SMART PUBLIC RESTROOM

FINAL PART

Designing a final module for a smart public restroom involves integrating various features that prioritize hygiene, efficiency, and user convenience. Here are components and features that could be part of this module:

Occupancy Monitoring:

- Sensors to detect occupancy and display availability.
- Green (vacant) or red (occupied) indicators outside the restroom.

Automated Entry/Exit:

- Motion sensors or touchless systems for door opening/closing.
- RFID or smartphone-based access for authorized users.

Hygiene Maintenance:

- Automatic flush for toilets and urinals.
- Touchless faucets and soap dispensers.
- Automated sanitizer or disinfectant dispensers for surfaces.
- Self-cleaning mechanisms for toilet seats and floors.

Air Quality Control:

- Air fresheners or purifiers to maintain good air quality.
- Motion-activated exhaust fans for efficient odor control.

Maintenance Alerts:

- Sensors to monitor soap, toilet paper, and paper towel levels, sending alerts for refill.
- Maintenance alerts for cleaning or repairs needed.

Energy Efficiency:

- LED lighting with motion sensors for energy conservation.
- Water-saving fixtures to minimize usage.

User Feedback Mechanism:

- Digital feedback systems for users to rate cleanliness or report issues.

Universal Accessibility:

- Design for users with disabilities, including grab bars, wider stalls, and lower sinks.
- Voice-activated controls for those with mobility issues.

Data Analytics and Remote Monitoring:

- Sensors to collect data on usage patterns, foot traffic, and supply needs.
- Remote monitoring for efficient maintenance and management.

Security and Safety:

- CCTV cameras for security.
- Emergency call buttons or systems.

Adaptability and Modularity:

- Modular design allowing easy integration or replacement of components.
- Upgradable systems to incorporate future technologies.

Privacy Measures:

- Soundproofing or white noise features to enhance privacy within the restroom.

Sustainability:

- Integration of sustainable materials and designs in construction.

COVID-19 Adaptations:

- Touchless temperature scanners or health check kiosks at the entrance.
- UV sanitization mechanisms for high-touch surfaces.

Integration with Mobile Apps:

- Integration with mobile apps for real-time restroom status and navigation.

Community Engagement:

- Interactive displays for public health awareness or local community messages.

Aesthetics and User Experience:

- Pleasant aesthetics and design for a comfortable user experience.

Maintenance and Cleaning Schedule Optimization:

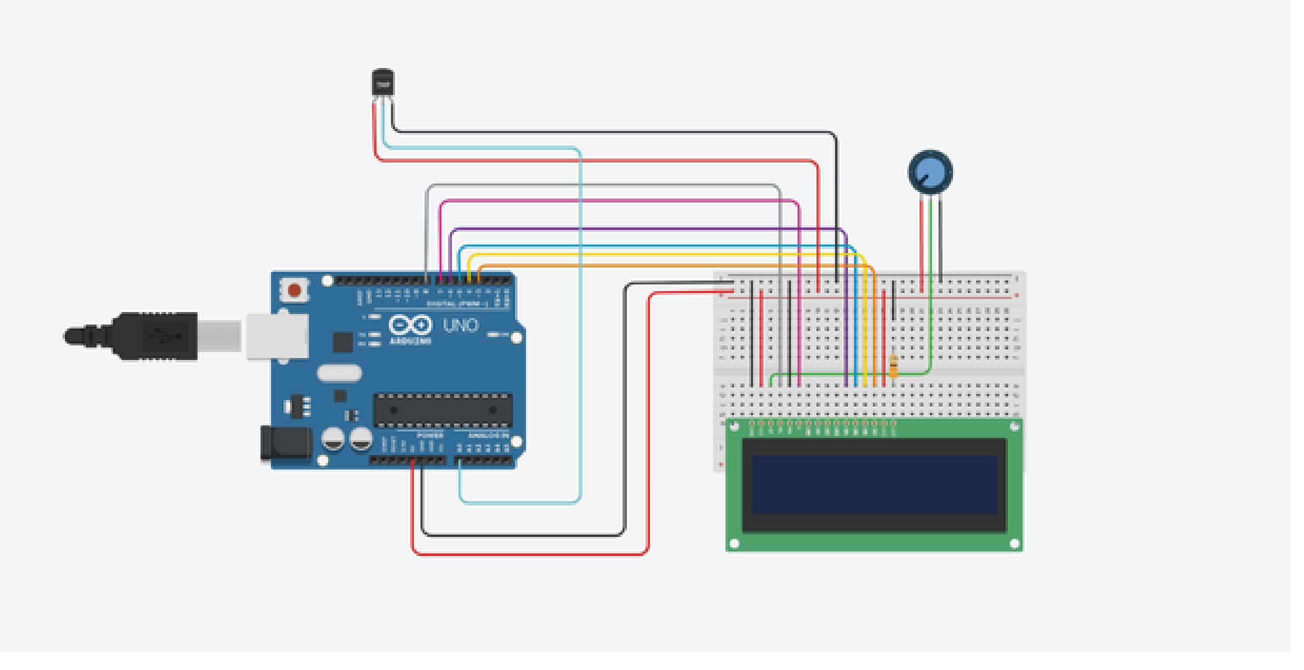
- AI-driven systems to predict usage peaks for cleaning and maintenance scheduling.

Emergency Response Protocols:

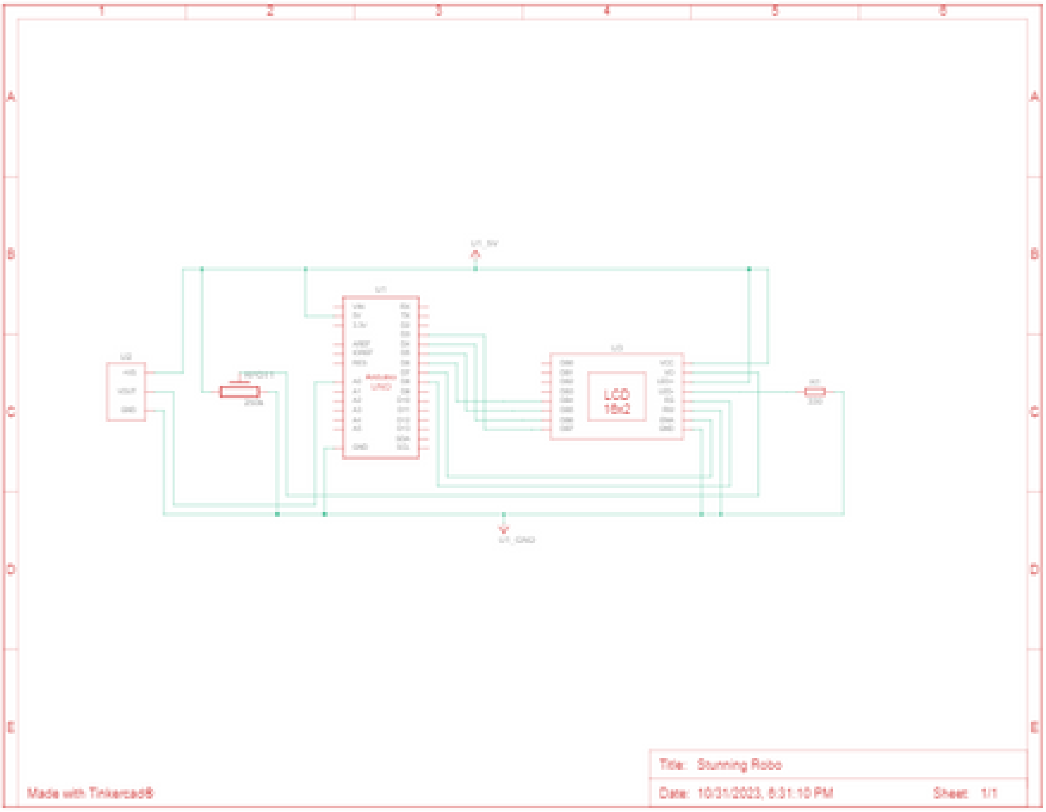
- Clear protocols for emergency situations, easily accessible to users.

Creating a final module for a smart public restroom involves combining these features to enhance hygiene, accessibility, and overall user experience, keeping in mind the needs of diverse user groups while prioritizing cleanliness, efficiency, and sustainability.

IMPLEMENTATION OF TEMPERATURE SENSOR



SCHEMATIC DIAGRAM:

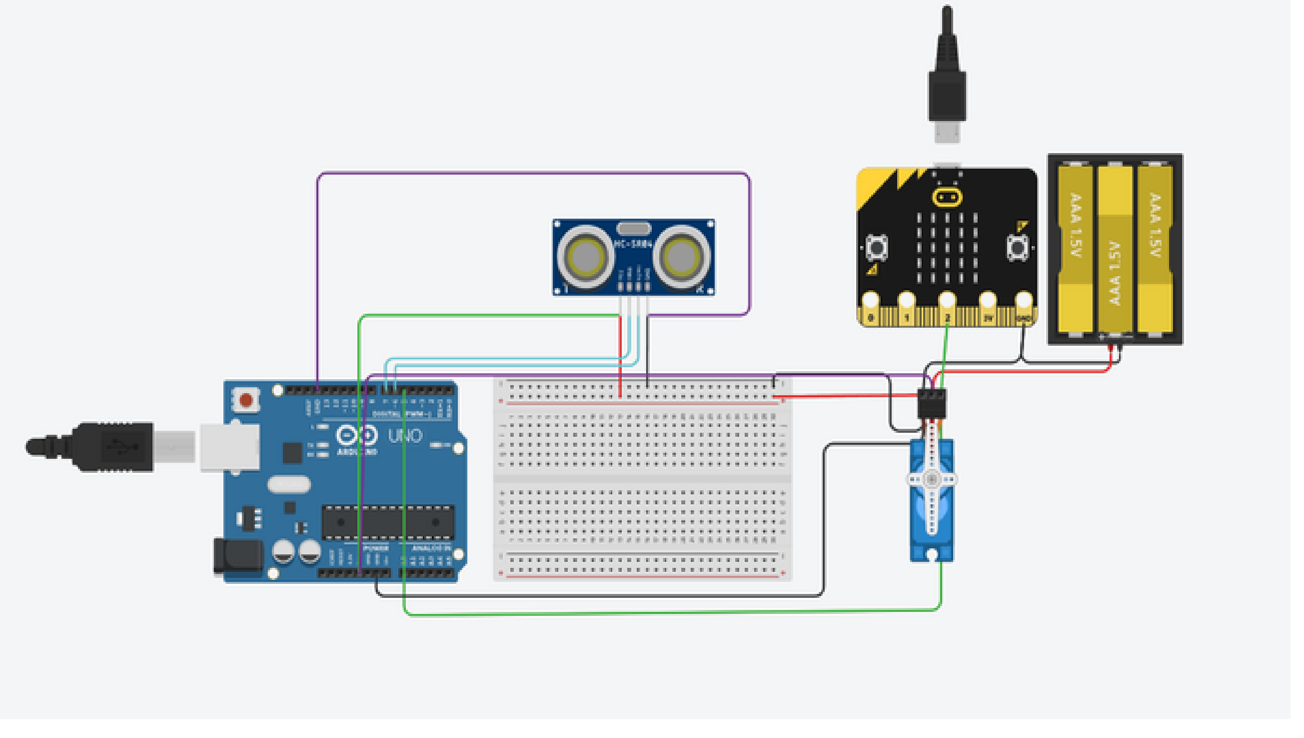


PROGRAM:

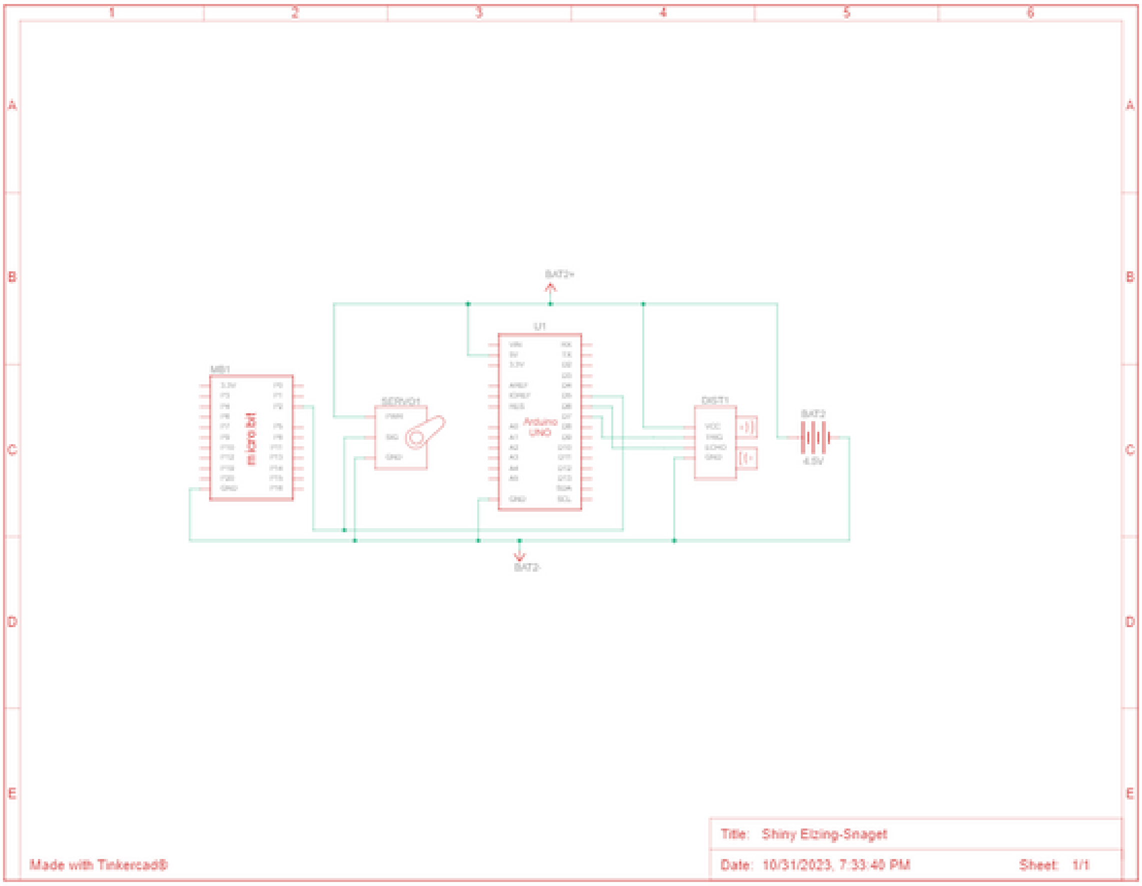
```
#include "LiquidCrystal.h"

LiquidCrystal lcd(8,7,6,5,4,3);

int sensorPin = 0;

 void setup()

{

  Serial.begin(9600);

  lcd.begin(16,2);

}

 void loop()

{

 int reading = analogRead(sensorPin);

 float voltage = reading * 4.68;
```

```
voltage /= 1024.0;
float temperatureC = (voltage - 0.5) * 100;
Serial.print(temperatureC);
Serial.println(" degrees C");
  lcd.setCursor(0,0);
  lcd.print("Temperature Value ");
  lcd.setCursor(0,1);
  lcd.print(" degrees C");
  lcd.setCursor(11,1);
  lcd.print(temperatureC);
 delay(100);
}
```

IMPLEMENTATION OF AUTOMATIC FLUSHING TOILET



SCHEMATIC DIAGRAM:

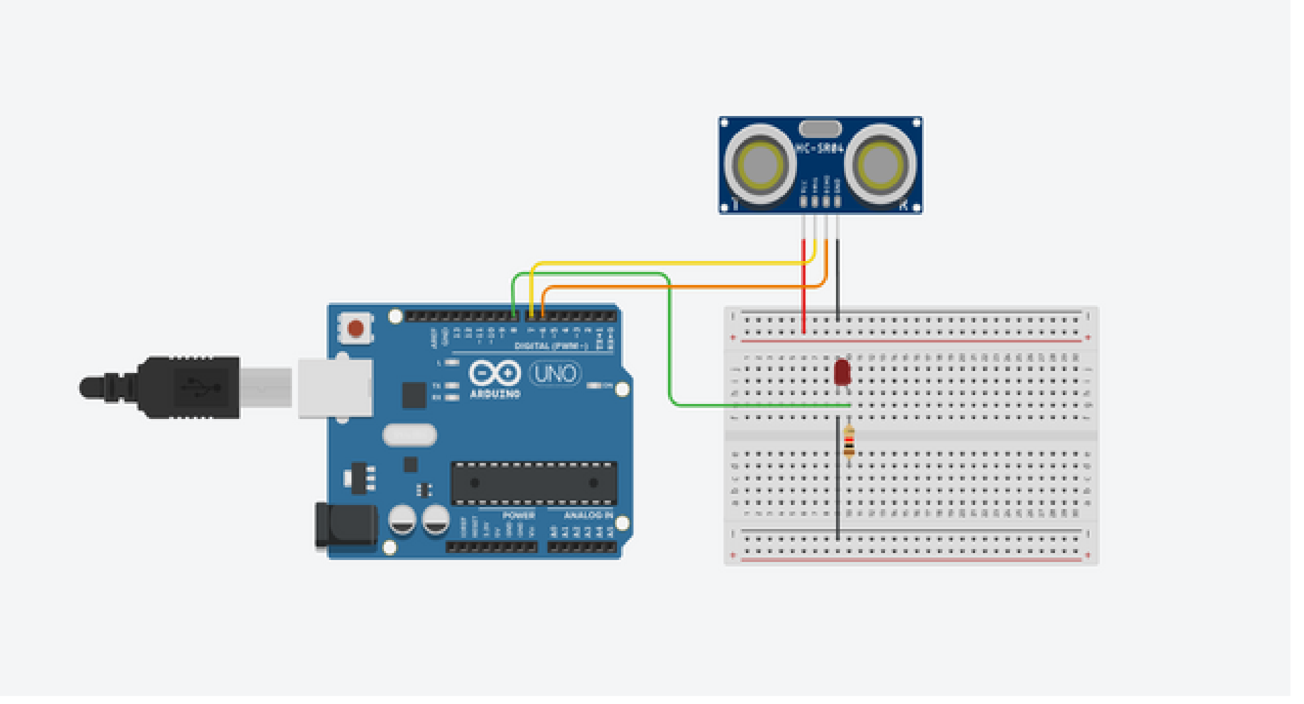


PROGRAM:

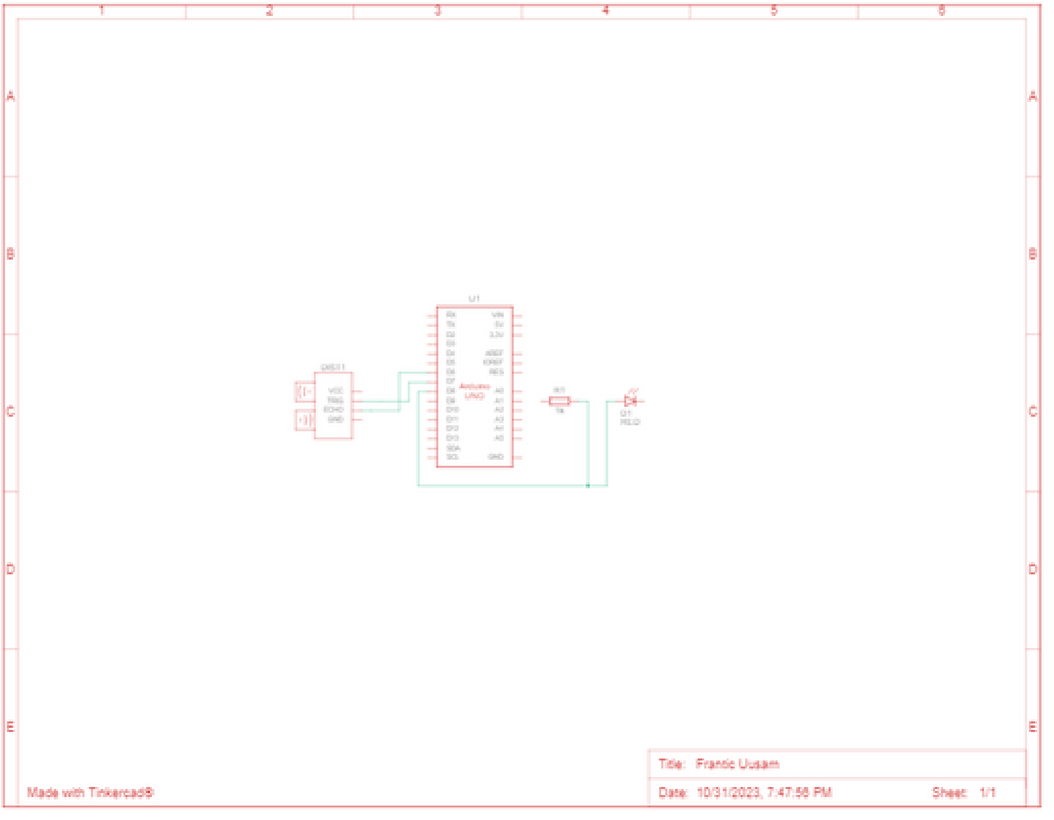
```
#include <Servo.h>

const int trigPin = 2; // Define Trig pin

const int echoPin = 3; // Define Echo pin

Servo servo; // Create a servo object

int distance; // Variable to hold distance value

void setup() {

  Serial.begin(9600);

  servo.attach(9); // Attach servo signal to pin 9

  pinMode(trigPin, OUTPUT);
```

```
  pinMode(echoPin, INPUT);
}
void loop() {
  digitalWrite(trigPin, LOW);
  delayMicroseconds(2);
  digitalWrite(trigPin, HIGH);
  delayMicroseconds(10);
  digitalWrite(trigPin, LOW);
distance = pulseIn(echoPin, HIGH) / 58; // Calculate distance in centimeters
  Serial.print("Distance: ");
  Serial.print(distance);
  Serial.println(" cm");
if (distance < 10) { // If the distance is less than 10 cm (adjust as needed)
    servo.write(90); // Rotate the servo to simulate flushing
    delay(1000); // Wait for the flush to complete
    servo.write(0); // Return the servo to its initial position
  }
 delay(100); // Delay for stability
}
```

IMPLEMENATION OF OCCUPANCY MONITORING



SCHEMATIC DIAGRAM:



PROGRAM:

```
const int trigPin = 2; // Trig pin of the ultrasonic sensor

const int echoPin = 3; // Echo pin of the ultrasonic sensor

const int ledPin = 7; // Pin to control the LED

long duration;

int distance;

void setup() {

  pinMode(trigPin, OUTPUT);

  pinMode(echoPin, INPUT);

  pinMode(ledPin, OUTPUT);

  Serial.begin(9600);

}

void loop() {

  digitalWrite(trigPin, LOW);
```

```
 delayMicroseconds(2);
 digitalWrite(trigPin, HIGH);
 delayMicroseconds(10);
 digitalWrite(trigPin, LOW);
 duration = pulseIn(echoPin, HIGH);
 distance = duration * 0.034 / 2;
 Serial.print("Distance: ");
 Serial.println(distance);
if (distance < 50) { // Change the threshold according to your setup
  digitalWrite(ledPin, HIGH); // LED indicating occupancy
 } else {
  digitalWrite(ledPin, LOW); // LED indicating vacancy
 }
 delay(1000); // Adjust the delay as necessary
}
```