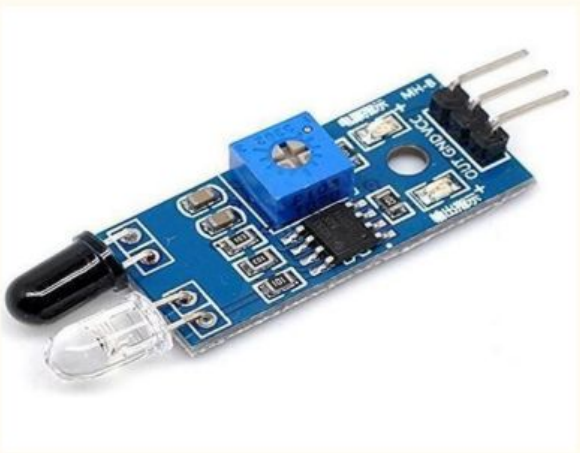

DEVELOPMENT OF
SMART PUBLIC
RESTROOM

OBJECTIVE

- To design a smart toilet which is equipped with sensor transceiver and ethernet connectivity.
- Remotely monitors cleanliness status of restrooms.
- Cleaners can be dispatched when needed instead of fixed intervals.
- Allow building owners and Facility Management(FM) and cleaning companies to manage usage across multiple restrooms.
- Using data to plan resources ahead of time based on usage patterns.

COMPONENT LIST

1. MQ-135 AIR QUALITY SENSOR(detects NH3 in air)
2. ARDUINO UNO
3. IR SENSOR
4. 16*2 CHARACTER LED DISPLAY
5. BREADBOARD



MODEL WORKING

1. MQ-135 GAS SENSOR attached to Arduino detects the ammonia level present in the air and displays the ammonia level in ppm on the LED display.
2. IF ammonia level is more than 1.5 ppm then green led is switched on indicating to start the fan
3. IF ammonia level is greater than 2.5 ppm then red led is switched on giving an indication to clean the toilet because the smell is unbearable.
4. Also,if a person enters and leaves the toilet the usage count is detected by IR sensor and is incremented by one.

CODE

```
/*
* Program to measure gas in ppm using MQ sensor
* Dated: 03-03-2019
*/
#include<LiquidCrystal.h>
#define RL 20  //The value of resistor RL is 47K
#define m -0.263 //Enter calculated Slope
#define b 0.42 //Enter calculated intercept
#define Ro 76.63 //Enter found Ro value
#define MQ_sensor A0 //Sensor is connected to A4


int avg_value,n=0;
int fan=7,clean=8,ir=10;
int count=0;


int cnt=20;
LiquidCrystal lcd(12,11,5,4,3,2);


void setup()
```

```
{
 pinMode(fan, OUTPUT);
 pinMode(clean, OUTPUT);
 pinMode(ir,INPUT);

 Serial.begin(9600); // sets the serial port to 9600
 Serial.println("NH3 in PPM"); //Display a intro message
 //delay(2000); //Wait for display to show info
 analogWrite(6,cnt);
 lcd.begin(16,2);
}
void loop()
{
 // count person with ir sensor
 if(!(digitalRead(ir)))
 {
   count++;
   Serial.print("Count=");
   Serial.println(count);
   Serial.print("Total=");
   Serial.println(count/2);
   digitalWrite(LED_BUILTIN, HIGH);
   delay(1000);
 }
```

```
 //ppm levels check with MQ-135 and controlling fan, clean msg
 float VRL; //Voltage drop across the MQ sensor
 float Rs; //Sensor resistance at gas concentration
 float ratio; //Define variable for ratio
 VRL = analogRead(MQ_sensor)*(5.0/1023.0); //Measure the voltage drop and convert to 0-5V
 Rs = ((5.0*RL)/VRL)-RL; //Use formula to get Rs value
 ratio = Rs/Ro;  // find ratio Rs/Ro
 float ppm = pow(10, ((log10(ratio)-b)/m)); //use formula to calculate ppm
Serial.print("NH3 (ppm) = ");
 Serial.println(ppm);
 //Serial.print("Voltage = "); //Display a intro message
 //Serial.println(VRL);
 if(ppm>2.0 && n!=2)
 {
   n=2;
   digitalWrite(fan, HIGH);
   digitalWrite(clean, HIGH);
 }
 else if(ppm>1.2)
 {
   n=1;
   digitalWrite(fan, HIGH);
   digitalWrite(clean, LOW);
 }
 else
```

```
 {
   n=0;
   digitalWrite(fan, LOW);
   digitalWrite(clean, LOW);
 }


 //lcd printing
 lcd.setCursor(0,0);
 lcd.print(String("Count=")+String(count/2));
 //lcd.print(count/2);
 lcd.setCursor(0,1);
 lcd.print(String("NH3 ppm=")+String(ppm));
 //lcd.print(ppm);
}
```