Smart farming using IOT

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Abstract :

Internet of Things (IoT) technology has brought revolution to each and every field of common man'slife by making everything smart and intelligent. IoT refers to a network of things which make a self-configuring network. The development of Intelligent Smart Agriculture IoT based devices is day by day turning the face of agriculture production by not only enhancing it but also making it cost-effective and reducing wastage. The aim / objective of this report is to propose IoT based Smart Agriculture System assisting farmers in getting Data (Temperature, Soil Moisture) for efficient environment monitoring which will enable them to increase their overall yield and quality of products. The IoT based Smart Farming System being proposed via this report is integrated with Arduino Technology mixed with different Sensors .

Scope :

With the adoption of IoT in various areas like Industry, Homes and even Cities, huge potential is seen to make everything Intelligent and Smart. Even the Agricultural sector is also adopting IoT technology these days and this in turn has led to the development of Agricultural IOT.

Introduction :

The objectives of this report are to proposed IoT based Smart Farming System which will enable farmers to have data of soil moisture environment temperature at very low cost. "SAVE THE AGRICULTURE", main factor of agriculture is to predict the climatic changes, here we are using IoT for monitoring the weather as well as atmospheric changes throughout the crop field by having several systems in different fields as clients, which is getting reported every time to the server, about the current atmospheric change at that every certain place. So that watering and pesticides can be served based on the conditions of the field.

Related Work :

IoT enables easy collection and management of tons of data collected from sensors and with integration of cloud computing services like Agriculture fields maps, cloud storage etc., data can be accessed live from anywhere and everywhere enabling monitoring and end to end connectivity among all the parties concerned.

IoT is regarded as key component for Smart agriculture as with accurate sensors and smart IoT based Smart Agriculture is regarded as IoT gadget focusing on Monitoring of Environmental data in terms of Temperature, Moisture and other types depending on agricultural methods sensors integrated with it. The system provides the concept of "Plug & Sense" in which farmers can the data generated via sensors can be easily shared and viewed by agriculture consultants anywhere remotely via Cloud Computing technology integration. The system also enables analysis of various sorts of data via graphical method equipment's, farmers can increase the food production by 70% till year 2050 as depicted by experts.

1. Analysis of existing methods :

In the existing methods, all weather predictions and environmental change are done manually and they are using Weatherical Information for the communication, it is actually slower than as expected .

In this mini project, sensors are used, so that resulting data having high accuracy about the environment. By this project all gets processed automatically, if there is any possibility of rain in weather cloud, then Temperature sensors are helpful.

2. The structure of the report is containing:

IoT Technology and agriculture-concepts and definition, IoT enabling technologies, agriculture current scenario and future forecasts with IoT based smart farming system, the components and modules used in it and working principal of it. It consist of conclusion, future scope and references.

Proposed Work :

Title: SMART AGRICULTURE USING IoT

5.1 Problem Statement:

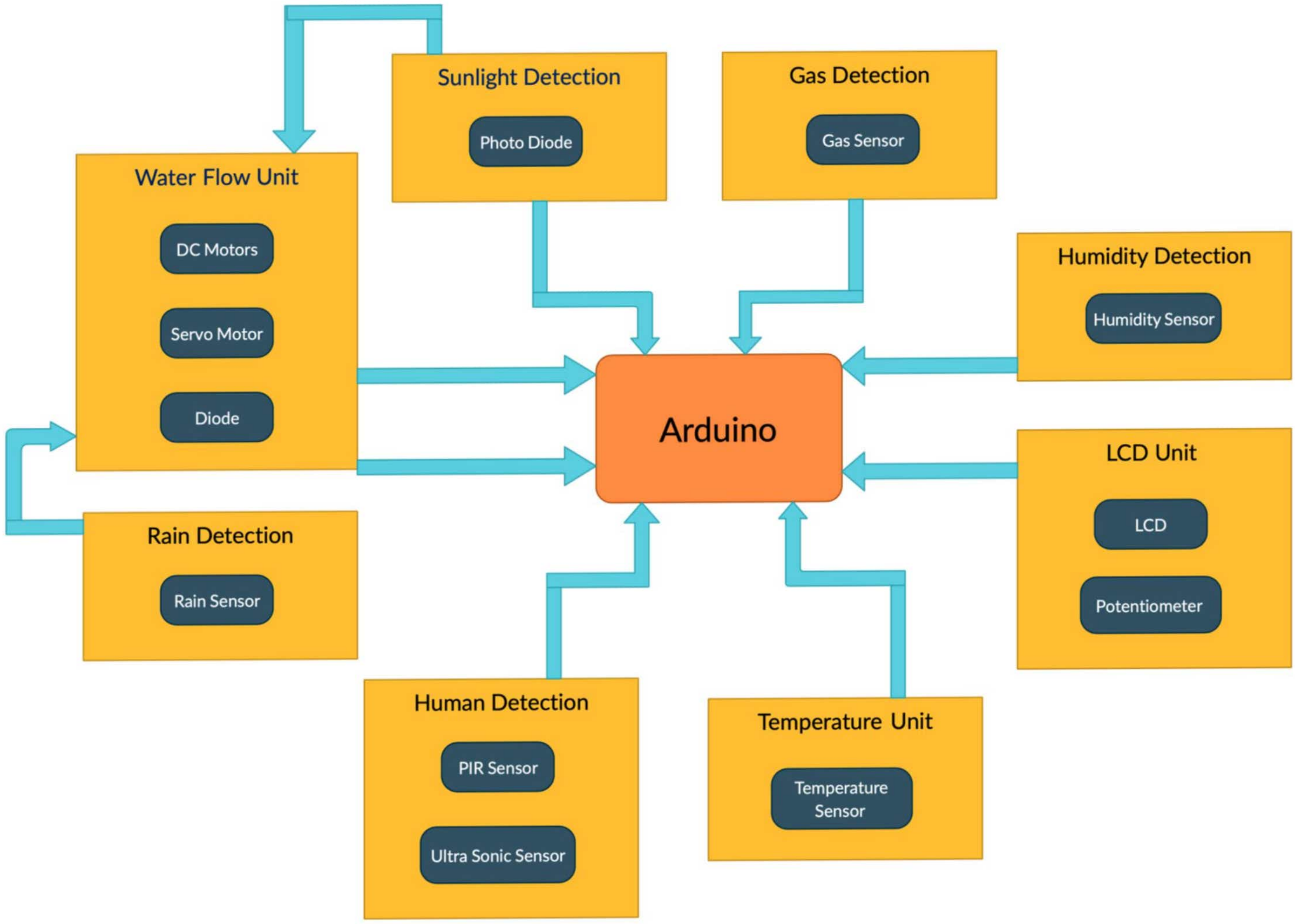
Develop a mini project that performs smart agriculture methods using IOT. Using some sensor like Temperature sensor ,humidity sensor ,photodiode sensor for sunlight ,buzzers for alert ,gas sensor for green gas ,rain sensor ,soil sensor for moisture ,ultrasonic sensors ,servo motor for sprinkling purpose ,PIR sensor for detecting objects such as animal ,human beings ,so that it will protect them from emitting gases by blowing buzzers. By using sensor values, calculate the data. Internet of Things has a strong backbone of various technologies such as Sensor Networks, Security Protocols to made Agricultural things simpler.

5.2 Social Relevance

IoT based Smart Agriculture improves the entire Agriculture system by monitoring the field in real-time. With the help of sensors and interconnectivity, the Internet of Things in Agriculture has not only saved the time of the farmers but has also reduced the extravagant use of resources such as Water and Electricity. It keeps various factors like humidity, temperature, soil etc. under check and gives a crystal-clear real-time observation.

This will help bridge the gap between production and quality and quantity yield. IoT-enabled agriculture allows farmers to monitor their product and conditions in real-time. They get insights fast, can predict issues before they happen and make informed decisions on how to avoid them. Additionally, IoT solutions in agriculture introduce automation.

5.3 Architecture/Model/Block Diagram



Additional Sensor (**Note:** In Tinker cad the following sensors were not available thus we instead covered up the rest of the sensors in the diagram) **:**

- **Humidity Sensor**
- **Rain Sensor**

CODE

mini.c 〉 No Selection

```
//header files for servo motor and LCD
#include <Servo.h>
#include <LiquidCrystal.h>

//Initialization of lcd object
LiquidCrystal lcd(2,3,4,5,6,7);

//Initialization of servo motor object
Servo servo;

//Initialization of global variable
float tmp=0;
float light=0;
float gas=0;
float cm=0;
int pir=0;

/*Function for alerting the user
  about the gas leak and human/animal
  detection
*/
void gas_pir_buzzer(float gas,int pir)     //define of gas_pir_buzzer
{
    bool p=false;    //assigning value of p for pir variable
      if(pir>0)
    {
        p=true;
    }


      if(gas<=85)        //no gas leakage
    {
      noTone(10);
      lcd.setCursor(0,1);
        lcd.print("G:safe");
    }
      else if((gas>85 && gas<=150) || p)  //gas leaks at moderate range
    {
       if(p) //human/animal detected
       {
         lcd.setCursor(0,1);
              lcd.print("G:Unsafe");
            tone(10,100);
       }
       else //human/animal not detected
       {
         lcd.setCursor(0,1);
              lcd.print("G:Unsafe");
            tone(10,1);
       }

```

mini.c 〉 No Selection

```
    }
      else if(gas>150 || p)  //gas leaks at intense range
    {
       if(p) //human/animal detected
       {
         lcd.setCursor(0,1);
              lcd.print("G:alert");
         tone(10,200);
       }
       else //human/animal not detected
       {
         lcd.setCursor(0,1);
           lcd.print("G:alert");
         tone(10,5);
       }
    }
}

void ultrasonic_dc(int triggerPin, int echoPin) //define of ultrasonic_dc
{
    pinMode(triggerPin, OUTPUT);
    digitalWrite(triggerPin, LOW);
    delayMicroseconds(2);

    digitalWrite(triggerPin, HIGH);
    delayMicroseconds(10);
    digitalWrite(triggerPin, LOW);
    pinMode(echoPin, INPUT);

    long pulse= pulseIn(echoPin, HIGH);  //assigning the value of pulse

      cm=0.01715*pulse;  //calculating the cm according to pulse

      lcd.setCursor(10,1);
      lcd.print("cm:");
      lcd.setCursor(13,1);
      lcd.print(cm);

      if(cm>=20 && cm<320) //dc motor turned on
    {
         digitalWrite(12,HIGH);
          digitalWrite(13,LOW);
    }
      else //dc motor turned off
    {
        digitalWrite(12,LOW);
          digitalWrite(13,LOW);
    }
}
```

mini.c 〉 No Selection

```c

void servo_dc_manager(float light) //define of servo_dc_manager
{
    if(light>=80) // maximum light intensity
    {
        analogWrite(9,1000); //dc motor is on
          servo.write(0);
    }
      else if(light>=65 && light<80) // moderate light intensity
    {
          for(int i=0;i<=180;i++)
        {
             servo.write(i); //servo motor is on
        }
    }
      else
    {
        analogWrite(9,0); // both dc and servo motor is off
          servo.write(0);
    }
}

void setup()
{
      pinMode(15,INPUT);
      pinMode(14,INPUT);
      pinMode(10,OUTPUT);
      pinMode(0,OUTPUT);
      pinMode(1,OUTPUT);
      pinMode(19,INPUT);
      servo.attach(11);
      lcd.begin(16,2);
      analogWrite(8,0);
}


void loop()
{
      gas=analogRead(16);  //reading value for gas variable

      pir=analogRead(19);  //reading value for pir variable
      gas_pir_buzzer(gas,pir);    //call for gas_pir_buzzer

      ultrasonic_dc(17,18);    //call for ultrasonic_dc

      light=analogRead(14); //reading value for light variable

      //maping for temperature
      tmp=map(((analogRead(15) - 20) * 3.04), 0, 1023, -40, 125);

      servo_dc_manager(light); //call for servo_dc_manager
```

```

    //lcd display logic
    lcd.setCursor(0,0);
    lcd.print("T:");
    lcd.setCursor(2,0);
    lcd.print(tmp);
    lcd.setCursor(9,0);
    lcd.print("L:");
    lcd.setCursor(11,0);
    lcd.print(light);
    delay(1000);
    lcd.clear();
}

```

5.4 Hardware and Software Requirement

In this project, various components including software are being used for IoT based Smart Agriculture development.

They are as follows:

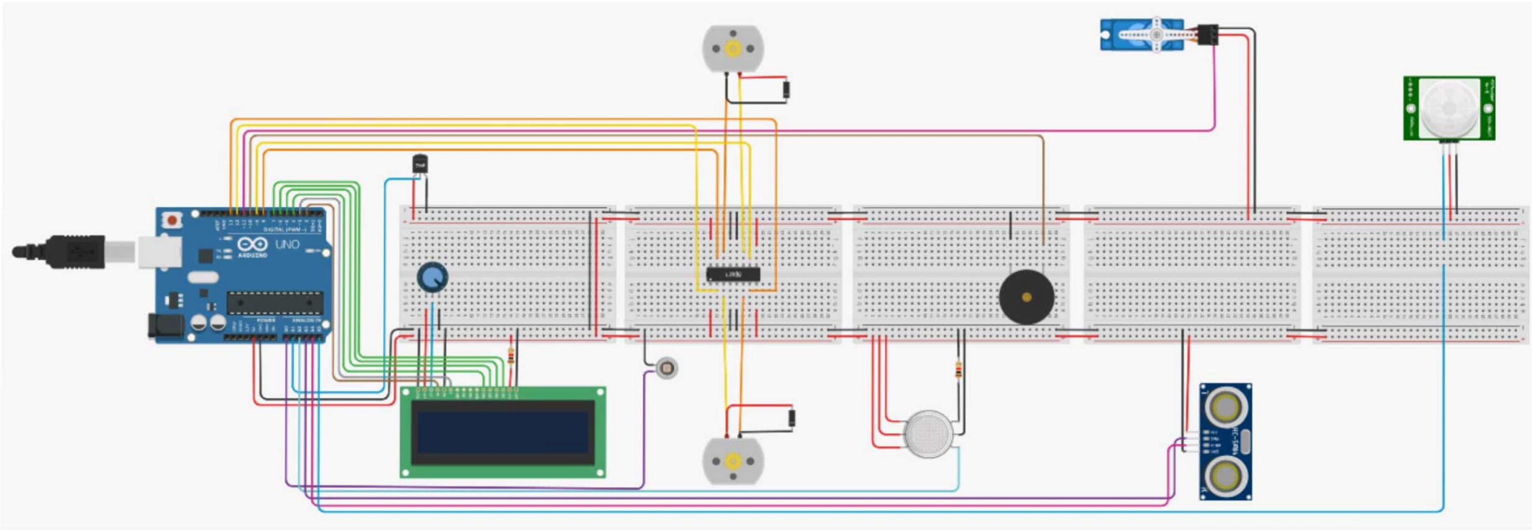
Mini Project

Component List

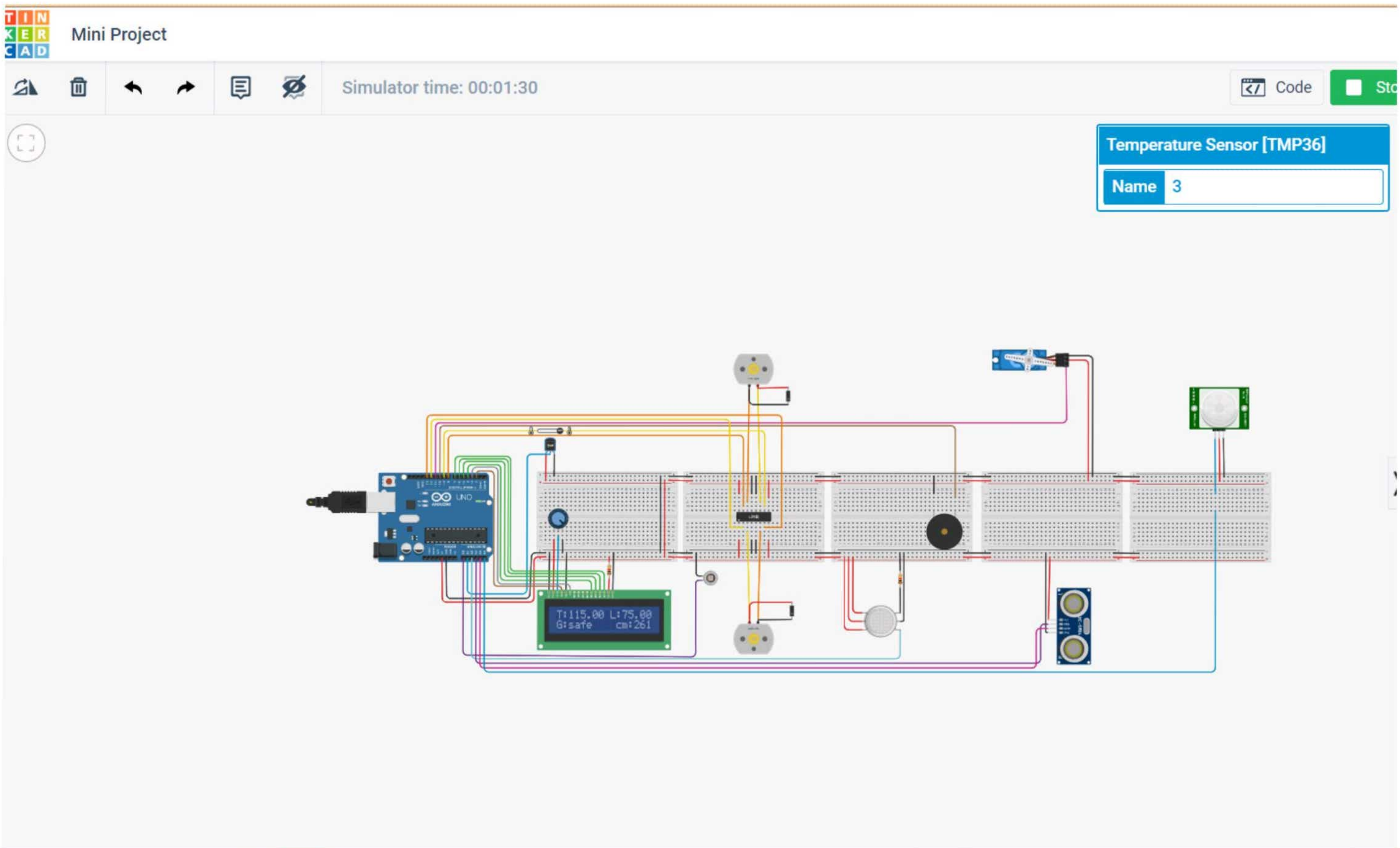
Name	Quantity	Component
U1	1	Arduino Uno R3
U3	1	Temperature Sensor [TMP36]
U2	1	LCD 16 x 2
Rpot6	1	250 kΩ, Potentiometer
R6 R1	2	1 kΩ Resistor
U13	1	H-bridge Motor Driver
M1 M2	2	DC Motor
U14	1	Photodiode
GAS1	1	Gas Sensor
PIEZO1	1	Piezo
SERVO2	1	Micro Servo
DIST1	1	Ultrasonic Distance Sensor
PIR1	1	-68.84620998721078 , -202.00690167308233 , -233.27302530572402 PIR Sensor
D1 D2	2	Diode

5.5 Results obtained

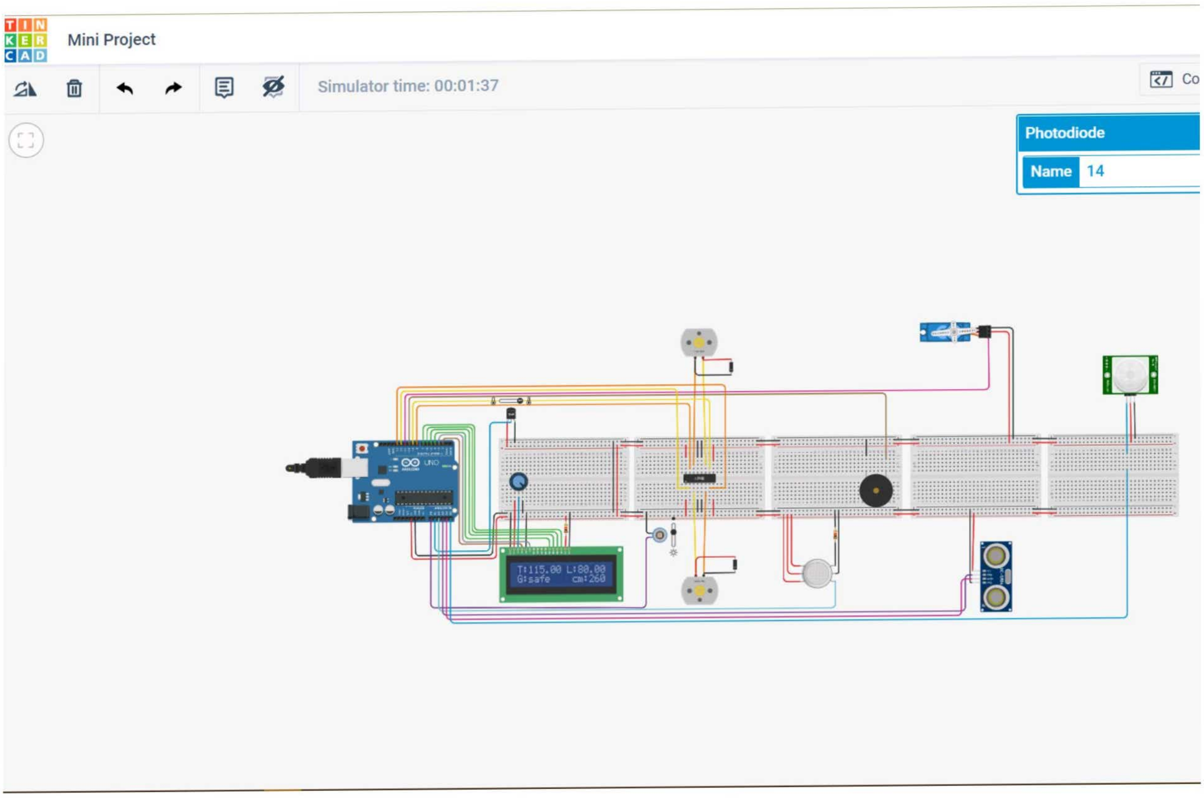
DIAGRAM :



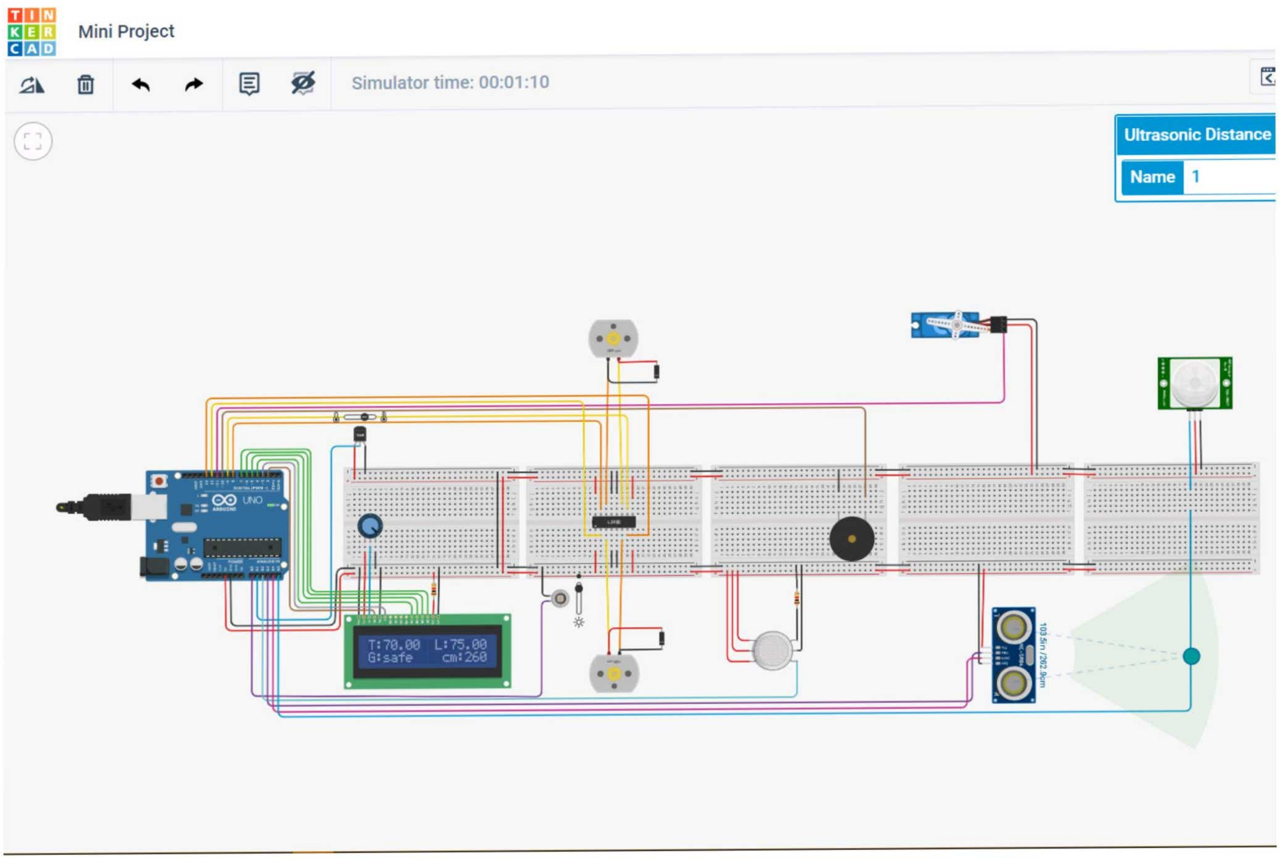
1. Temperature Sensor Output



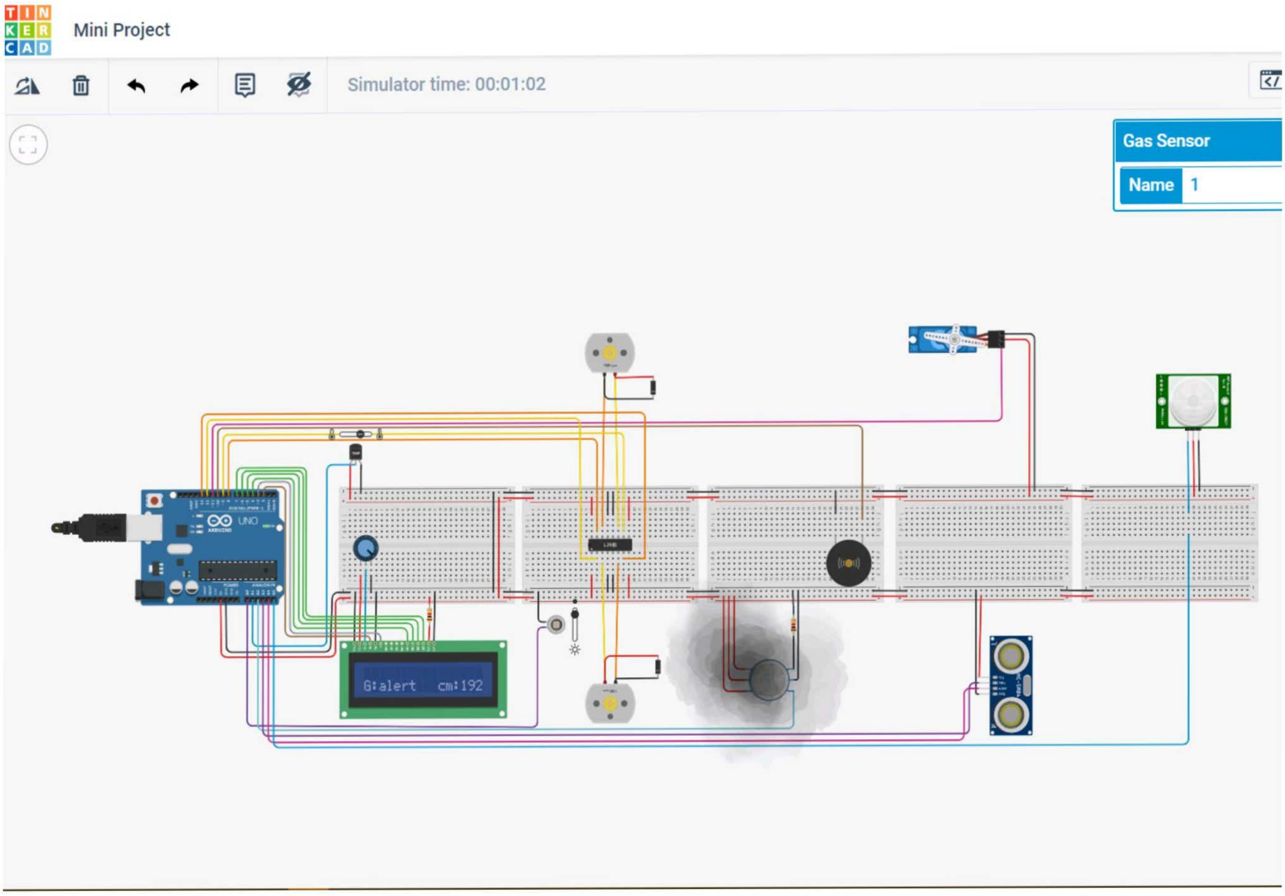
2. Photo Sensor Output

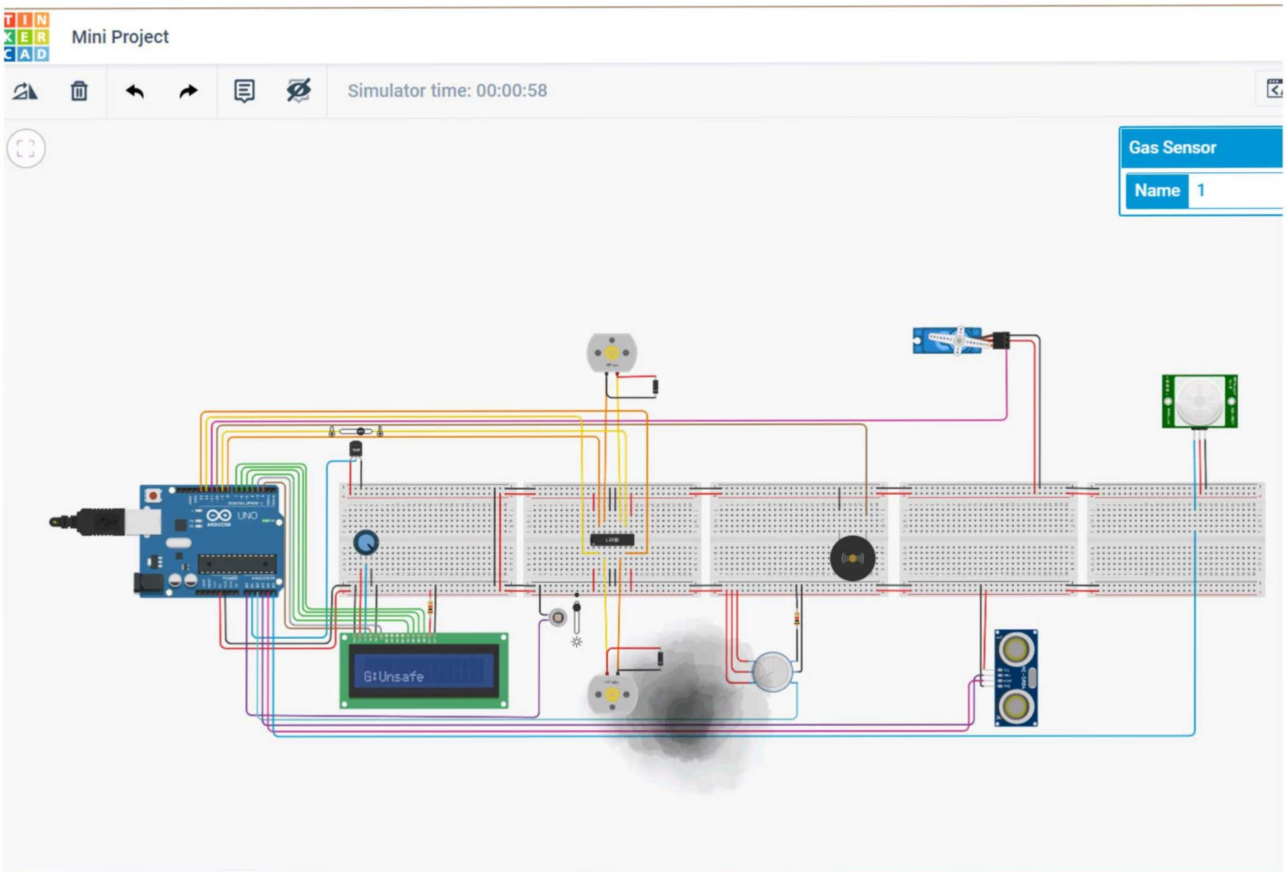


3. Ultrasonic Sensor Output

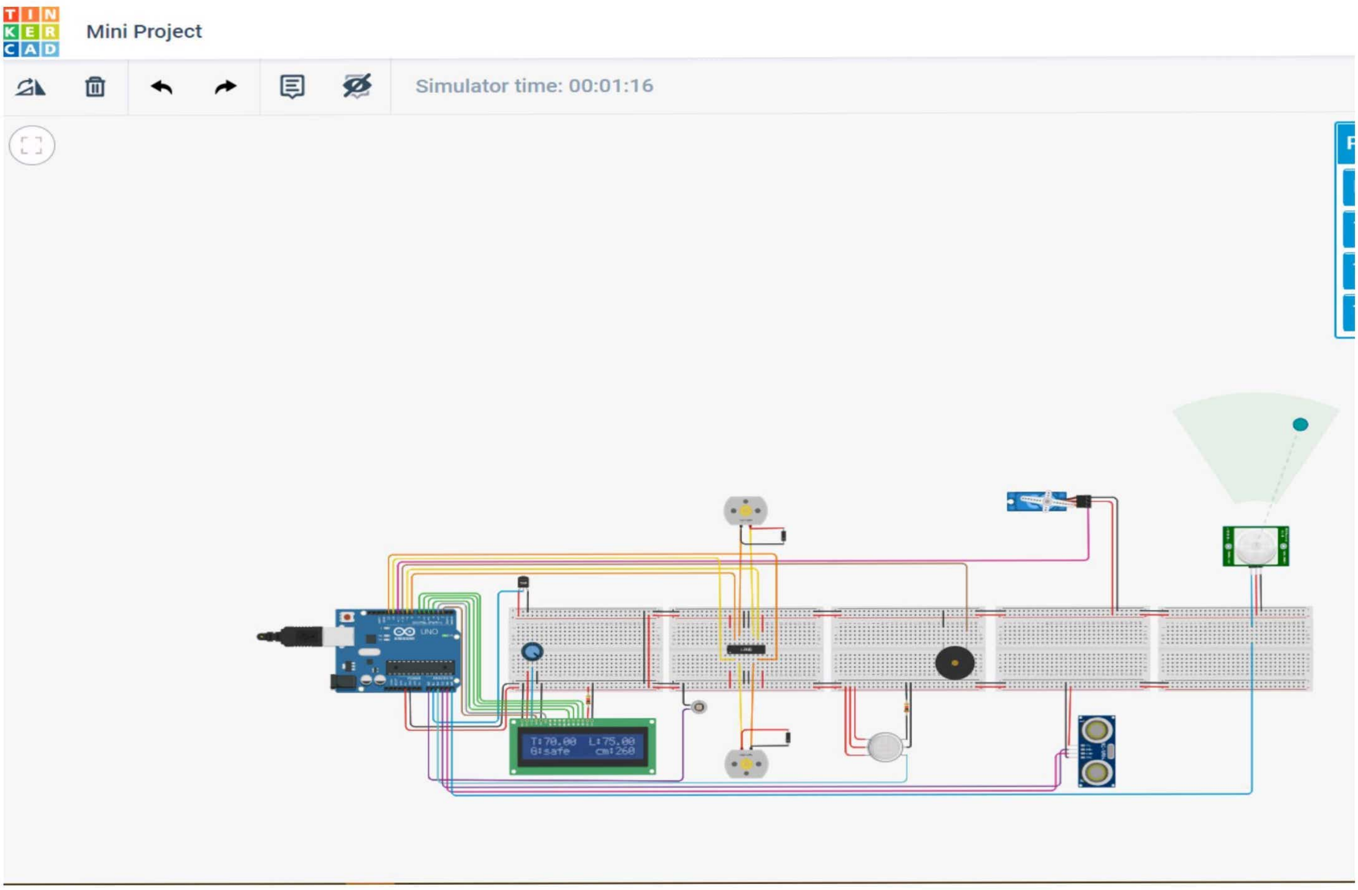


4. Gas Sensor Output





5. PIR Sensor Output



Conclusion :

IoT based Smart Agriculture for Monitoring of Temperature and Soil Moisture has been proposed using Arduino. The project has high efficiency and accuracy in fetching the data of temperature and soil moisture. The IoT based smart agriculture being proposed via this report will assist farmers in increasing the agriculture yield and take efficient care of food production as the System will always provide helping hand to farmers for protecting them from poisonous gases.

References :

https://youtu.be/RvoaCEbnbgo

https://youtu.be/qXDLQIpIr8c

https://www.google.com/url?sa=t&source=web&rct=j&url=https://www.ijrte.org/wp-content/uploads/papers/v7i5/E1987017519.pdf&ved=2ahUKEwjJicu__ffrAhUHhZQKHS00CDQQFjACegQIDRAB&usg=AOvVaw3zxHTdPzT0_5BnHeNkk1C3