Fig 5 depicts the Proteus at rest.

ARDUINO UNO

Arduino is a free and open-source hardware and software prototyping platform. A motor can be started, an LED can be turned on, and anything may be published online by using an Arduino board to receive inputs like light on a sensor, a finger on a button, or a tweet. Sending a set of instructions to the board's micro controller will instruct your board what to do. You achieve this by using the Arduino Software (IDE), which is based on Processing, and the Wiring-based Arduino Programming Language.



Figur 6: Arduino Uno Board

NODE MCU

The WiFi counterpart of an Ethernet module is a Node MCU. It combines the functions of a micro controller with a WiFi access point. The Node MCU is a very potent tool for WiFi networking because to these features. It can function as a station or access point, run a web server, or connect to the internet to download or upload data.

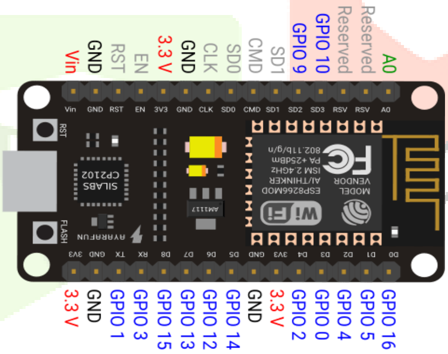


Figure 7: Node MCU

GSM NETWORK

A second-generation cellular standard called GSM (Global System for Mobile) was created to provide voice services and digital modulation-based data transfer.

SERVICES FOR GSM:

Tele-services

Data or Bearer Services

Supplementary Services.

GSM OPERATION

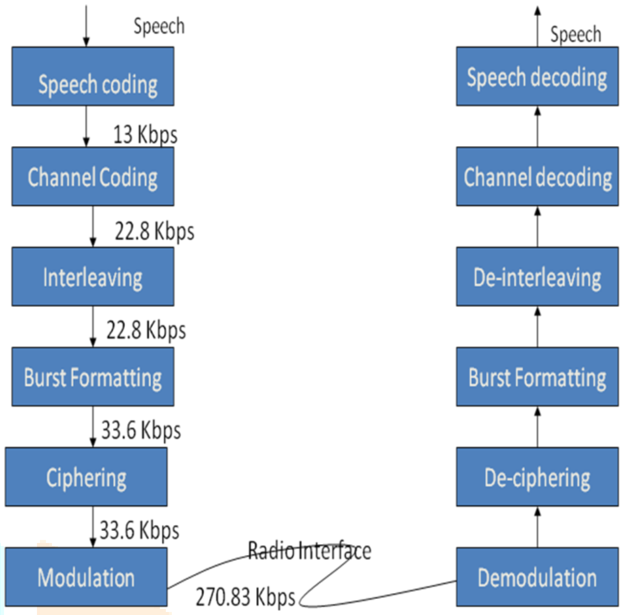


Figure 8: block diagram of GSM operation

CONCLUSION

We made an effort to offer solutions for this issue and to put in place a productive system for managing and monitoring water levels.The major goal of this project is to create a flexible, affordable, and easily adjustable system that can, among other things, address our problems with water distribution between two regions and protect low-lying areas from flooding. To manage the data and cut costs, we have been employing a microcontroller. Because our lab trials have been successful, we have suggested a cloud-based water level monitoring and management network. This network's versatility will allow us to control the system from any location by gaining access to cloud data using a variety of devices.

In cases like floods, when the automated gate raising system will assess the water levels and respond appropriately, this sort of technology is more useful. By minimising manual labour, this might have a significant positive impact on studies pertaining to the effective management of water at dams.

REFERENCES

[1]Ferguson M in the year 20012 researched on a 12 months rain water tank water saving and energy.
[2]B. Madhuravani, Dr DSR Murthy, A novel secure authentication approach for wireless communication using chaotic maps, Proceedings - International Conference on Trends in Electronics and Informatics, ICEI 2017, 2018, 2018- January, pp. 360–363.
[3]Javier Fluixá-Sanmartín, Luis Altarejos-García ” Review article: Climate change impacts on dam safety” 2018.
[4]Leping He, Jie Tan “Non-Contact Measurement of the Surface Displacement of a Slope Based on a Smart Binocular Vision System” 2018 .
[5]M. Clara de Lacy, M. Isabel Ramos “Monitoring of vertical deformations by means high-precision geodetic levelling.” 2017.
[6]Pietro Milillo, Roland Bürgmann ” Space geodetic monitoring of engineered structures: The ongoing destabilization of the Mosul dam” 2016.
[7]Chuanbo Zhou, Shiwei Lu , Nan Jiang “Rock Mass Deformation Characteristics in HSSI by Open-Pit to Underground Mining” 2016.
[8]Patel Zubair a, Ansari Mustaqeemalama, Khan Saalima Chaudhary Mohammeda Amol M Khatkhatea “Mechatronics Design Of A Rain Water Harvesting System For Smart Cities ”2018.
[9]R.Deepa, Vaishnavi Moorthy, Shreyans Gupta, Rohit “Smart approach to harvest rainwater using Internet of things” 2020.
[10]Abhijit G Kalbande “Smart Automation System Using Arduino And Rain Drop Sensor” 2017.
[11]Noor Hasyimah Abu Rahim1, Muhammad Nor Izzuddin Mohd Nasober “Development of A Rainwater Harvesting Monitoring System for Agriculture” 2019.

[12]Vatsala Sharma , Kamal Nayanam, Himani "Arduino based Smart Water Management " .
[13]J. Fluix´a-Sanmart´ın, L. Altarejos-Garc´ıa, A. Morales-Torres, and I. Escuder-Bueno, "Review article: Climate change impacts on dam safety," Nat. Hazards Earth Syst. Sci. , vol. 18, no. 9, pp. 2471-2488, Sep. 2018.
[14]P. Milillo et al., "Monitoring dam structural health from space: Insights from novel InSAR techniques and multi-parametric modeling applied to the Pertusillo dam Basilicata, Italy," Int. J. Appl. Earth Obs., vol. 52, pp. 221-229, Oct. 2016.
[15]H. Woschitz, F. Klug, and W. Lienhart, "Design and Calibration of a Fiber-Optic Monitoring System for the Determination of Segment Joint Movements Inside a Hydro Power Dam," J. Lighw. Technol., vol. 33, no. 12, pp. 2652-2657, 2015.
[16]M. C. De Lacy, M. I. Ramos, A. J. Gil, O. Franco, A. M. Herrera, M. Avil´es, A Dom´ınguez, and J. C. Chica, "Monitoring of vertical deformations by means high-precision geodetic levelling. Test case: The Arenoso dam (South of Spain)," J. Appl. Geod., vol. 11, no. 1, pp. 31- 41, 2017.
[17]K.Pushpa Rani, Krishna Srija, A.Jyothianvitha, M.Ashasri, I.Mamatha, G.Rajesh. "Rain Water Harvesting for Smart Water Management Using IoT" 2021.