IOT PHASE 5

SMART WATER MANAGEMENT

Smart water management:

Smart water meter

Smart water management refers to the use of technology and data-driven strategies to optimize the utilization, distribution, and conservation of water resources. This approach aims to address the growing challenges associated with water scarcity, population growth, and climate change.

A smart water meter is an advanced and technologically enhanced version of a traditional water meter used to measure water consumption in residential, commercial, and industrial settings.

Smart water meters are designed to provide more accurate, real-time, and detailed information about water usage. Increasing water consumption and wastage is leading to water scarcity. While a large population has no safe drinking water, some people use a lot of water on daily basis and waste it.

This project is of a smart water meter that measures our daily water usage and feeds live data on our phone that is connected to a database, which can be accessed by the concerned authorities through a web browser.

Objectives of Smart water meter:

1. Real-time Monitoring: Smart water meters provide real-time data on water consumption. This enables utility companies and consumers to monitor usage continuously, detect leaks, and make informed decisions about water conservation.

2. Leak Detection: One of the primary objectives of smart water meters is to detect leaks and anomalies in the water distribution system. By identifying leaks early, water utilities can reduce water wastage and minimize infrastructure damage.

3. Remote Reading: Smart meters enable remote reading of water consumption data, eliminating the need for manual meter readings. This not only reduces labor costs for utility companies but also provides more accurate and up-to-date information.

4. Water Conservation: Smart water meters encourage water conservation by providing consumers with detailed information about their water usage. This empowers

consumers to take control of their consumption and reduce wasteful practices.

5. Billing Accuracy: With accurate and timely data, smart water meters help ensure fair and precise billing for consumers. This can lead to reduced disputes and increased customer satisfaction.

6. Data Analytics: The data collected by smart water meters can be analyzed to gain insights into consumption patterns, identify trends, and optimize water distribution networks. This data-driven approach helps utilities make informed decisions and improve overall system efficiency.

7. Demand Forecasting: Smart water meters can assist in forecasting water demand, allowing utilities to better plan for future infrastructure and capacity requirements. This helps in avoiding over-investment or under-provisioning of water resources.

8. Remote Control: Some smart water meters can be integrated with control systems to remotely shut off or adjust water supply, reducing water wastage in case of emergencies or unauthorized use.

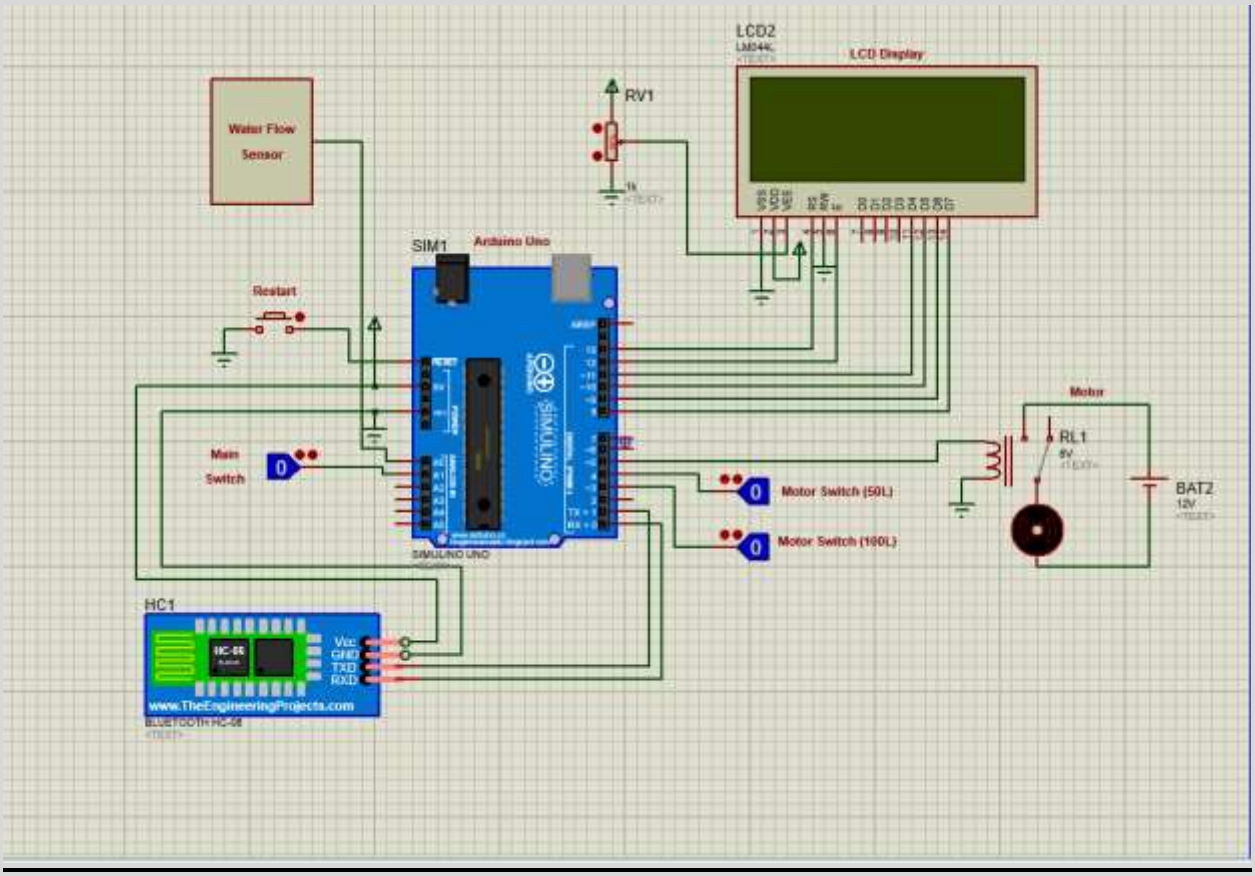
IOT device setup:

Components Required:

- ✓ Arduino board (e.g., Arduino Uno)
- ✓ Water flow sensor (e.g., YF-S201)
- ✓ LCD display (optional, for real-time readings)
- ✓ PROTEUS SIMULATOR
- ✓ Bluetooth module HC-06

Assemble:

- Using PROTEUS simulator .
- Connect the water flow sensor to the Arduino using wires. The sensor typically has three pins: VCC (power), GND (ground), and OUT (data). Connect VCC to 5V, GND to GND, and OUT to a digital pin on the Arduino (e.g., D2).
- connect the LCD display to the Arduino. connect power, ground, and data pins to the appropriate Arduino pins.
- Then connect the Bluetooth module to the Arduino uno fot the further process and connect the module to the bluetooth app created from the MIT app inventor
- Control the switches through manual switches or the Bluetooth app



Upload the Arduino Code:

Write and upload the Arduino code to read data from the water flow sensor. The code should include instructions to calculate and display water flow rate and total water usage. If you're using an LCD display, make sure the code displays the data in a user-friendly format.

Write the code for the Bluetooth module also and install it to the Arduino board

PLATFORM DEVELOPMENT:

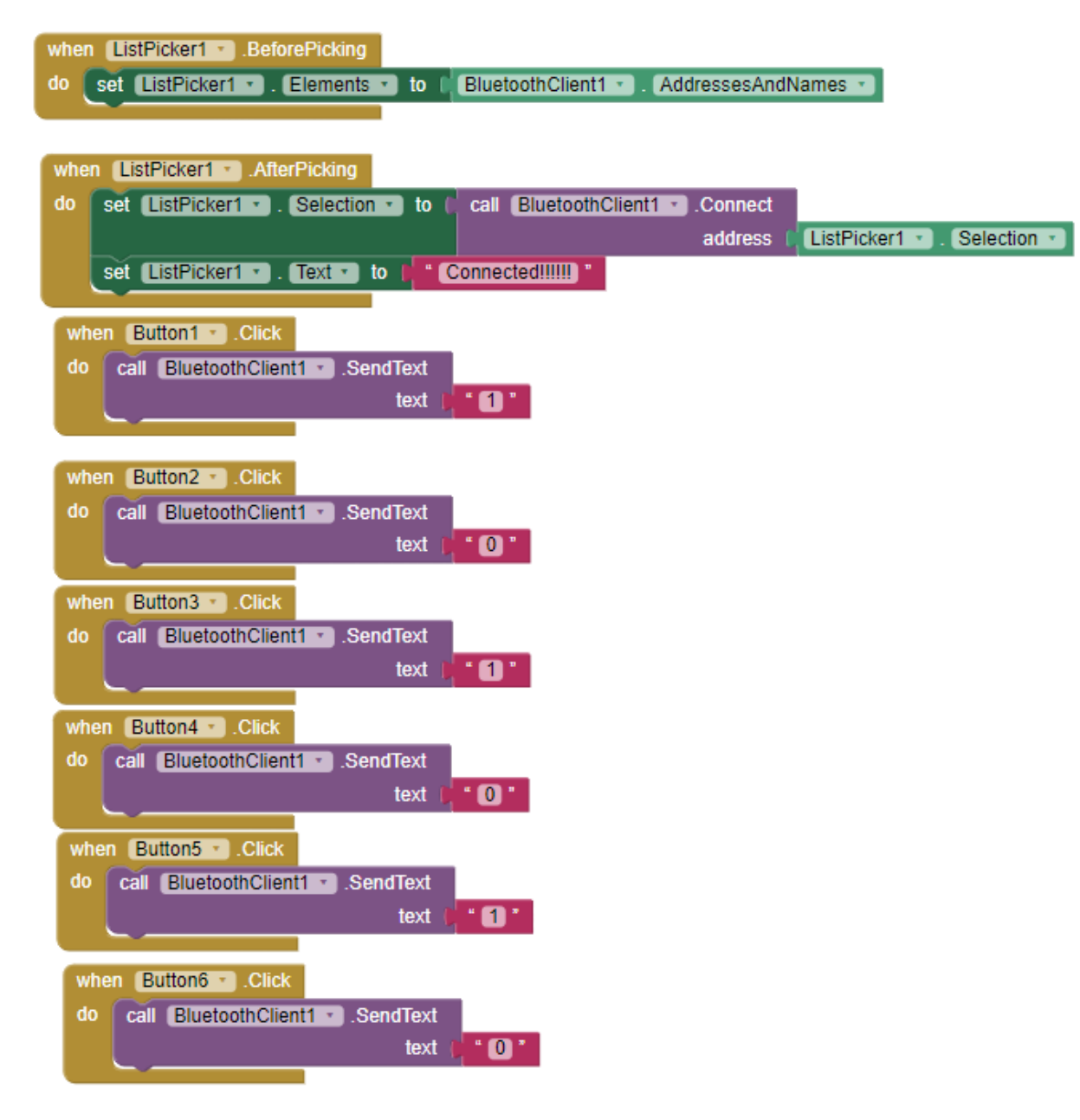
MIT APP INVENTOR

MIT App Inventor is a user-friendly, web-based platform for creating Android apps. It uses visual programming and a blocks editor, making it accessible to beginners. You can test your apps in real-time on Android devices, access device features, and even publish apps on the Google Play Store. It's popular in education for teaching app development.

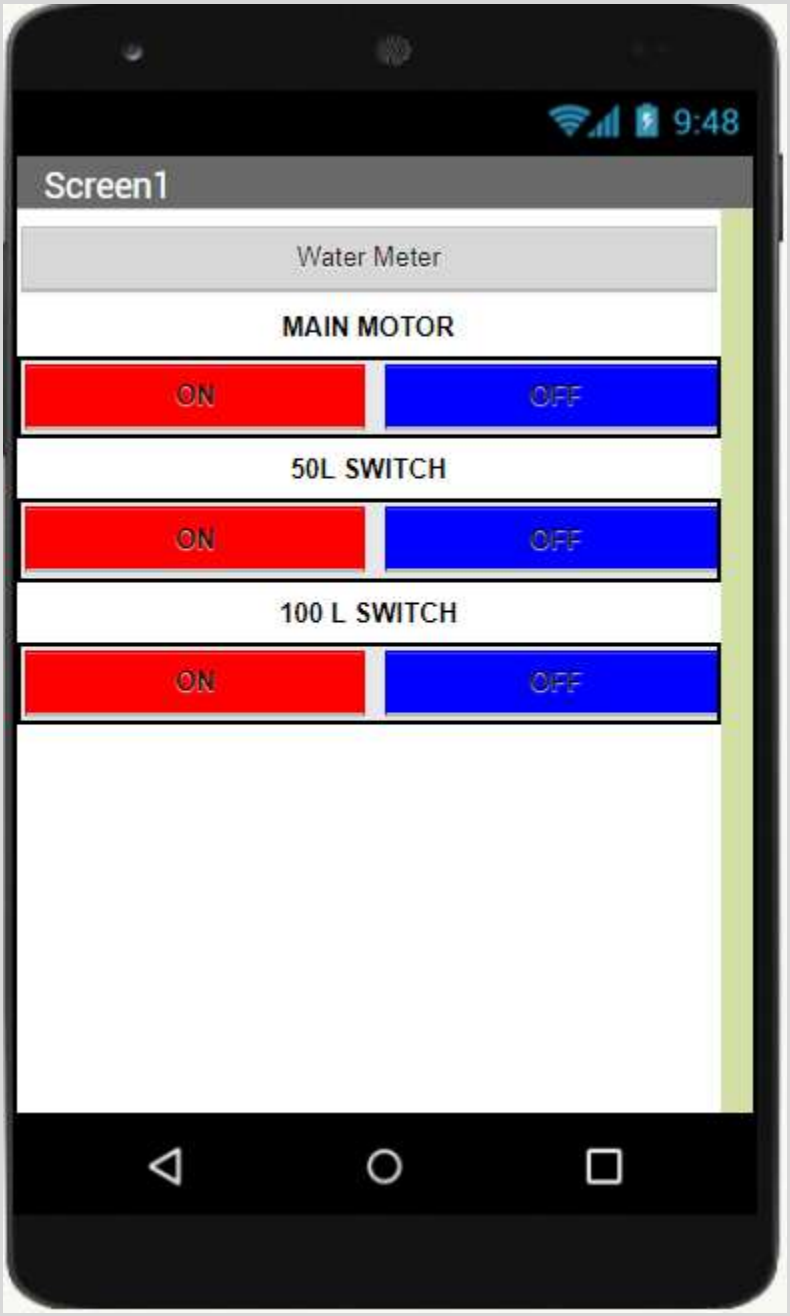
It is an excellent tool for learning and prototyping mobile app ideas, and it's widely used in educational settings to introduce programming and app development to students.

It provides a gentle learning curve and encourages creativity and innovation in app creation. While it's not as powerful or flexible as traditional app development platforms, it's a great starting point for those new to mobile app development.

Here, we have designed an app using MIT app inventer so that the Water meter can be controlled with our smart phone using the connectivity of Bluetooth.



We have designed with three Swithes, Switch 1 is to control the Main motor, 50L and 100L switches are also used to control the water flow amount.



CODE IMPLEMENTATION:

Main source code

```
#include <FlowMeter.h>
#include "Wire.h"
#include "OakOLED.h"
OakOLED oled;
FlowMeter Meter1 = FlowMeter(2);
FlowMeter Meter2 = FlowMeter(3);
void Meter1ISR() {
 Meter1.count();
}
void Meter2ISR() {
Meter2.count();
}
void setup() {
 oled.begin();
 Serial.begin(9600);
 attachInterrupt(INT0, Meter1ISR, RISING);
 attachInterrupt(INT1, Meter2ISR, RISING);
 Meter1.reset();
 Meter2.reset();
}
void loop() {
data();
}
void data(){
Meter1.tick(3000);
Meter2.tick(3000);
Serial.print(String(Meter1.getCurrentFlowrate()));
```

```
Serial.print("l/m");
Serial.print(":");
Serial.print( String(Meter1.getTotalVolume()));
Serial.print("L total");
Serial.print(":");
Serial.print(String(Meter2.getCurrentFlowrate()));
Serial.print("l/m");
Serial.print(":");
Serial.print( String(Meter2.getTotalVolume()));
Serial.print("L total:");
Serial.println(" ");
oled.clearDisplay();
oled.setTextSize(1);
oled.setTextColor(1);
oled.setCursor(0, 0);
oled.println("Flow rate");
oled.setTextSize(2);
oled.setCursor(10, 12);
oled.println(Meter2.getCurrentFlowrate());
oled.setTextSize(2);
oled.setCursor(80, 12);
oled.println("l/m");
oled.setTextSize(1);
oled.setTextColor(1);
oled.setCursor(3, 29);
oled.println("Total Volume");
oled.setTextSize(2);
oled.setTextColor(1);
oled.setCursor(10,40 );
oled.println(Meter2.getTotalVolume());
```

```
oled.setCursor(80, 40);
oled.println("lit");
oled.display();
delay (3000);
}
```

CONNECT BLUETOOTH APP TO BLUETOOTH MODULE:

```
const int switch1Pin = 2; // Pin for switch 1
const int switch2Pin = 4; // Pin for switch 2
const int switch3Pin = 3; // Pin for switch 3

void setup() {
  Serial.begin(9600);
  pinMode(switch1Pin, INPUT_PULLUP); // Internal pull-up resistor
  pinMode(switch2Pin, INPUT_PULLUP); // Internal pull-up resistor
  pinMode(switch3Pin, INPUT_PULLUP); // Internal pull-up resistor
}

void loop() {
  // Read the state of the switches
  int switch1State = digitalRead(switch1Pin);
  int switch2State = digitalRead(switch2Pin);
  int switch3State = digitalRead(switch3Pin);

  // Send the states of the switches over Bluetooth
  Serial.print("Switch1: ");
  Serial.print(switch1State);
  Serial.print(" Switch2: ");
  Serial.print(switch2State);
```

```
  Serial.print(" Switch3: ");
  Serial.println(switch3State);

  delay(1000); // Delay for stability and avoid rapid transmissions
}
```

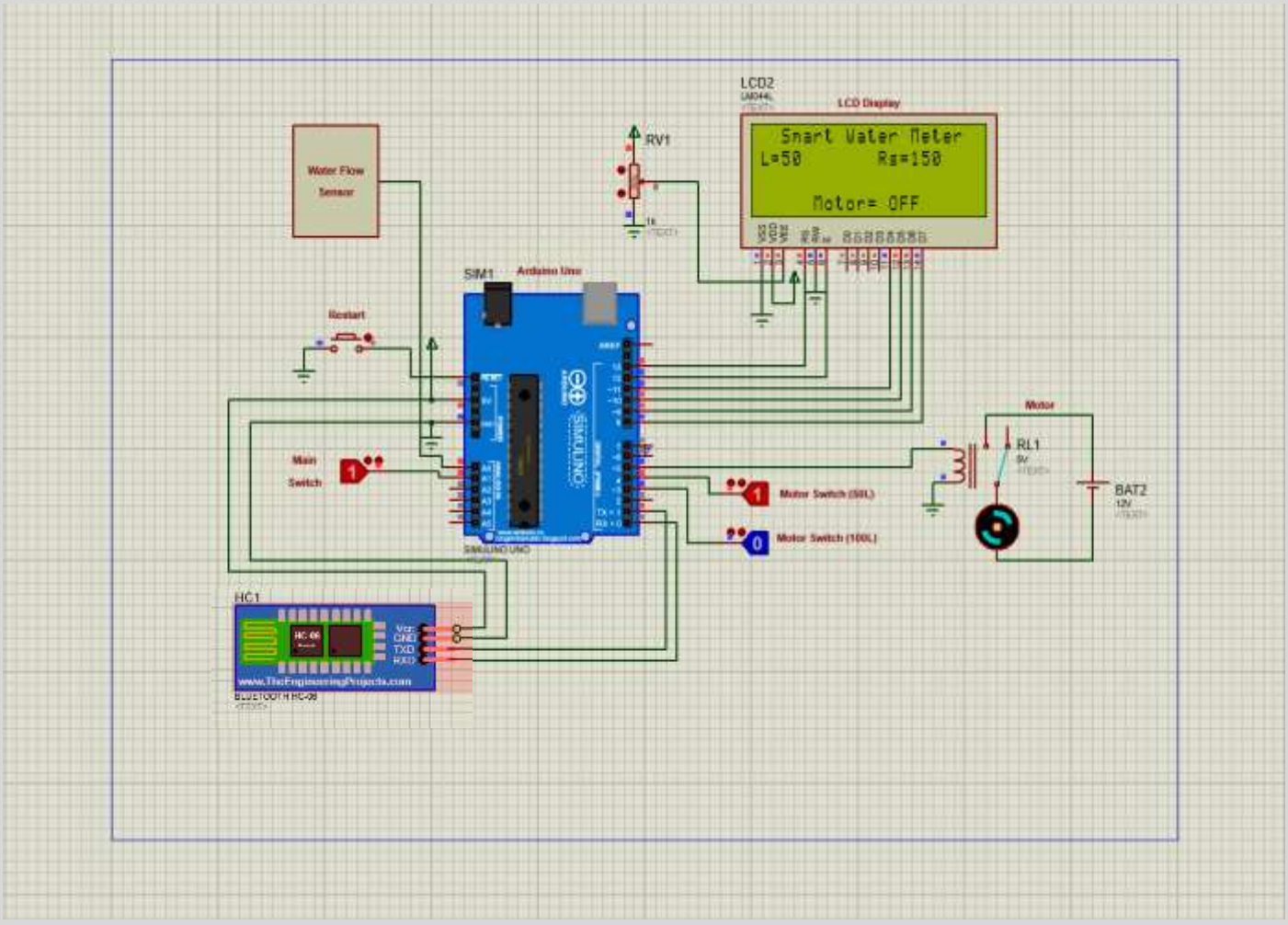
CONNECT MODULE TO ARDUINO:

```
#include <SoftwareSerial.h>
SoftwareSerial bluetooth(0, 1); // RX, TX

const int switch1Pin = 2; // Pin for switch 1
const int switch2Pin = 3; // Pin for switch 2
const int switch3Pin = 4; // Pin for switch 3

void setup() {
  Serial.begin(9600);      // Serial monitor
  bluetooth.begin(9600);   // Bluetooth module
  pinMode(switch1Pin, INPUT_PULLUP); // Internal pull-up resistor for switch 1
  pinMode(switch2Pin, INPUT_PULLUP); // Internal pull-up resistor for switch 2
  pinMode(switch3Pin, INPUT_PULLUP); // Internal pull-up resistor for switch 3
}

void loop() {
  // Read the state of the switches
  int switch1State = digitalRead(switch1Pin);
  int switch2State = digitalRead(switch2Pin);
  int switch3State = digitalRead(switch3Pin);

  // Send the states of the switches over Bluetooth
```

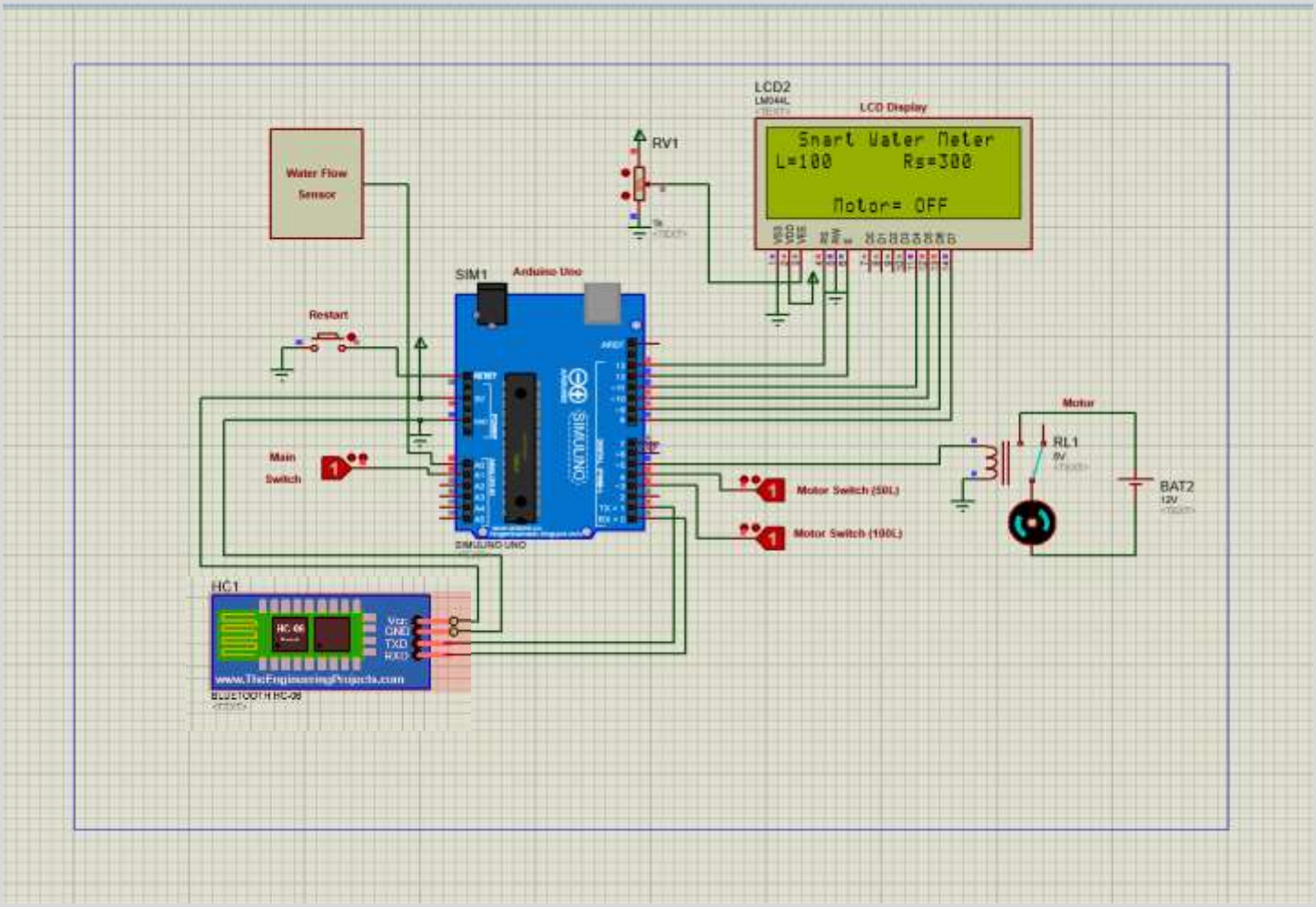
```
  bluetooth.print(switch1State);
  bluetooth.print(switch2State);
  bluetooth.println(switch3State);

  delay(1000); // Delay for stability and avoid rapid transmissions
}
```

WORKING AND RESULTS:

Once the system is set up, it will continuously monitor water flow and display real-time data. You can expand the project to include features like sending data to a cloud platform for remote monitoring.



Above, the 50L motor switch is turned ON in our mobile app so the water is had flown till the sensor reaches 50L ,then as per our program after that the motor had switched OFF and the price for the same been calculated Rs.150.



In second case, the 100L motor switch is turned ON in app and the respective amount for the water flow has been calculated and displayed.When it reaches 100L then the Motor has turned OFF automatically.

CONCLUSION:

Bluetooth-controlled smart water meter is a valuable tool for modern water management. It provides real-time data, aids in leak detection, and offers remote control via smartphones or Bluetooth-enabled devices. This accessibility empowers users to make informed decisions, prevent water wastage, and reduce their water bills.

Beyond individual benefits, these meters contribute to broader water conservation efforts, reduce environmental impact, and enable proactive responses to water shortages or drought conditions. Their integration of IoT technology aligns with the trend of creating efficient and sustainable systems for managing our precious water resources.

With user convenience and resource conservation at its core, Bluetooth-controlled smart water meters play a pivotal role in addressing the growing global need for responsible water usage and management.

THANK YOU