A

PROJECT REPORT
ON

DATE AND TIME BASED WATERING SYSTEM USING RTC MODULE

Submitted By:
BOMMISETTY LOHITHA

Aim:

In recent years, the importance of efficient water management has become increasingly critical, particularly in agriculture and gardening. Traditional watering methods often lead to overwatering or underwatering, which can adversely affect plant health and waste valuable resources. To address these challenges, this project presents an automated watering system that utilizes an Arduino microcontroller in conjunction with a Real-Time Clock (RTC) module and a soil moisture sensor.

Objectives:

- To implement a date and time-based watering system using an RTC module for accurate scheduling.
- To monitor soil moisture levels to prevent overwatering.
- To provide a user-friendly interface for setting watering schedules.

Components Required:

Arduino Board(e.g., Arduino Uno)

The Arduino board serves as the central microcontroller for the project. It processes inputs from the RTC module and soil moisture sensor, executes the programmed logic, and controls the relay to activate the water pump. Arduino boards, such as the Arduino Uno, are popular for their ease of use, extensive community support, and compatibility with various sensors and modules.

RTC Module(e.g., DS3231)

The RTC module, such as the DS3231 or DS1307, is responsible for keeping track of the current date and time. It maintains accurate time even when the Arduino is powered off, thanks to a backup battery. The RTC module communicates with the Arduino via the I2C protocol, allowing the microcontroller to retrieve the current time and schedule watering operations accordingly.

Soil Moisture Sensor

The soil moisture sensor measures the moisture level in the soil. It typically consists of two probes that detect the electrical resistance of the soil; the resistance decreases as moisture increases. The sensor outputs an analog signal that the Arduino reads to determine whether the soil is adequately moist. This information is crucial for preventing overwatering and ensuring that plants receive the right amount of water.

Water Pump

The water pump is the actuator that delivers water to the plants. It can be a submersible or surface pump, depending on the setup. The pump is controlled by a relay, which acts as a switch to turn the pump on or off based on the watering schedule and soil moisture readings. The pump's capacity should be chosen based on the size of the watering system and the needs of the plants.

Relay Module(to control the water pump)

The relay module is an electronic switch that allows the Arduino to control high-voltage devices, such as the water pump, safely. When the Arduino sends a signal to the relay, it closes the circuit, allowing current to flow to the pump and activating it. Relay modules typically have multiple channels, enabling control of multiple devices if needed.

Breadboard and Jumper Wires

A breadboard is used for prototyping and connecting the various components without soldering. It allows for easy adjustments and modifications during the development phase. Jumper wires are used to make connections between the Arduino, sensors, relay, and other components on the breadboard.

Power Supply(for the water pump)

The power supply provides the necessary voltage and current to the Arduino, RTC module, soil moisture sensor, and water pump. Depending on the components used, the power supply may be a USB connection, a battery pack, or an external power adapter. It is essential to ensure that the power supply meets the voltage and current requirements of all connected devices.

Connections:

- RTC Module Connections:
    - VCC - 5V
    - GND - GND
    - SDA - A4
    - SCL - A5
- Soil Moisture Sensor Connections:
    - VCC - 5V
    - GND - GND
    - Signal Pin – analog pin(e.g., A0)
- Relay Module Connections (for water pump control):
    - VCC - 5V
    - GND - GND
    - Control Pin - digital pin on Arduino (e.g., D7)

Software Setup:

Install Required Libraries:

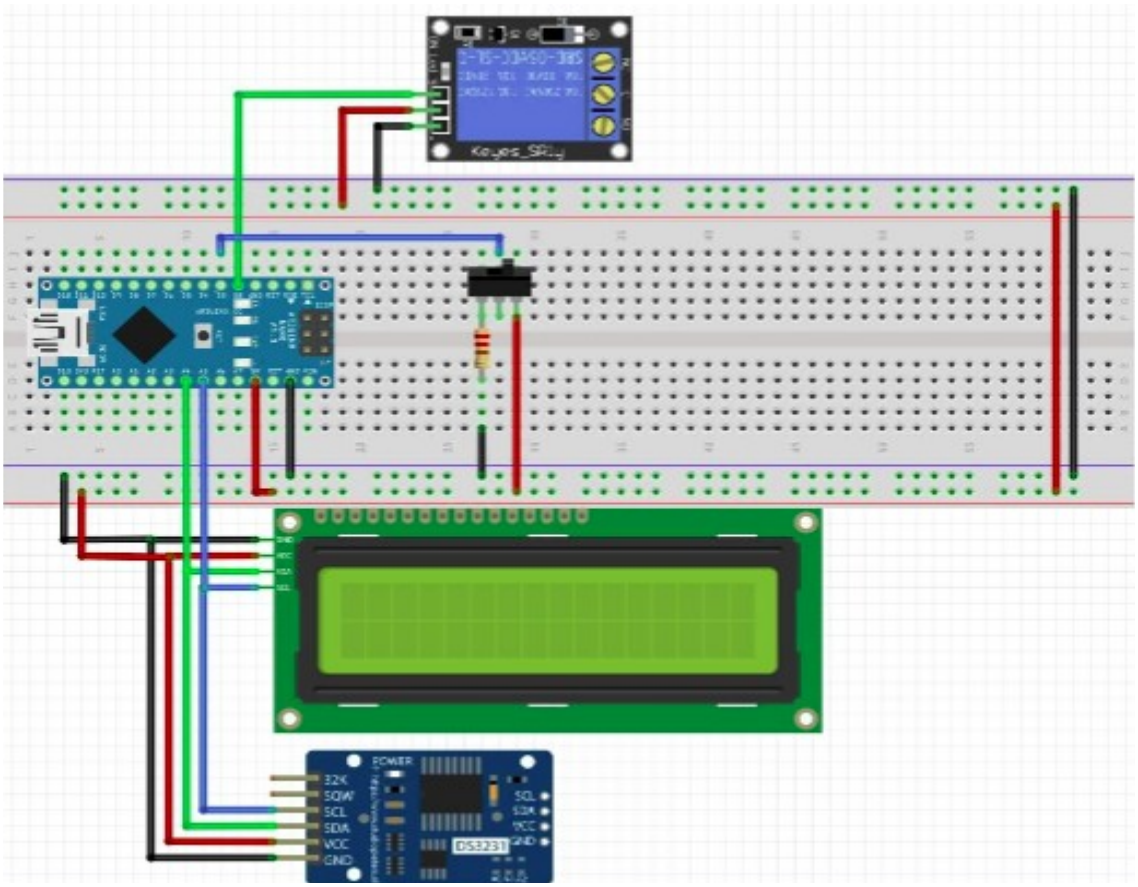
- For RTC: Install the `RTClib`library.
- For soil moisture sensor: No additional libraries are typically required.

Program:

```
#include <Wire.h>

#include <RTClib.h>


RTC_DS3231 rtc; // Create  object


const int relayPin = 7;

const int moistureSensorPin = A0;


void setup() {

   Serial.begin(9600);

   rtc.begin();

   pinMode(relayPin, OUTPUT);

}


void loop() {

   DateTime now = rtc.now(); //  current date and time

   int moistureLevel = analogRead(moistureSensorPin);


   // Example: Watering schedule at 09:25 AM

   if (now.hour() == 9 && now.minute() == 25 && moistureLevel < 300) {

      digitalWrite(relayPin, HIGH);

      Serial.println("Watering plants...");
```

```
    } else {
        digitalWrite(relayPin, LOW);
    }
    delay(60000);
}
```

SCHEMATIC:



Functionality:

- Timekeeping: The RTC module maintains accurate time, allowing the system to operate on a set schedule.
- Soil Moisture Monitoring: The soil moisture sensor continuously monitors the moisture level in the soil, preventing overwatering.
- Automated Watering: The system activates the water pump at the scheduled time if the soil moisture level is below a certain threshold.

Future scope:

Furthermore, the project serves as a foundation for future enhancements, such as the addition of user interfaces for easier scheduling, remote monitoring capabilities, and integration with smart home systems. Overall, this project exemplifies how technology can be harnessed to improve agricultural practices, promote sustainability, and simplify the care of plants, paving the way for smarter and more efficient gardening solutions.

Conclusion:

The date and time-based watering system using Arduino and an RTC module successfully demonstrates the potential of automation in modern gardening and agriculture. By integrating key components such as the RTC module, soil moisture sensor, water pump, and relay module, the project effectively addresses the challenges of manual watering, ensuring that plants receive the appropriate amount of water at the right times.

This automated system not only enhances plant health and growth by preventing overwatering and underwatering but also promotes water conservation, making it an environmentally friendly solution. The ability to schedule watering based on real-time data allows for efficient resource management, which is particularly beneficial for individuals with busy lifestyles or for larger agricultural operations.