ULAB

UNIVERSITY OF LIBERAL ARTS BANGLADESH

COURSE TITLE : COMPUTER ORGANIZATION & ARCHITECTURE

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SECTION :03

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Title :

IOT based Rain water Harvesting System.

Introduction :

Rain water harvesting (also known as rainwater recycling) is the process of collecting and storing rainwater for irrigation and non-potable needs, reducing reliance on traditional water sources and conserving water. It's an environmentally conscious approach that aids in preserving water resources and decreases dependence on traditional water sources such as municipal water supplies. Arduino based Rain water harvesting system optimizes water usage. By using the power of IOT, these solutions contributes to a more sustainable future. Additionally, the inclusion of pH level detection through software implementation makes the system more effective. By implementing pH detection software, we can monitor the acidity of rainwater, which is crucial for sustainability. Arduino-based systems for rainwater harvesting include components like rain sensors , and tanks, offering a flexible and efficient solution for sustainable water management. By integrating Arduino technology, these systems become scalable, efficient, and customizable, contributing to environmental preservation and promoting water sustainability in both residential and commercial context.

Problem Statement:

Conventional water supply systems are frequently inefficient and environmentally unsustainable, resulting in overreliance on centralized water sources and heightened strain on ecosystems. However, current rainwater harvesting setups often lack efficient management and control features, occasionally struggling to address these issues. An Arduino-powered rainwater harvesting system will incorporate sensors to monitor rainfall intensity and storage tank levels in real-time, enabling adaptive adjustments to water collection and distribution

processes. An Arduino-driven rainwater harvesting setup will include sensors to monitor rainfall intensity and storage tank water levels in real-time, facilitating adaptable management of water collection and distribution procedures.

Objective:

The objective of implementing an Arduino-based rainwater harvesting system is to develop an effective and automated solution for storing and utilizing rainwater. Through the integration of Arduino technology, the system endeavors to enhance water management procedures, decrease dependence on conventional water sources, and promote sustainability in water Moreover, it ensures the safety of the harvested water from being contaminated by acid rain.

Motivation:

The main motivation behind developing an IOT based rainwater harvesting system is to grow awareness of the importance of water conservation and sustainable resource management. Our mission is to promote sustainable water management through the widespread adoption of rainwater harvesting system.

Theory:

Arduino UNO: Arduino is an open source electronics platform based hardware which is easy to use for various systems.

Water Sensor: Water Sensor module can easily sense the presence of water. They use conductive or optical methods on their surface and convert that into an electrical signal.

Servo Motor: Servo motors allows precise control of angular position , in rain water system servo motors are used to control mechanisms involved in water collection, storage.

Apparatus :

List of equipment that were needed for this project:

Name	Quantity
Arduino UNO	1
Rain Water Sensor module	1
Jumper wires both male and female	1 set
Bread board	1
Micro servo motor	1

Due to budget insufficiency, we had to omit the inclusion of a pH sensor module.

Circuit Diagram:

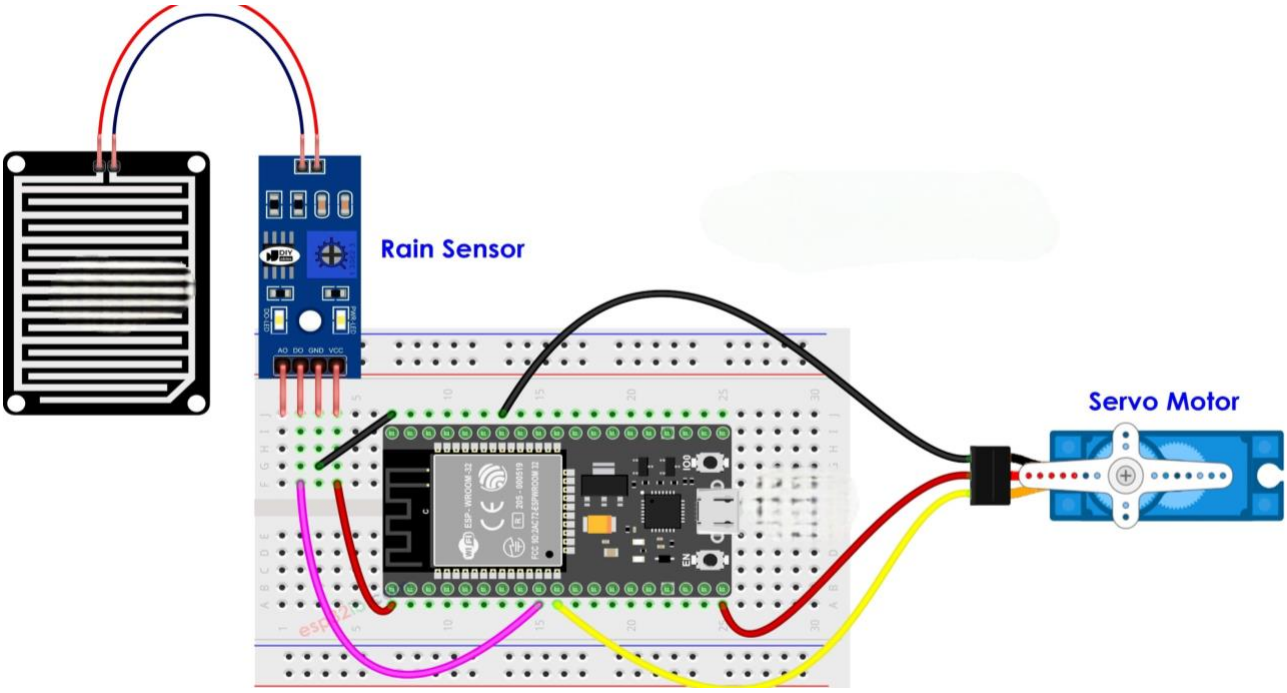

Fig 1: Rain water harvesting Circuit.

Design:

Flowchart:

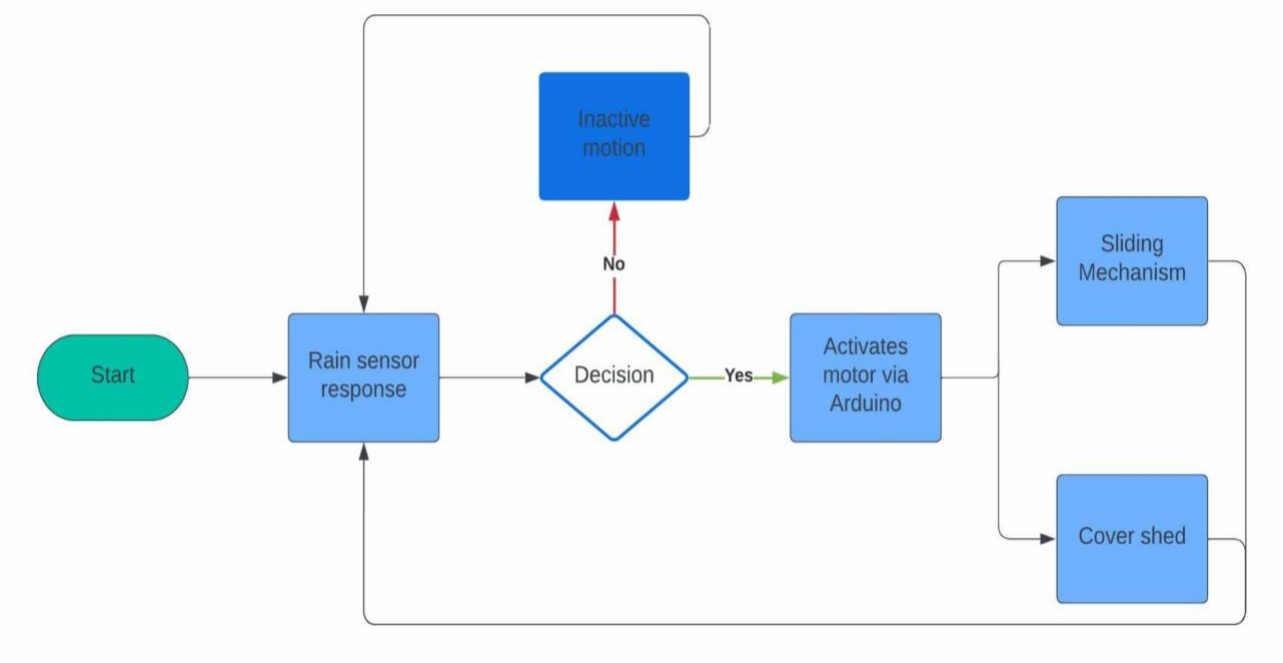

fig 2: Flowchart of Rain water harvesting system

Software:

Arduino IDE

Modules for interfacing with sensors and actuators

Code:

```
#include <Servo.h>

#define RAIN_SENSOR A0

#define SERVO_PIN  10

Servo myservo; // servo object

Float pHValueThreshold = 4.5; // pH value threshold for acid rain
```

```
Void setup() {
  pinMode(RAIN_SENSOR, INPUT); // Set rain sensor pin as input
  myservo.attach(SERVO_PIN); // servo pin 10
  myservo.write(0); // Initialize servo position to 0 degree
  delay(2000); // Delay
  Serial.begin(9600);
}

Void loop() {
Int rainValue = analogRead(RAIN_SENSOR); // Read value from rain sensor
  Float pHValue = readPHValue(); // Read pH value
  If (pHValue < pHValueThreshold) { // If pH value is less than acid rain
    Myservo.write(0); // Rotate servo to 0 degrees
    Delay(2000); // Delay for servo to reach position
  } else { // pH value is higher than acid rain
    If (rainValue < 500) { // rain is detected
      Myservo.write(180); //  to 180 degrees
      Delay(2000);
      // wait until rain stops (rain sensor value 1023)
```

```
      While (analogRead(RAIN_SENSOR) < 900) {
      Delay(100); // Adjust delay for smooth checking
      }
      Myservo.write(0); //back to 0
      Delay(2000); // Delay
    }
  }
  Delay(1000); // Check rain sensor and pH value every 1 second
}
//function to take input of the ph meter
Float readPHValue() {
  Return 6.0;
}
```

Budget Estimation:

Here is the budget estimation of our project:

Equipment	Budget
Arduino uno (Standard)	710/-
BreadBoard	125/-
Rain water sensor module	90/-
Micro servo motor	175/-
Jumper wire	120/-

Outcome:

Following the project's completion, we hope for the following results:

1. Accurate rainwater detection using sensor information.

2.Auto detection of acid rain and deploying necessary measures.

3. The effective integration of sensors and actuators to create an automated system for detecting rainwater reduces the difficulties that humans have while storing and distributing water.

4.Due to resource limitations, the pH sensor could not be integrated into the sample implementation of the project. But the code was written so that the pH value can be manually input into the system and the system can deploy the necessary measures.

Future Work:

Integrating IoT Technology :

Explore integrating IoT sensors and devices to enhance the rain water harvesting system efficiency and connectivity with smart home technologies.

Advanced Forecasting :

Develop predictive analytics models to forecast rainfall patterns and optimize the system's water storage and distribution based on predicted demand.

User Friendly Mobile App :

Create a mobile app that allows to users to monitor, control and optimize the rain water harvesting system remotely from their smartphones.

Conclusion:

In conclusion, the integration of an Arduino-based rainwater harvesting system presents a promising automated solution for the collection, storage, and supply of rainwater. By leveraging Arduino technology, this system can streamline the process, ensuring efficient management of water resources with minimal manual intervention.. It provides a dependable and environmentally friendly method of water harvesting because of its capacity to precisely detect rainfall, initiate required processes, and control water distribution. Overall, this system holds great potential in addressing water scarcity challenges. It also promotes environmental conservation efforts.

Contribution:

Team members	Work	Percentage
Tasphia Islam	Circuit implementation, Code, Hardware implementation.	29%
Farah Hoque	Slide , report and flowchart, Hardware implementation.	28%
Fayza Farzana Islam	Proposal writing and report, Hardware implementation.	22%
Rafia Haque Arpita	Equipment purchase , hardware implementation.	21%

Reference :

- Chen, C., & Wu, Q. (2018). Development of an automatic irrigation system using IoT technology. *2018 IEEE International Conference on Consumer (ICCE)*. DOI: 10.1109/ICCE.2018.832
- Electronic Devices and Circuit Theory (11th Edition) by R. Boylestad and L. Nashelsky