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Smart Water Monitoring and Management System

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Abstract

Internet of Things(IOT) can be considered as the upcoming age of Internet. There has been extraordinary progression in innovations of figuring, versatile correspondence, remote correspondence, universal processing and this opens the entryway for IOT. The Internet of things advances to degree that number of the 'Things' associated is undeniably more than the absolute populace of the world. As these numerous gadgets are associating and sharing data, monstrous measure of information will be created. This information will be significant just in the event that we can draw bits of knowledge from it. Existing frameworks invest more energy for social affair information and focus less on bits of knowledgethat can be drawn from information. The water level in tanks must be gathered physically. In a conveyance framework, stream meter and weight meters are taken physically. Water quality is checked by taking examples which is then tried from labs and furthermore this will take hardly any days to get the outcome.This paper targets a growing keen framework for overseeing water which is a need later on.This paper gives a model of simply such a framework that is capable enough to give ongoing data about the degree of water in the tank.The primary aim of the developed framework is to monitor the level of water in water tank and make the tank smarter. So that it helps in detecting the water wastageand steps can be taken to avoid unnecessary overflow of water by allowing them to automate and monitor it from far-flunglocation.

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1. Introduction

Water is one of the fundamental assets for human life. As the utilization of water is expanding, water board turns into a major test for both the administration and water organizations. Water board have job in numerous parts of human lives like water utilization, horticulture, nourishment generation, condition and so on.

Web of Things is a system of associated gadgets, where the gadgets can be a sensor, mobile phone, actuator, RFID frameworks or anything that can transmit and get data, over a correspondence channel. The gadget can be stationary or mobile and are remarkably distinguished by their address and it will be imparted either by wired or remote innovation.

In view of the technique for computerization, different types are as follows:-

1. **Wi-Fi based Water Level Monitoring:-** Here Bluetooth plays a major role in alerting the anomalies and sending the data collected from the sensor to the firebase database through which app isconnected.
2. **Remote Water Level Monitoring: -** In this, the system is controlled remotely. In our system, we have designed an android application through which user can get the overall information about the level of water in the tank. Amount of water utilized as well as amount of water saved on daily basis and the user can also switch on and off the motor whenrequired.
3. **Automatic Water Level Monitoring:-**The system is programmed to automatically perform some defined actions. This means our system consists of ultrasonic sensor which is used to monitor the level of water. We have also used relay device in order to automatically switch off the motor when the water level rises to a certain level that is maintained bycode.

2. Related Work

According to the Census report in 2011, 63% of India's GDP originates from the urban territories and just 31% of India's populace is living there. Populace dwelling in rustic zones began moving to urban zone for a superior way of life[1]. By 2030, nation is expecting 40% of populace in urban areas and that will contribute 75% of India's GDP. For pleasing this urbanization, improvement in frameworks in physical, monetary and social are required. Both government and private divisions previously started some program by putting resources into these territories[3]. In 2014-15 Budget, Government of India apportioned 70.6 billion for savvy city ventures. Keen Solutions for a Smart city can be ordered dependent on the administration divisions[5]. Water and Energy board are the key

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territories of core interest. Shrewd Meters (which can screen and deal with the utilization and conveyance), water quality observing, spillage recognizable pieces of proof and so on are hardly any difficult arrangements in Indian situation[9]. Savvy matrices, inexhaustible source vitality the executives, green structure and so on are a few arrangements going under energy board. Shrewd Parking, clever traffic the executives, incorporated multi-modular transport can bring Smart transportation to the city[6].

The existing frameworks are based on manual system and it is in wired form, which takes a huge amount of time to get the desired performance of the test. The analyzing of what type of system are already developed in our country. The name of the existing software is "Automatic water pump controller". Some of the basic advantage of using this system includes:

1. This controller is suitable for any type of motor - Single or ThreePhase
2. When the water in the overhead tank goes below the predefined minimumlevel it switches ON the pump.
3. When the water level in the overhead tank reaches the maximum stage, itswitches OFF the pump therefore preventsoverflow.
4. It shall again switch ON the siphon when there is adequate water in the watertank.
5. Therefore, there is no need to manually switch ON or switch OFF the pump.

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2.1 Basic applications of the Existing System are :

1. Used in buildings where the manual monitoring isdifficult.
2. Used in industries to control the water level and in chemical mixingetc.
3. It can be installed in metro cities where the drinking water is the only water for all purposes which keep the drinking water portable.

The disadvantages of the existing system includes :

1.This system may not be able to handle the highpower.

2.The components used in this system are very sensitive and can be damagedeasily. We need to insert the wire in accordance to the level ofwater.

3.The whole system is in wired form and hence it is more difficult to manage thesystem.

4.It is moreexpensive.

5.Installation process is not so easy for this system and needs a lot of effort in order to install and use thesystem.

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3.Research Methodology

Some major components are Android application, Node MCU, Ultrasonic sensor, Relay module, AC motor and the mechanism part attached to the watertank.The ultrasonic sensor which is HC-SR04 will constantly check the level of water in the water tank. It will sense the data and sends to the Node MCU which consists of Wi-Fi module which helps in transmission of data to the firebase database. And whenever water level increases uptoa certain level, it automatically switches off the motor using relay. Also, motor can be easily controlled using android application remotely. The role of each component is explained below.

Ultrasonic Sensor: The main work in this project lies within the ultrasonic sensor.The sensor we have chosen is HC-SR04. It is the sensor that will help in getting the level of water in the water tank by calculating the distance between the sensor and upper water level and help the project to process further.

Node MCU: It is one of the microcontrollers that we have used in our project. It helps us to rotate the mechanism that has been connected to the water tank and the esp8266 (i.e., the Wi-Fi module) which will help us to interface with the androidapplication.

Relay: A transfer is an electrically worked switch. It comprises of a lot of information terminals for a solitary or different control signals, and a lot of working contact terminals. The switch may have any number of contacts in various contact structures; for example, make contacts, break contacts, or blends thereof.

Android Application: Application acts as GUI of our project as it is completely for the external use (i.e., for interfacing with the user). It is connected with mechanism through Node MCU, so when the user wants to turn OFF the motor he justneeds to click the OFF button on the application.

AC motor: Our project consists of some major components which are Android application, Node MCU, Ultrasonic sensor, Relay module, AC motor and the mechanism part attached to the watertank.

The ultrasonic sensor which is HC-SR04 will constantly check the level of water in the

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water tank. It will sense the data and sends to the Node MCU which consists of Wi-Fi module which helps in transmission of data to the firebase database. And whenever water level increases upto a certain level, it automatically switches off the motor using relay. Also, motor can be easily controlled using android application remotely. The role of each component is explained below.

Fig. 1

Ultrasonic sensor used in our system senses the distance of water in the water tank and sends that particular value in the firebase database. Snapshots are attached here (where the distance is stored in the database):

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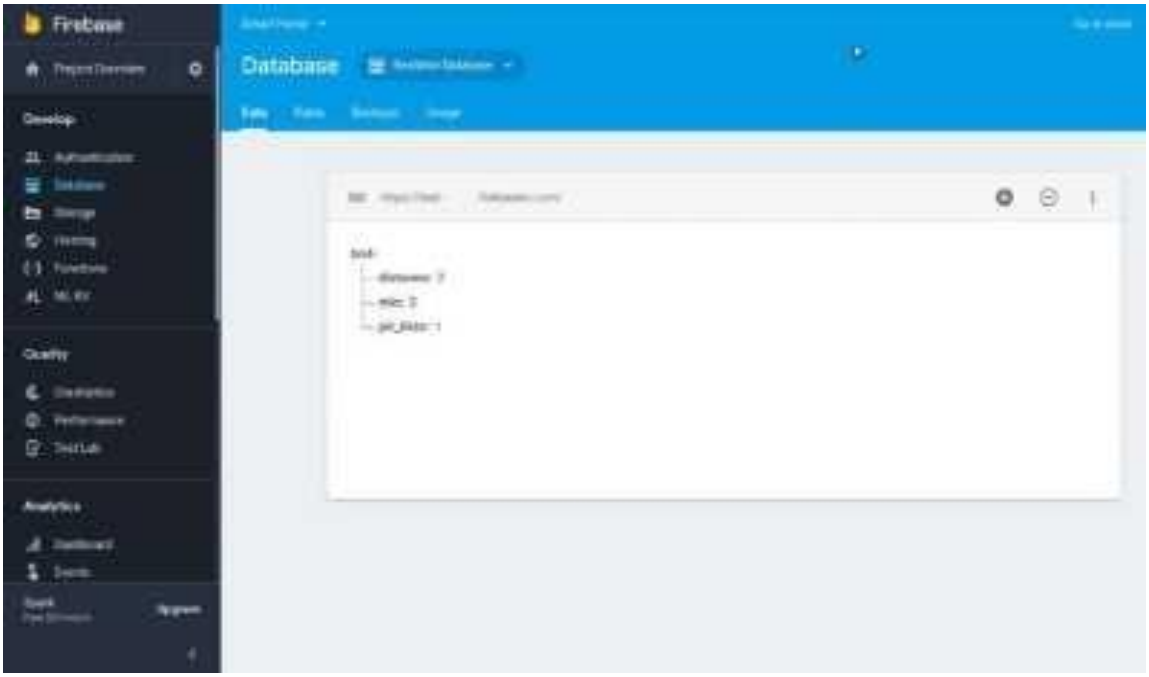
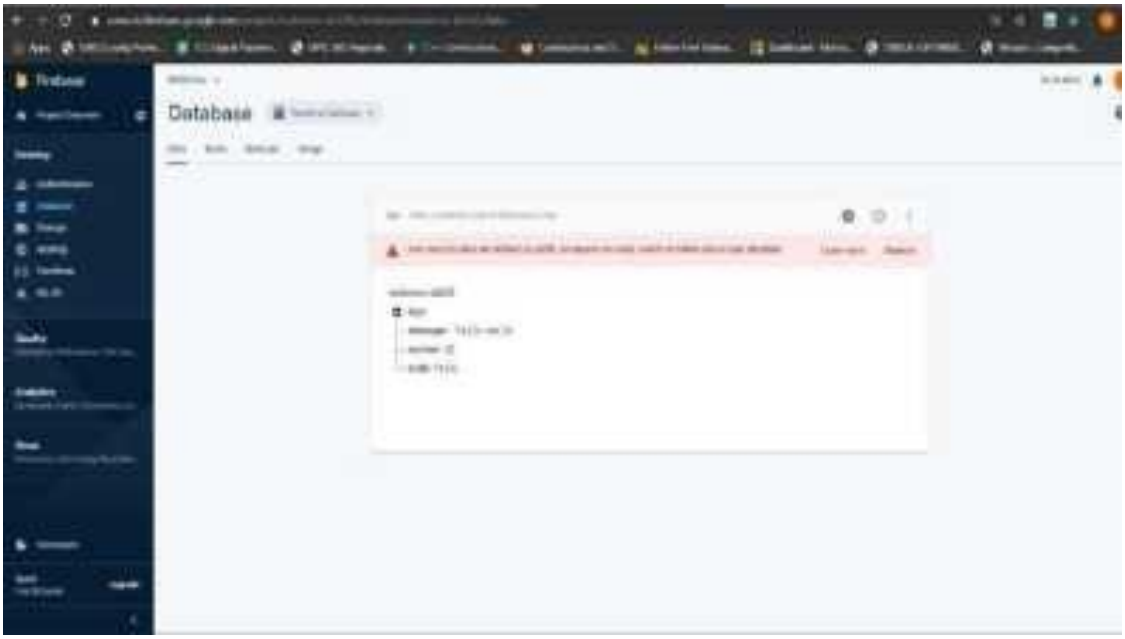


Fig.2

Fig.3



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FirebaseAuthentication:

For authentication and verification of account of a particular user in our android application, we have used firebase. We have enabled email and password verification in our app.

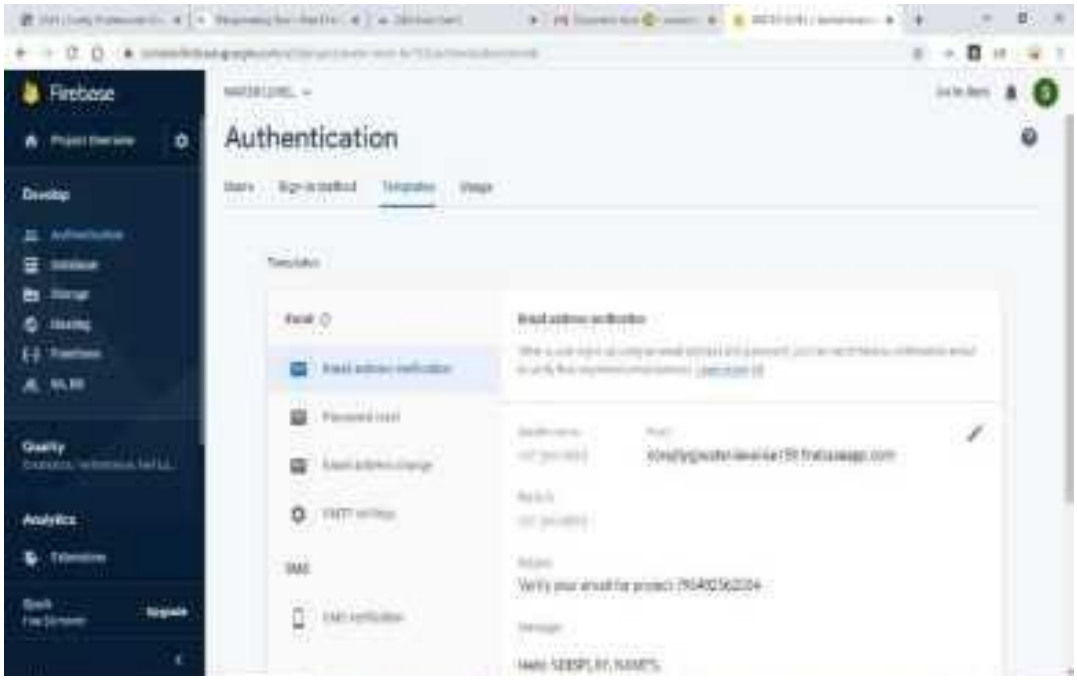

Fig.4

3.1 **PRODUCT DEFINITION**

Basically, the developed system consists of components like node mcu, ultrasonic sensor, relay module. NodeMCU is a Firmware on ESP8266. ESP8266 is a low-cost, Wi-Fi module chip that can be configured to connect to the internet for Internet of Things (IoT) and similar technology projects. Fundamentally, your ordinary electrical and mechanical supplies can't associate with the internet all alone. Ultrasonic sensor is used to calculate the distance of water level into the water tank and the sensor sends all the collected data to the firebase database using Wi-Fi which is already embedded in node mcu. Relay is used to switch on and off the motor whenever the water level reaches at a certain level. Our developed system is very cheap as compared to another system already developed in our Country. As the overall price of the developed system is less than 500. So, it is easily affordable to every commoner. We have also developed an application through which user

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can control the motor remotely. It is not necessary for the user to be at that particular locationalways.

3.1 USAGE

It is very easy to use this developed (prototype). There is no rocket science behind using our system. It is very simple and easy to understand for every person of any age group or it hardly matters if the particular user is literate or illiterate. So, it can be easily installed in the village area as well. Now-a-days every person uses android for different purpose, so it doesn't require any additional system for the system to be bought. Now basically there are very simple steps to use our developed system and those are :-

1.First of all, our system is very much compact and smaller in size so it can be easily installed in a particular watertank.

2.Then the user needs to switch on the motor to transmit water into the water tank. And then your work is done. Now our system will work automatically. And when the water level gets rises upto a certain level inside the water tank, then it will automatically switch off the motor using relay module which we haveused.

3.Also, user can use his/ her android for controlling or operating the motor remotely. The user needs to install an application from play store, i.e., "Smart Water Level Tracker". And then user needs to open the application. In that application, firstly user needs to signup using email and password. After that a new screen will appear through which user needs to login with the previously entered password. After verification of password, a new screen will appear where different options are available for the user like user can get the data of the amount of water utilized as well as amount of water saved on a daily basis. And also, the user can switch on and off the motor using that android phone by being at any location. The user doesn't need to be present manually for performing this task. It can be easily operated though this developed application.

4. Conclusion

The aim of the framework is to minimize the wastage of water and to use the water in an efficient manner. Problem may be that user may forget to switch off the motor thus allowing the overflowing of water from the tank which eventually leads to the wastage of water. The application has been used so that even though user is not present in his home he can switch it off from anywhere as it is the part ofIOT. At the current stage the project detects the level of water uptoa certain level and it will automatically switch off

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the motor. The option of ON and OFF using button, has also been provided in the workso that it can be used as part of home automation systems. The correct data on the android application of the amount of water utilized as well as amount of water saved on a daily basis; has been taken into consideration. It helps the user to manage the water in an efficient manner and this will automatically leads to the decrease in the level of water wastage and hence removing the problem of waterscarcity.

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