

Effective and Efficient Rainwater Monitoring and Control System

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Abstract

As we all know that water is an important resource for life and its existence. Nowadays water scarcity is nearly in every corner of the world and to overcome this problem collecting of water and storing it for several other purposes is being practiced. Rainwater Harvesting is one of the method to overcome this problem and this method is being practiced from a long time back but in our project we will be mainly working on how we can effectively & efficiently manage the water which is stored from the rain in a container/tank and use it when required. The system developed can measure the water level and several other parameters of water for the supply and can provide update through alert message as well as store the data to the cloud and anyone can remotely access the data which is stored in the cloud. The hardware components which we will mainly be using is Renesas Microcontroller, Relay, PH sensor, Water Pump, LCD and thus making our project more simpler and easier for the people to use.

Article History

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1. Introduction

Rainwater is one of the major source of water that falls on the surface of the earth and most of the water from the rain is been discharged and runoff into lakes, rivers, canals. As we all living beings require water for most of our basic needs and purpose in day to day life. In cities water scarcity is one of the major problem that they face in daily life so to overcome this problem storing of water is not only necessary task to perform but apart from storing of water we also have to monitor and control the water which we have stored. So in this project we are mainly focusing on how the monitoring and controlling of the stored water is been done so that the water stored can be effectively and efficiently been used without wasting a single drop of water. In this project there are different kinds of sensors are used such as PH sensor, Rain sensor etc. The work of the sensors is to sense the parameter and display the related results. For the displaying purpose we are using LCD device which

will be connected to the microcontroller. We will be using Renesas Microcontroller for controlling of the hardware. All the related information regarding the rainwater which is collected in the tank such as storage level, PH level, date and other data will be stored to the Amazon cloud where we will be having a page to display the related information of the rainwater. Apart from all these alert message will also be send to the registered number.

2. Literature Survey

As we clearly know that several studies were conducted with respect to the development and implementation of rainwater effectively in commercial as well as in household buildings in urban areas. A research has been conducted by (Appan et al 1997, Terry Thomas 1998, Marcel Marcelo et al 2012, B.Abwneh et al 2011, A.Jabelamar and G. Ravikumar 2011).

Rainwater Harvesting and storing is also economically feasible to apply as in few cases it provides benefits in many ways including financial benefits also. Nowadays this system of rainwater harvesting is accepted by the society as a research on the economic feasibility analysis with various existing methods have been performed to prove that economic value of rainwater controlling and harvesting systems are accepted by the society.

This system of rainwater to store and use has been widely applied in several other countries around the globe.

Keeping in mind some of the social aspects of rainwater harvest has also been conducted by several Researchers (N.Nagaraj et al. 2011). Talking about environmental side then there also rainwater harvest system supports environmental sustainability by reducing the usage of water and also helps to process the groundwater.

In order to meet clean water before using this requires many treatments to be done in order to maintain the quality of rainwater. As many other countries have issued rules and regulations regarding the implementation of rainwater harvesting system.

3. Proposed System

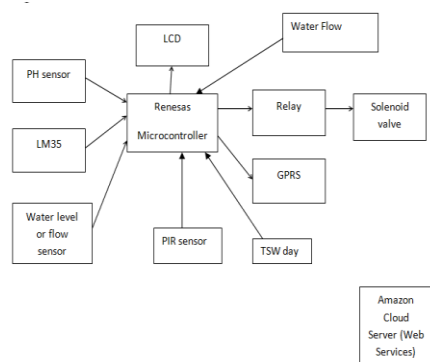


Figure 1: Architecture diagram of the system including all the modules.

The system is been made with several hardware and software components which are dumbled together in this project so that the system can function properly and to get the desired result by giving the correct input and to store the water and to measure the accurate result and store it to the cloud.

There are several methods used for each of the component to perform its task and all of them are connected together so that the system can generate correct output and the desired results can be obtained.

4. System Design & Analysis

Renesas Microcontroller

We have used Renesas microcontroller in our project as this microcontroller is very cost effective and is a 16 bit microcontroller. This microcontroller is the heart of the hardware and performs several tasks. It

has three sections in it the first one is controller section second one is communication section and the third one is power section. The Starting of the motor and controlling of the device is mainly handled by this controller in our project.

The Soil Moisture Sensor

This sensor is used to find the content or to measure the amount of moisture present in the soil. This sensor is one of the most easiest and simpler one for the sensing of moisture content in the soil.

Rain Sensors

Rain sensor is used to detect the rain and create an alarm. Hence we can preserve water and use it later for different purposes. To conserve water there are several methods that are available like harvesting etc. To increase the level of underground water we can Use this methods. These sensors are mainly used in the field like automation, automobiles, irrigation and communication, etc.

Amazon Web Services (AWS): We have used cloud to store the information over internet so that it will be easier to access from anywhere. In this project we are using Amazon cloud (AWS). We will be creating an account on AWS by normal procedure and then we can have our own AWS services which will be secured with username and password. Thus we will be creating and storing information on Amazon cloud.

I. Components Required

Table 1: Hardware required for the project.

SL NO.	COMPONENT
1.	LCD
2.	Renesas Microcontroller RL78
3.	LM35
4.	GPRS/GSM
5.	Relay
6.	Water level sensor
7.	PIR sensor
8.	PH sensor
9.	Solenoid valve

Table 2: Software required for the project.

SL NO.	Software
1.	Cubesuite++
2.	Renesas flash programmer
3.	Dotnet

5. Methodology

This project is mainly a combination of software as well as hardware components which runs together for

the smooth functioning of this complete project to execute and to get the desired results. As collection of rain water is done in a water tank. There will be a Renesas microcontroller which will control all the hardware parts of the project, to which several kinds of sensors will be attached to it for the smooth working of the system.

For the analysis of the project the PH level and water level is considered for analysis of rain water for the monitoring purpose. To monitor the volume of water discharge water level sensor is used.

The monitored sensor value is uploaded to cloud via General Packet Radio Service (GPRS). In this project we will monitor and control several parameters of rain water which is collected and stored in the tank and the information gained from that will be stored in the cloud.

In this project we will be mainly focusing on monitoring & controlling of the Rainwater which is collected and stored in the water tank. The sensors which we will be using in this system are PH sensor, water level sensor, rain sensor. And all the readings will be display on the LCD.

We will be also using relay and water pump which will help in starting of the motor and relay is used for the triggering of the motor. The PH sensor which is used in this will help us to know the PH value and will display Acidic or Neutral on the LCD.

In the storage level which will be in the water tank will mainly focus on high and low which means that if the water is full or above a certain level then the motor will be in OFF mode and if the water level is below or tank will be empty then the motor will be in ON mode.

Apart from all these we will be connecting this information to the cloud with the help of GPRS/GSM and store it in Amazon Cloud by creating an account in AWS.

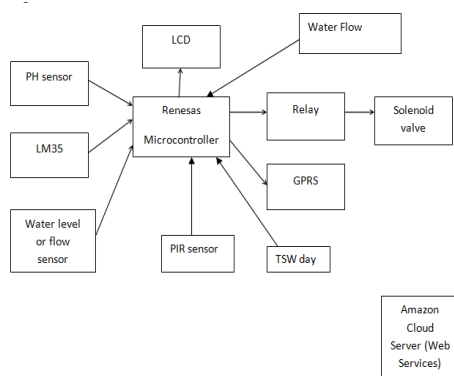


Figure 2: Modules of the Project.

6. Experimental Results

The Result of this project is that we have collected the rainwater and stored in a water tank and the related information such as PH value, water level, etc are stored in the Amazon cloud and we can remotely access the data and see the usage of the rainwater which is been stored in the tank all the details of this

project is uploaded on the cloud so that it can be easier of us to monitor as well as for the controlling and taking several measures for the rainwater and thus lead to successful implementation and running of this project.

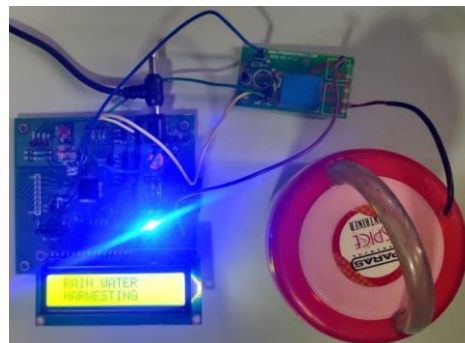


Figure 3: Renesas Microcontroller along with the LCD & motor & relay as well as the water tank connected all together.

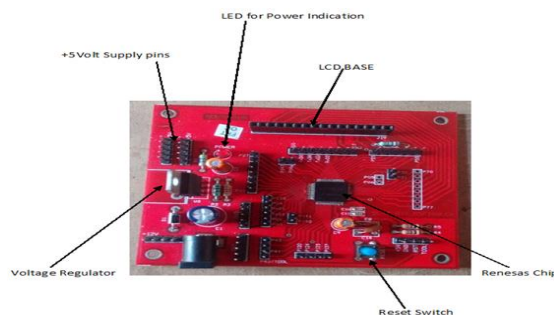


Figure 4: Renesas Microcontroller



Figure 5: Soil Moisture Sensor



Figure 6: Rain Sensor

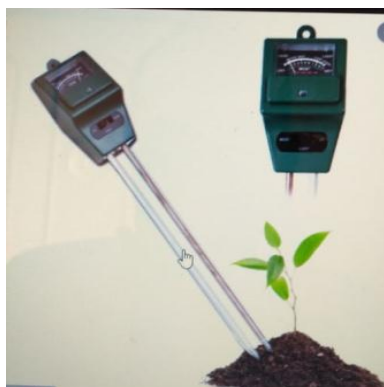


Figure 7: PH Sensor

7. Conclusion & Future Enhancement

After all the procedure to be finished and seeing the results we came to a conclusion that this project is developed for the rainwater firstly to collect that water and store it, moving forward towards this project deals with several kinds of sensing of rain water and analysis of water which is stored in a tank, apart from all these this project will start the motor to fill the tank and ON & OFF of the motor according to the requirement and finally storing the information to the Amazon cloud.

Coming to the future work of this project we can further add more features to this project so that it can perform all other tasks also and can help in the ease of work related to the storing, controlling and monitoring of the rain water. Most of the units can be embedded along with the controller on a single board.

We can also use many other areas of computer science which will help in more accurate and correct monitoring of the system.

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