

Internet Of Thing Based Effective Water Management System For Real Time

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Abstract

Efficient water management system is a smart technology to save rainwater, control and prevent spoilage of water. Which uses a smart water tank which saves rainwater and prevents the spoilage off the water, where this proposed system will be beneficial in both cost and efficient water management and the rainwater is further used for smart irrigation system, where the water which pumped to the garden through sprinkler will be from the water tank. Here are many of the ways IoT can enhance water management- Water leakage detection. More green systemic water management. Water excellent and protection monitoring. Quality control on water reserves. Transparency on consumption. Prescriptive upkeep on infrastructure. This research work is helpful in managing rainwater efficiently by using technology and resources.

Keywords: IoT, Water Management, Rainwater, Sensors, Sprinkler, Circuits.

Introduction

Methods of water management can be categorised as Maintenance, Distribution, retrofit program and Behavioral-practices. The main objective of this work is to implement smart technology to save rainwater, which can be used for many purposes and this research work may have a drastic change in how people use water, it also helps people to make use of water efficiently and which will result is sustainable usage of water. This experiment work has a cost beneficiary objective and also can be implemented in all the individual houses. This water can be used for car wash, maintaining lawn areas, etc and also pumped into a sprinkler for garden purposes and it helps in growing greenery around us.

The problem we are currently facing is water problem everywhere, according to current geographical data, cape town was the first city to reach Zero-day, which may be possible to happen in coming decades in sou-polo, Mexico, London, France, Bengaluru. It was mentioned as 'Bengaluru', not India.

Currently, there is a water loss of approximately 72.5% that could be used in various daily activities essential for the home. There is no doubt that water is the main and most important component of the planet, could be considered as an essential resource, which is granted by land. It is a shame that human beings do not even realize the role that this resource has for human development and no reaction on their part to promote the care and use of water.

This is because of inefficient usage of water, water is being wasted everywhere and also because of deforestation, and other natural disasters, as the problem is very high, By 2040 there would be no drinking water available in most of the places. Suddenly we cannot grow trees and forests, so we know that the solution is not simple and it takes long years. So there should be made some serious solutions to save water and to use it efficiently.

Advantages of existing system:

- Rainwater is stored in the safest way.
- There will be no spoilage of water.
- Automatically maintains the garden through sprinklers.
- Reliable and cost beneficiary

Disadvantages of existing system:

- Heavy rains may result in not treating rainwater.
- Not suitable when there's too much rain.
- Only rainwater is saved into tank.
- This system is affected when there's no rainfall.

2. Related Work

Rain water harvesting is receiving increased attention worldwide as an alternative source of water especially in drought affected area (Monali Bhosale,et. al 2020). Rainwater harvesting (RWH) is a practice of growing importance in the United Kingdom, particularly in the southeast of England where the water availability per person is even less than in many Mediterranean countries. Research work proposed the rainwater harvesting and stormwater management in UK (Shereif H. Mahmoud • X. Tang. Et. Al 2015). The "Resourceful smart home energy management system: An exploration of IoT use cases" desires to take care of the developing issue of pointless energy utilization in a singular's family utilizing the idea of the IoT

(web of things). The plan screens and investigates the energy devoured by the power outlets in the family utilizing sensors and microcontrollers. The proposed configuration gives the client different control strategies to control energy utilization(M. B. Soudan et. al 2018).

In our research work we have implemented the idea of monitoring and analyzing the electricity usage of the home. But unlike the referenced article where its major focus is on mains power consumption and usage of power by different sockets. Our work focus is on the efficient usage of different sources of electricity.

The “Design of an IoT Energy Monitoring System” is a writeup on plan and carry out a minimal expense IoT energy checking framework that can be utilized in numerous applications, for example, power charging framework, energy the executives in shrewd matrix and home computerization (K. Chooruang and K. Meekul (2018)).

In our research work we are using a similar idea of energy monitoring using an ACS712 current sensor, It allows us to measure and monitor the power usage in the home. We also trying to implement the concept of reverse metering/net metering, where excess energy produced through renewable resources is routed to main grid and appropriate amount is reduced from the monthly electricity bills.

In [3], The “Energy monitoring and control using Internet of Things (IoT) system” is a writeup on manually controlling the state of different outlets in the home (W. T. Hartman, et.al. (2018)).

Unlike this referenced work, we are using a fully automated system that switches between different energy resources without the need of manual intervention. The operations can also be overridden manually if the user chooses to but its not recommended.

Savvy Home innovation is the eventual fate of private related innovation which is intended to convey and circulate number of administrations inside and outside the house through organized gadgets wherein every one of the various applications and the knowledge behind them are coordinated and interconnected. These savvy gadgets can possibly impart data to one another given the long-lasting accessibility to get to the broadband web association. (L. Salman et al.,2016)

We take the view that effective reception of IoT in modern conditions ought to be treated as a multidisciplinary issue and ought to be completed in moderately little strides to limit dangers and interruption. (A. Vakaloudis and C. O'Leary, 2019)

Web of Things (IoT) is the arrangement of advancements that can interconnect anything, from day to day existence objects to more modern organized gadgets. The IoT worldview is continually expanding the quantity of gadgets claimed by end-clients. (Y. Benazzouz, C. Munilla, et. al 2014)

The Internet of things (IoT) is quick advancing with a wide scope of innovations being assigned explicitly as IoT arrangements. Studies on such arrangements for the most part reference the particular correspondence medium while refuting the total engineering of the IoT framework. According to a framework point of view, a total IoT arrangement can be isolated into three classes, the information authority, the specialized technique and the cloud stage administration. (J. Fox, A. Donnellan and L. Doumen, 2019)

The accomplishment of the IoT world requires administration arrangement credited with pervasiveness, dependability, elite execution, productivity, and versatility. (A. R. Biswas and R. Giaffreda, 2014)

Progression in IoT based application has turned into the best in class innovation among the specialist because of the accessibility of Internet all over the place. To make the application more easy to use, online and android based advancements have acquired their significance in this state of the art innovation. (S. K. Vishwakarma, et. al 2019)

With each upgrade in Internet as far as speed and data transmission, IOT (Internet Of things) is taking the market on another hub and thumping the entryway with new chances of innovations. (A. K. Gupta and R. Johari, 2019)

The Received Signal Strength Indication (RSSI) worth of Bluetooth can be utilized to assess distance between Internet of Things (IoT) gadgets. IoT gadgets, inside Wireless Body Area Network (WBAN) region, can perceive each other in office climate naturally. (J. Jung, D. Kang and C. Bae, 2014)

Proposed work

In this proposed system we are implementing a smart technology to save rainwater, control and prevent spoilage of water. Which uses a smart water tank which saves rainwater and prevents the spoilage off the water, where this proposed system will be beneficial in both cost and efficient water management and the rainwater is further used for smart irrigation system, where the water which pumped to the garden through sprinkler will be from the water tank. This work is helpful in managing rainwater efficiently by using technology and resources.

Hardware Requirements:

1. Arduino Uno
2. LCD Display
3. Water level Sensor
4. Moisture Sensor
5. Single Chanel relay

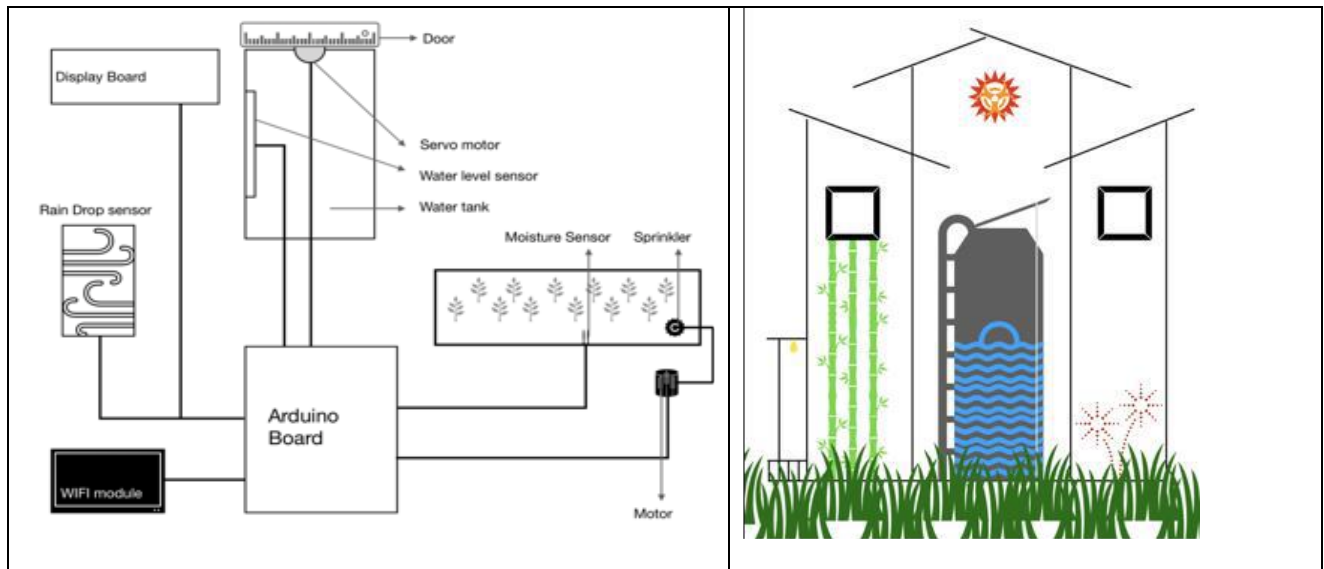
6. Raindrop sensor
7. Servo motor
8. Sprinkler
9. Jumper Wires
10. Water pump Motor
11. Node MCU Wifi module

And Arduino IDE

Components used

- **Arduino IDE:** The Arduino Integrated Development Environment (IDE) is a cross-platform application (for Windows, macOS, Linux) that is written in functions from C and C++. It is used to write and upload programs to Arduino compatible boards, but also, with the help of 3rd party cores, other vendor development boards.
- **Arduino UNO:** The UNO is the best board to get started with electronics and coding. If this is your first experience tinkering with the platform, the UNO is the most robust board you can start playing with. The UNO is the most used and documented board of the whole Arduino family.
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- **Single Chanel relay:** The Single Channel Relay Module is a convenient board that can be used to control high voltage, high current loads such as motor, solenoid valves, lamps, and AC load. It is designed to interface with a microcontroller such as Arduino, PIC and etc. ... It also comes with an LED to indicate the status of the relay.
- **Servo Motor:** Servos are controlled by sending an electrical pulse of variable width, or pulse width modulation (PWM), through the control wire. There is a minimum pulse, a maximum pulse, and a repetition rate.
- **Water pump motor:** Motor is an electrical machine that converts electrical energy into mechanical energy and the pump is a mechanical device that converts mechanical energy into work to be done.

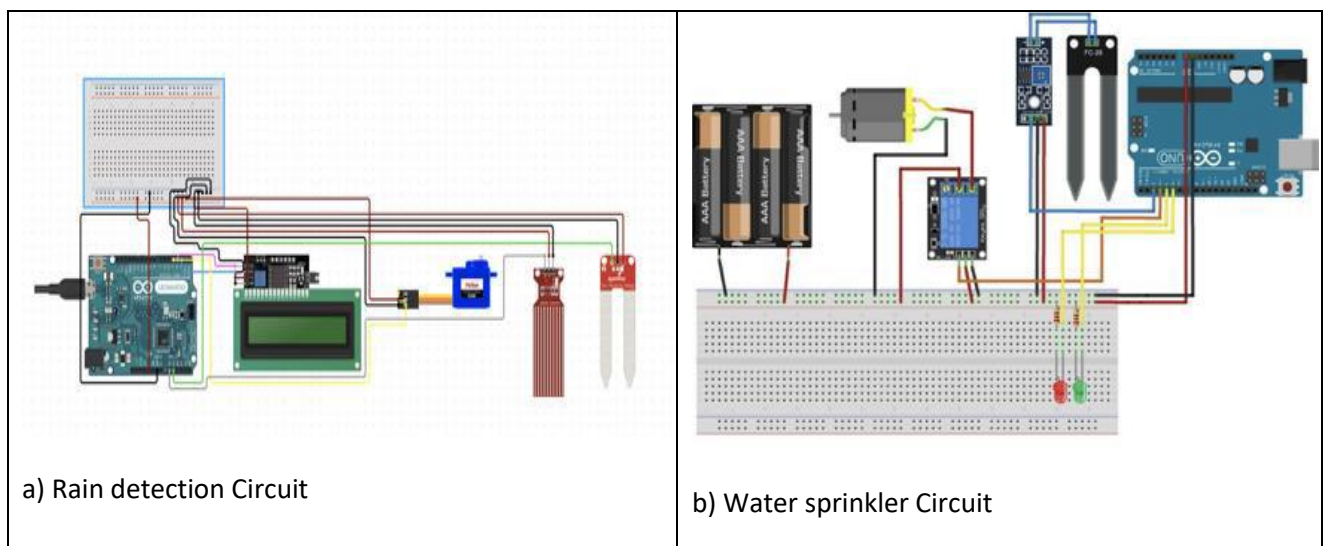
Figure 1: Block Diagram of the proposed system



- **Water level Sensor:** A level sensor is a device for determining the level or amount of fluids, liquids or other substances that flow in an open or closed system. ... Continuous level sensors are used for measuring levels to a specific limit, but they provide accurate results.

- **Soil Moisture Sensor:** The Soil Moisture Sensor is used to measure the volumetric water content of the soil. This makes it ideal for performing experiments in courses such as soil science, agricultural science, environmental science, horticulture, botany, and biology.

Figure 2: Circuit Diagram: a) Rain detection Circuit b) Water sprinkler Circuit



- **Rain Sensor:** A rain sensor or rain switch is a switching device activated by rainfall. There are two main applications for rain sensors. The first is a water conservation device connected to an automatic irrigation

system that causes the system to shut down in the event of rainfall. This sensor is used in our work for identifying the density of the traffic , figure 2 a) shows the Rain detection Circuit.

● **Sprinkler:** Sprinkler irrigation is a method of applying irrigation water which is similar to natural rainfall. Water is distributed through a system of pipes usually by pumping. It is then sprayed into the air through sprinklers so that it breaks up into small water drops that fall to the ground, figure 2 b) shows the Water sprinkler Circuit.

Flow diagram

Figure 3: Flow Diagram: a) Rainwater Management b) Sprinkler system

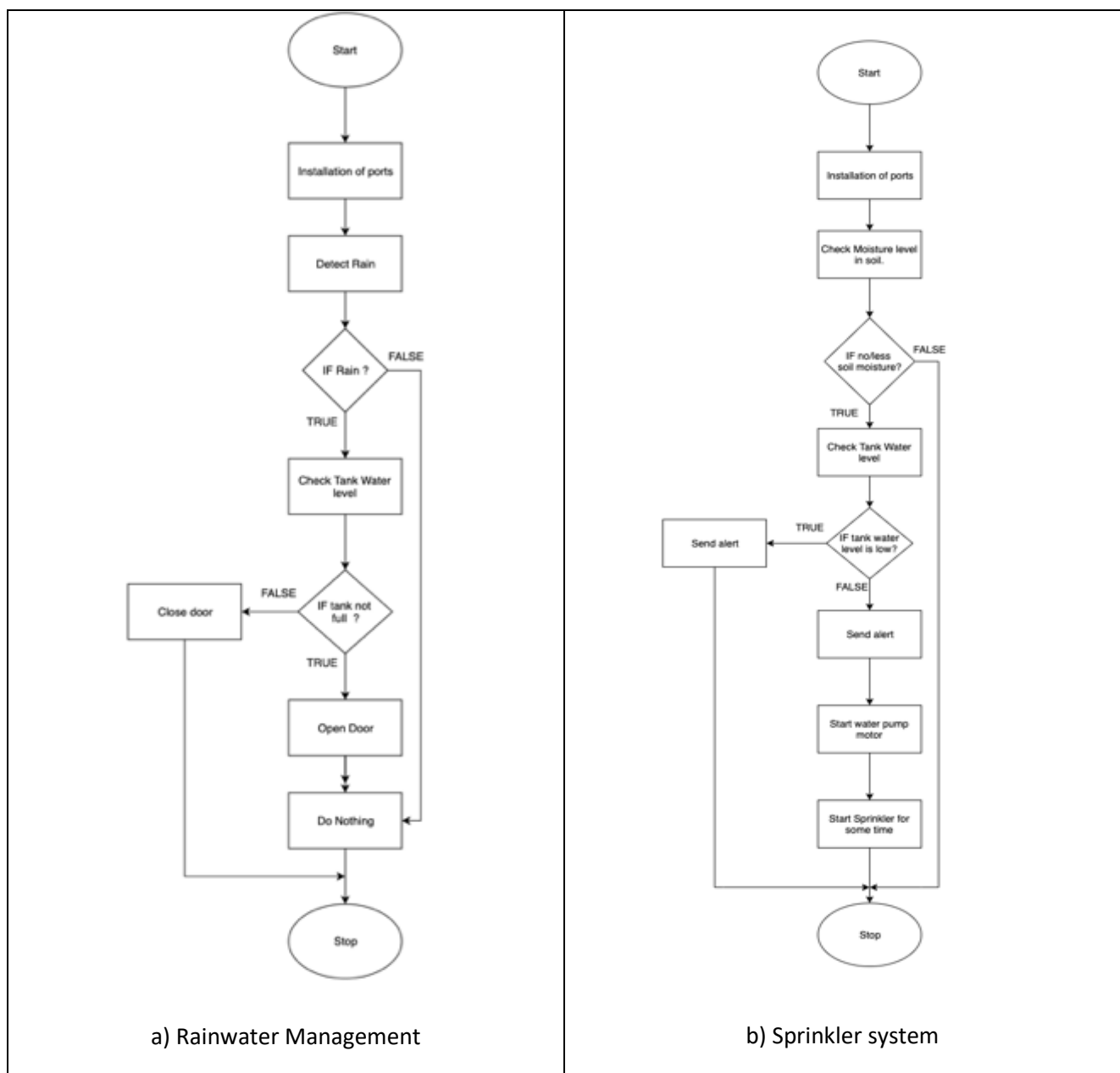


Figure 3 a) represents the Rainwater Management Start with installation ports and detect Rain, if Raining condition move to check tank water level and move to another condition if tank is not full then move to open door and do nothing and stop the process otherwise if tank full then close the door. If it is not raining do nothing and stop the process.

Figure 3 b) represents the Sprinkler System Start with installation ports and check moisture level in the spoil then check the condition 'if no/less soil moisture?' then move to check water tank level and condition 'if water tank levels low?' then sends alert and stop the process. The condition 'if no/less soil moisture?' is false then condition move to stop. And if water tank level is not low condition move to send alert and start water pump motor and then start sprinkler for some time.

Result and discussion

The rainwater is wasted and not treated properly all the time, here, we are implementing a smart technique to treat rainwater, we are trying to store the rainwater in-tank automatically when there is rainfall. The main Moto here is to save rainwater without any spoilage.

Using the same Arduino UNO, we are also detecting the water level in the tank, and using it to garden purpose, i.e... An automatic system is developed to pump this water into a motor to the sprinkler, whenever the moisture content is less in the ground. Further detailed results are as follows.

Rain detection : The rain detection sensor detects the rainfall and checks the tank level, whether to store the rainwater or not. It sends a signal to the water level detection sensor module to check the water can be stored or not.

Water level checking : When there is rain, it receives a signal from the previous module and this module checks for the water level in the tank, if water level present in the tank is low, it automatically opens the door to store rainwater, else the door remains closed.

Moisture detection : This module checks for the moisture level in soil/garden. If there's no moisture content in the soil it automatically sends a signal to the water level sensor to check if there is enough water in the tank to pump for the garden.

Sprinkler system : Sprinkler system is implemented to supply the water efficiently to garden when the soil moisture sensor detects the low moisture content in the soil, it automatically sends a signal to water level sensor, if there is enough water to pump, it automatically transfers the control to the sprinkler system, to pump the water for the allotted duration.

Conclusion

The proposed system represents to save rainwater without any spoilage. There are a lot of features and functionalities that can be integrated into the proposed application, but the work scope has been limited to

diligently resolve the problems as included in the work. Rainwater harvesting is the gathering and storage of rain, in preference to allowing it to run off. Rainwater is accumulated from a roof-like surface and redirected to a tank, cistern, deep pit (well, shaft, or borehole), aquifer, or a reservoir with percolation, so that it seeps down and restores the groundwater. It reduces soil erosion and flood dangers via collecting rainwater and decreasing the go with flow of storm-water to prevent urban flooding. Most homes that utilize rainwater harvesting systems have an integrated catchment region on the pinnacle of the roof, which has the capability of accumulating huge volumes of water in case of rain-storms. This research work objective must be achieved pertaining to the Time Constraint and Monetary constraint applied in accordance with the defined functionality of the system. However, features that are not included in the system can be considered as future enhancements. The limiting areas of this work contributing to enhancement thus are as follows, namely, Water Recycling and purification, Automated Pet feeding, Methods to use recycled water for Households.

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