L200921 Aisha Muhammad Nawaz
Spring 2024 BSCS 8A

IO4041 Introduction to Internet of Things
Assignment # 1 Arduino-based System Design

Due: 18 – 02 - 2024
Total Marks: 20 (3.3% Weightage)

Task: Your job is to design an Arduino Uno based system for the following problem. Design the circuit in Tinker cad simulator (https://www.tinkercad.com/dashboard). Pick one task according to your roll number.

Student with odd roll number (L200921)

Build a traffic light and pedestrian boom-gate system for a busy road. Due to high vehicular traffic, the signal normally stays green, and the boom-gate remains closed. When any pedestrians arrive to cross the road, a PIR motion sensor detects them, and once at least 60 seconds have passed since signal turned green, the system turns the traffic signal to yellow-then-red, and the boom gate then opens. When the sensor no longer detects pedestrians, or after 30 seconds (whichever is earlier), the traffic light changes to yellow-then-green and boom gate closes.
Note the timing requirements:

- Yellow light duration: 3 seconds
- Minimum time signal stays green: 60 seconds
- Maximum time signal stays red: 30 seconds

Components to be used on Tinker cad: PIR sensor, LEDs (for traffic lights), micro servo (for boom gate). How to keep track of time: https://docs.arduino.cc/built-in-examples/digital/BlinkWithoutDelay/

Deliverables

In Tinker cad, generate a sharing link (https://www.tinkercad.com/blog/tinkertips-share-link) for your circuit. Do NOT make the design public, or share the link publicly.
You should submit a PDF document containing:

- The design links
- Screenshots of both the circuit and the schematic.
- A copy of Arduino source code.

For assignment evaluation, you will be asked to demonstrate working of the circuit and explain your code/logic.

L200921 Aisha Muhammad Nawaz
Spring 2024 BSCS 8A

IO4041 Introduction to Internet of Things
Assignment # 1 Arduino-based System Design

SOLUTION

SOURCE CODE:

```
//L200921 Aisha Muhammad Nawaz - IIOT A1 BSCS 8A Spring 2024
/*
-> ODD ROLL NUMBER QUESTION:
Build a traffic light and pedestrian boom-gate system for a busy road. Due to high vehicular traffic,
the signal normally stays green, and the boom-gate remains closed. When any pedestrians arrive to
cross the road, a PIR motion sensor detects them, and once at least 60 seconds have passed since signal turned green, the system turns the traffic signal to yellow-then-red, and the boom gate then opens. When the sensor no longer detects pedestrians, or after 30 seconds (whichever is earlier), the traffic light changes to yellow-then-green and boom gate closes.
Note the timing requirements:
• Yellow light duration: 3 seconds
• Minimum time signal stays green: 60 seconds
• Maximum time signal stays red: 30 seconds
*/
#include <Servo.h>
int ON=255;
int OFF=0;

//<--- LEDs --->
int led_red=3;
int led_green=2;
int redState, yellowState=OFF;
int greenState=ON;

//<--- PIR SENSOR --->
int pirSensor=A4;
int pirState;

//<--- BOOM GATE --->
int gate=A5;
int posGate; //loop Variable
Servo servoGate;
int gateStatus=0; //0 for Gate Closed, 1 for Gate Opened.

//<--- Intervals --->
unsigned long lastTimeRed,lastTimeGreen=0;  // To store the last time the LED was updated
const long yellow_interval = 3000; //3 sec
const long green_interval = 60000; // Min time 60 sec
```

```
const long red_interval = 30000; // Max time 30 sec

void setup()
{
  pinMode(led_red, OUTPUT);
  pinMode(led_green, OUTPUT);
  pinMode(pirSensor,INPUT);
  servoGate.attach(gate);
  analogWrite(led_green,greenState); //Initially Green Light ON
}
void openGate()
{
for (posGate=90;posGate>=0;posGate=posGate-2) //Rotating Gate to open
{
servoGate.write(posGate);
delay(20);
}
gateStatus=1; //Updating status of gate to open i.e 1
}

void closeGate()
{
for (posGate=0;posGate<=90;posGate=posGate+2)//Rotating Gate to close
{
servoGate.write(posGate);
delay(20);
}
gateStatus=0; //Updating status of gate to close i.e 0
}
void loop()
{
 //Getting Current Time
 unsigned long currentTime = millis();

//Read PIR Sensor State
 pirState=digitalRead(pirSensor);

 if(pirState==HIGH)// If motion detected
 {
   if (currentTime - lastTimeGreen >= green_interval) //If green interval passed
   {
     if(greenState==ON)
     {
        //Open Gate (If it is Closed)
        if(gateStatus==0){openGate();}
```

```
      //Turn on Yellow light
      analogWrite(led_red,ON);
      redState=ON;
      yellowState=ON; // Note: Red+Green light on means Yellow Light
      delay(yellow_interval); // Let yellow light on till yellow interval

      //Turn on Red light
      greenState=OFF;
      analogWrite(led_green,greenState);
      lastTimeRed=millis(); //Update lastTime changed to Red to current time
    }
  }
 }
  else if((pirState==LOW) || (currentTime - lastTimeRed >= red_interval))//If no motion detected
or red interval reached
  {
   if(redState==ON)
   { //IF RED ON
      //Turn on  yellow light
       greenState=ON; //as Green+RED = Yellow
       yellowState=ON;
       analogWrite(led_green,ON);
       delay(yellow_interval); // Let yellow light on till yellow interval

       //Turn off red light
       redState=OFF;
       analogWrite(led_red,redState);
       // Save the last time state changed of RED
       lastTimeRed = millis();

       //Close Gate (If it is opened)
       if(gateStatus==1){closeGate();}
   }
 }
}
```

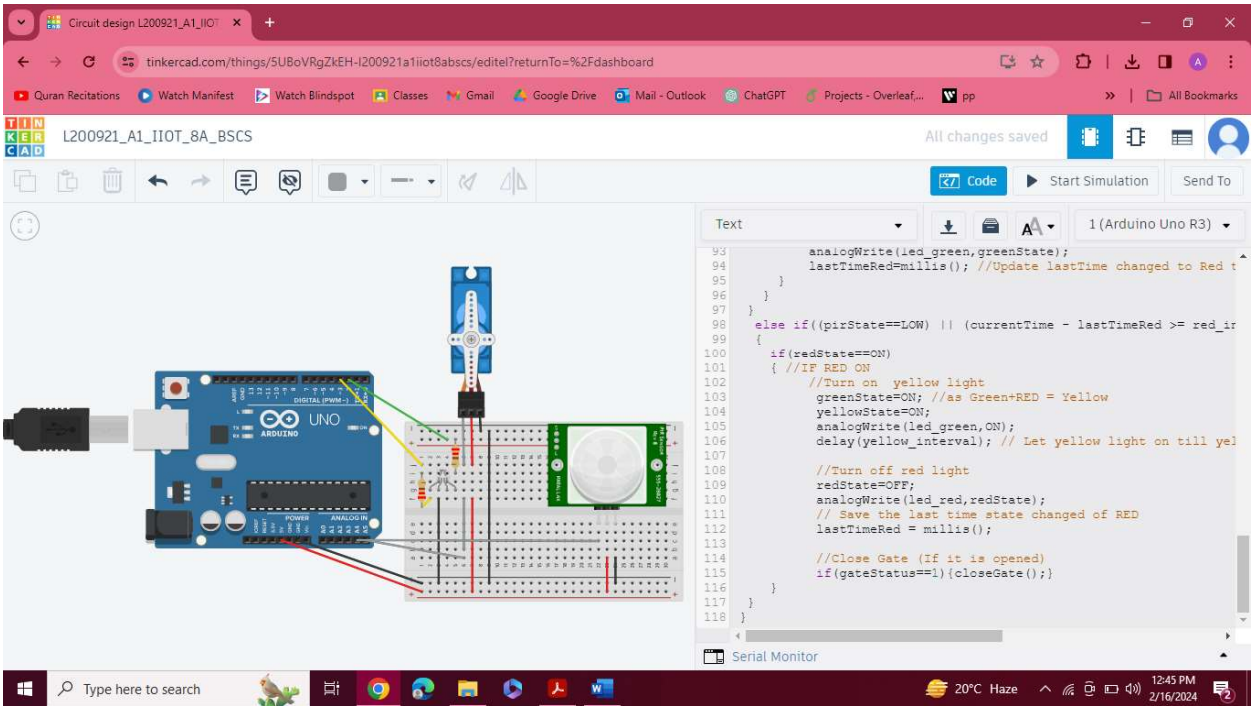
MY DESIGN LINK:

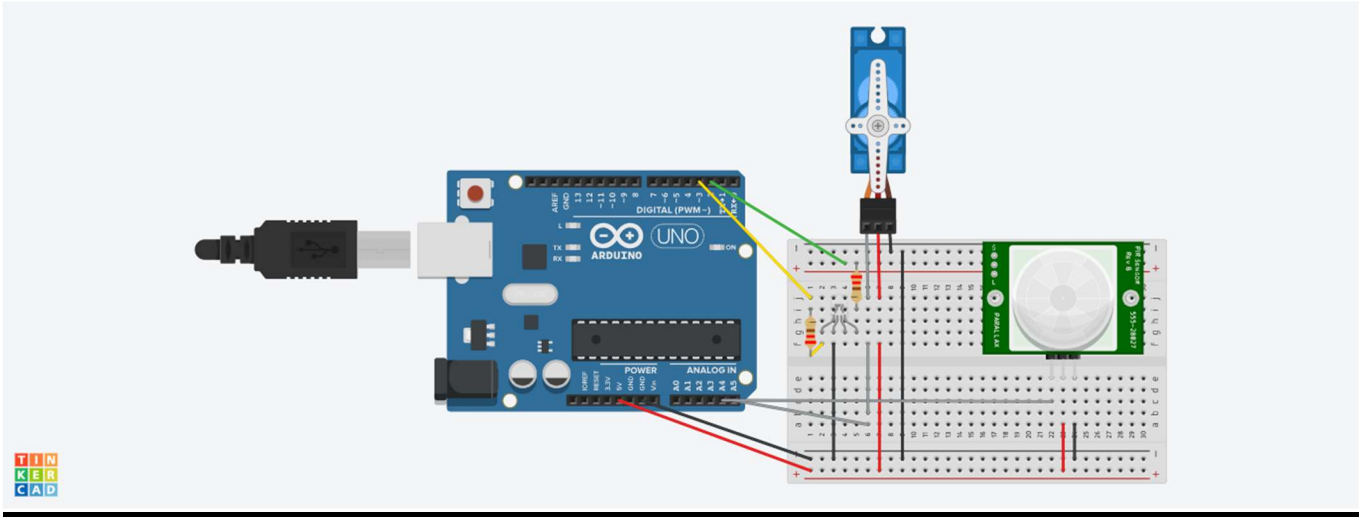
https://www.tinkercad.com/things/5UBoVRgZkEH-l200921a1iiot8abscs?sharecode=PM1K1eoWCNJLz0ifpw_TLRVxpZT2KCYgVMDvIcq38uQ

L200921 Aisha Muhammad Nawaz
Spring 2024 BSCS 8A

IO4041 Introduction to Internet of Things
Assignment # 1 Arduino-based System Design

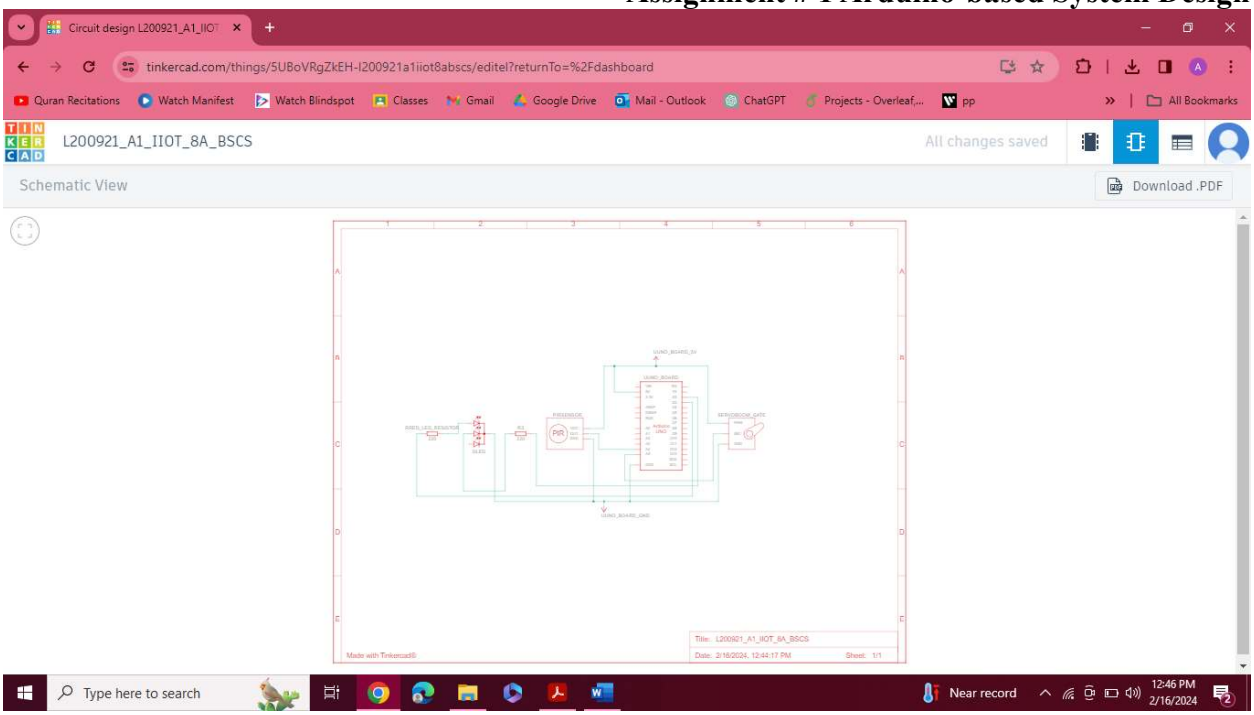
SCREENSHOTS (OF BOARD)



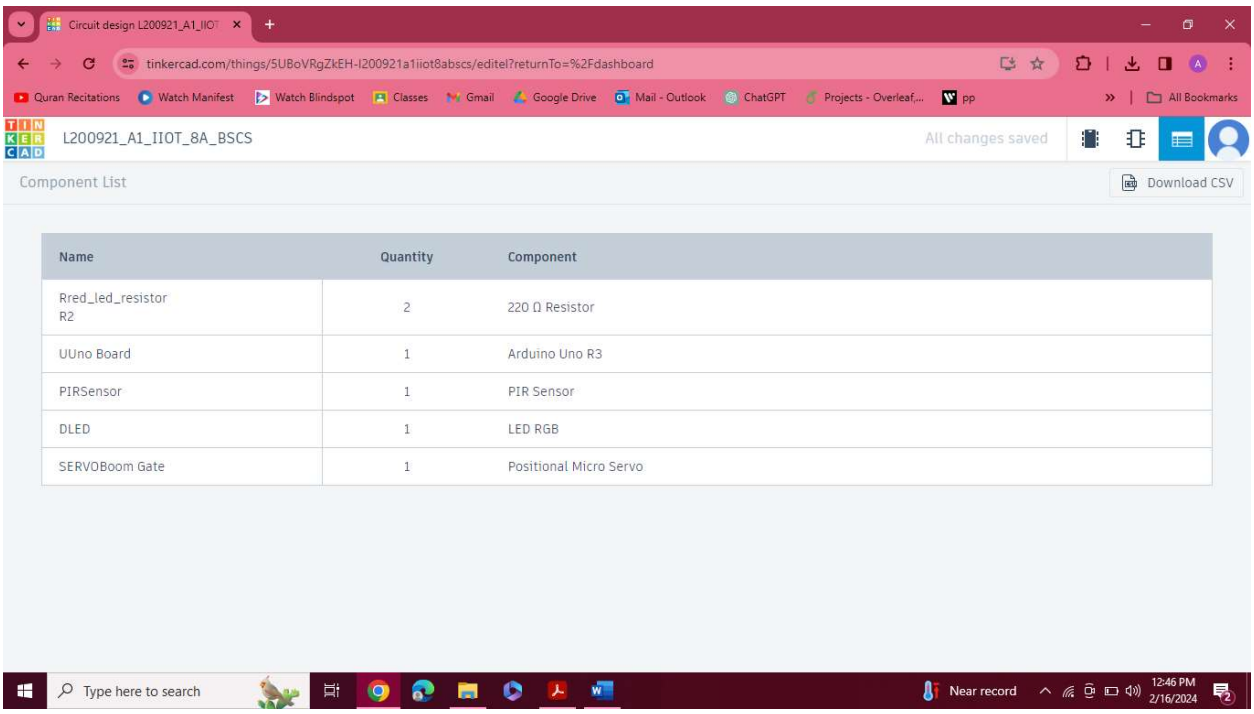


L200921 Aisha Muhammad Nawaz
Spring 2024 BSCS 8A

IO4041 Introduction to Internet of Things
Assignment # 1 Arduino-based System Design



(SCHEMATIC VIEW IS ALSO MORE CLEARLY ATTACHED AT END)**



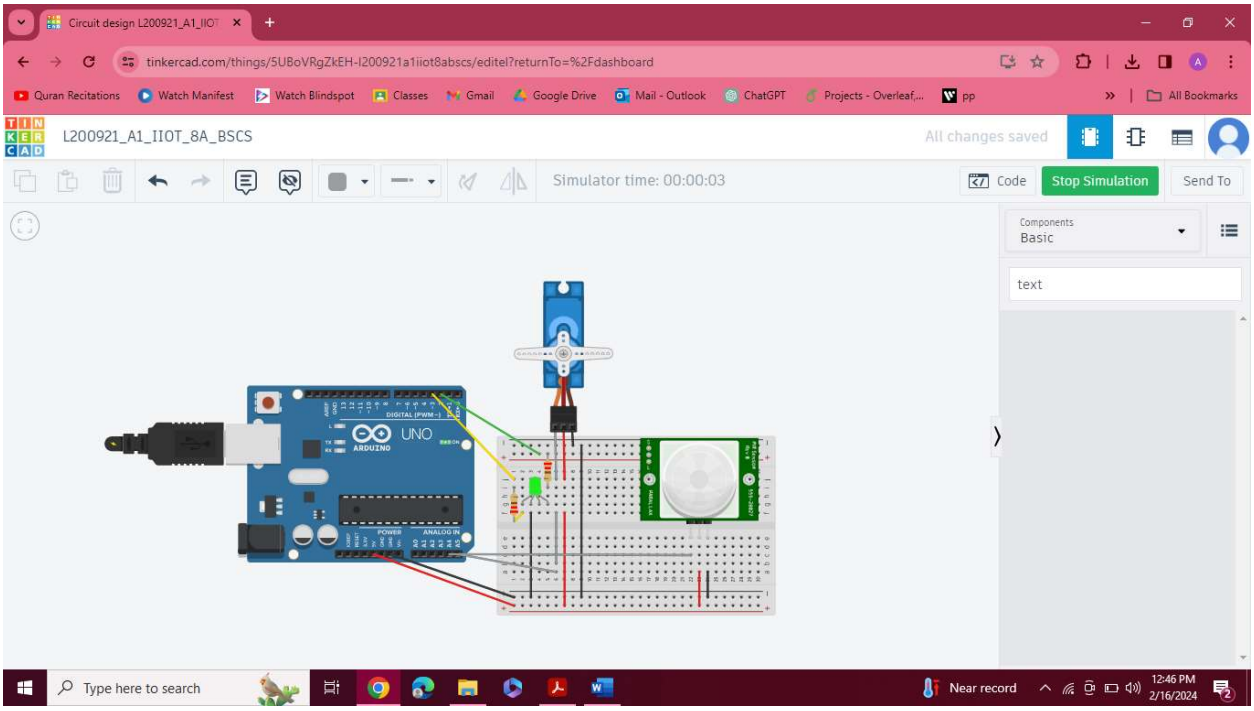
Name	Quantity	Component
Rred_led_resistor R2	2	220 Ω Resistor
UUno Board	1	Arduino Uno R3
PIRSensor	1	PIR Sensor
DLED	1	LED RGB
SERVOBoom Gate	1	Positional Micro Servo

L200921 Aisha Muhammad Nawaz
Spring 2024 BSCS 8A

IO4041 Introduction to Internet of Things
Assignment # 1 Arduino-based System Design

SCREENSHOTS (OF WORKING)

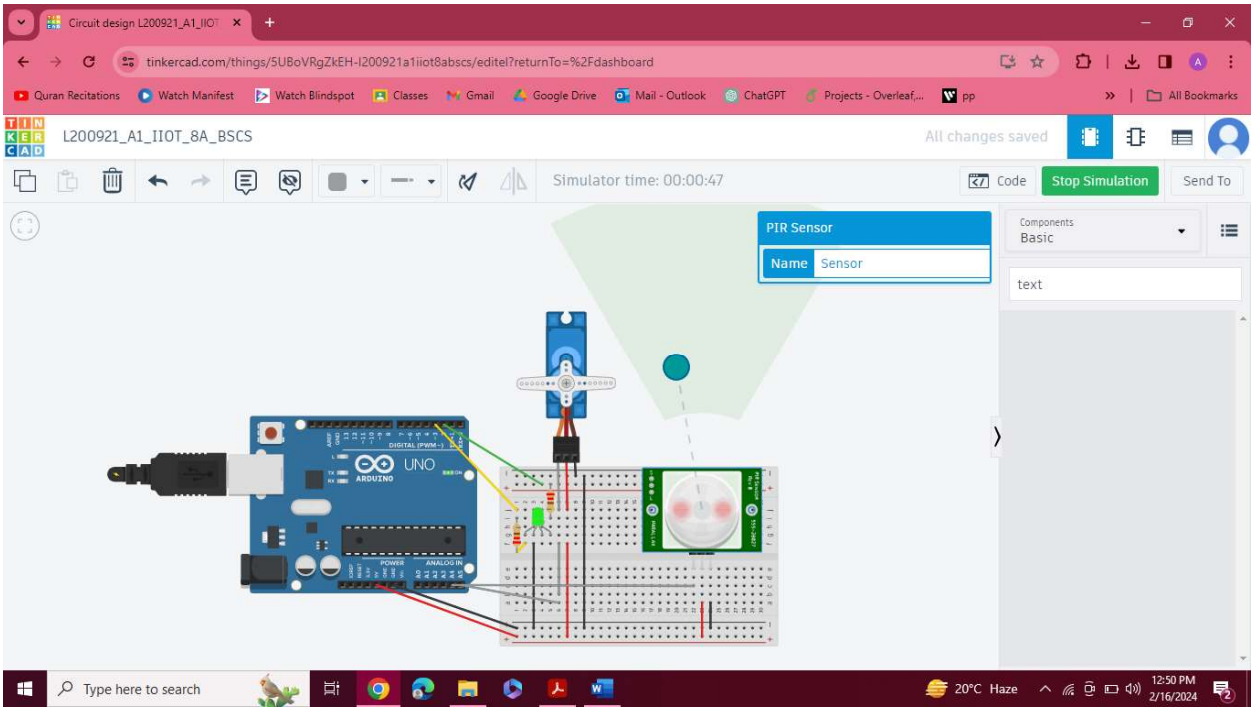
- **Green Light ON & Boom Gate Closed (No Motion Detected)**



L200921 Aisha Muhammad Nawaz
Spring 2024 BSCS 8A

IO4041 Introduction to Internet of Things
Assignment # 1 Arduino-based System Design

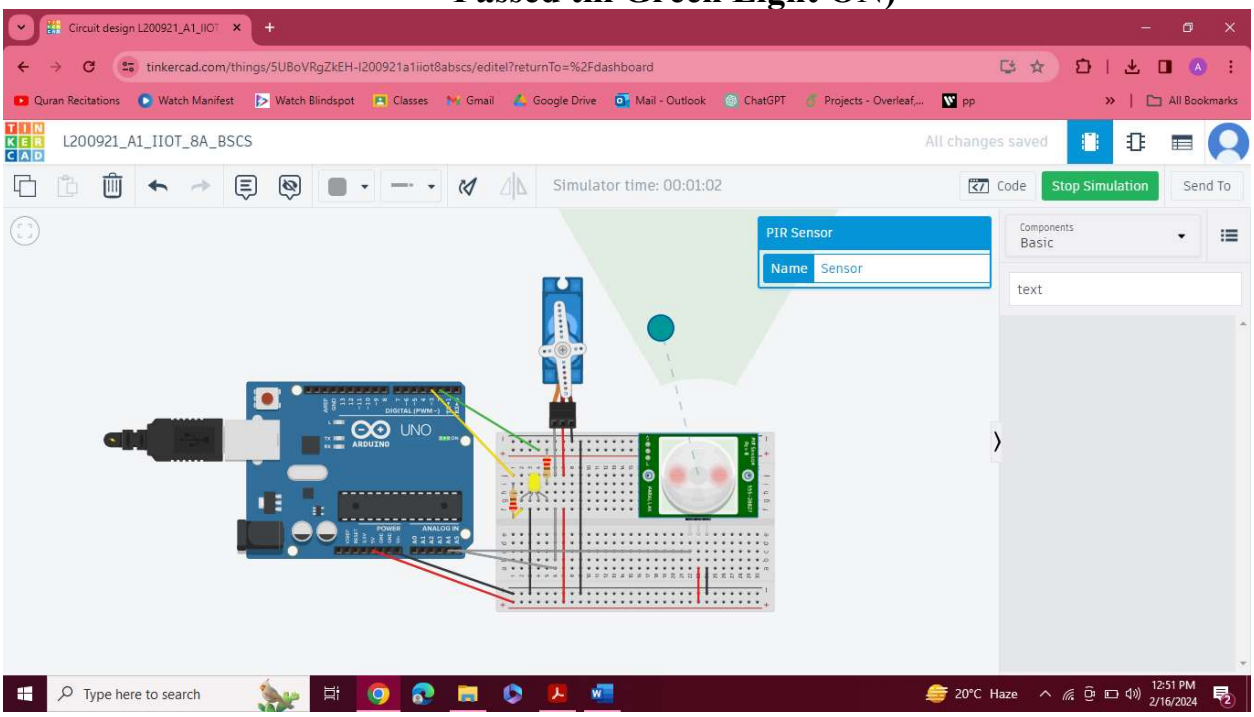
- **Green Light won't change & Gate won't open till 60 secs of green light passed even if motion detected**



L200921 Aisha Muhammad Nawaz
Spring 2024 BSCS 8A

IO4041 Introduction to Internet of Things
Assignment # 1 Arduino-based System Design

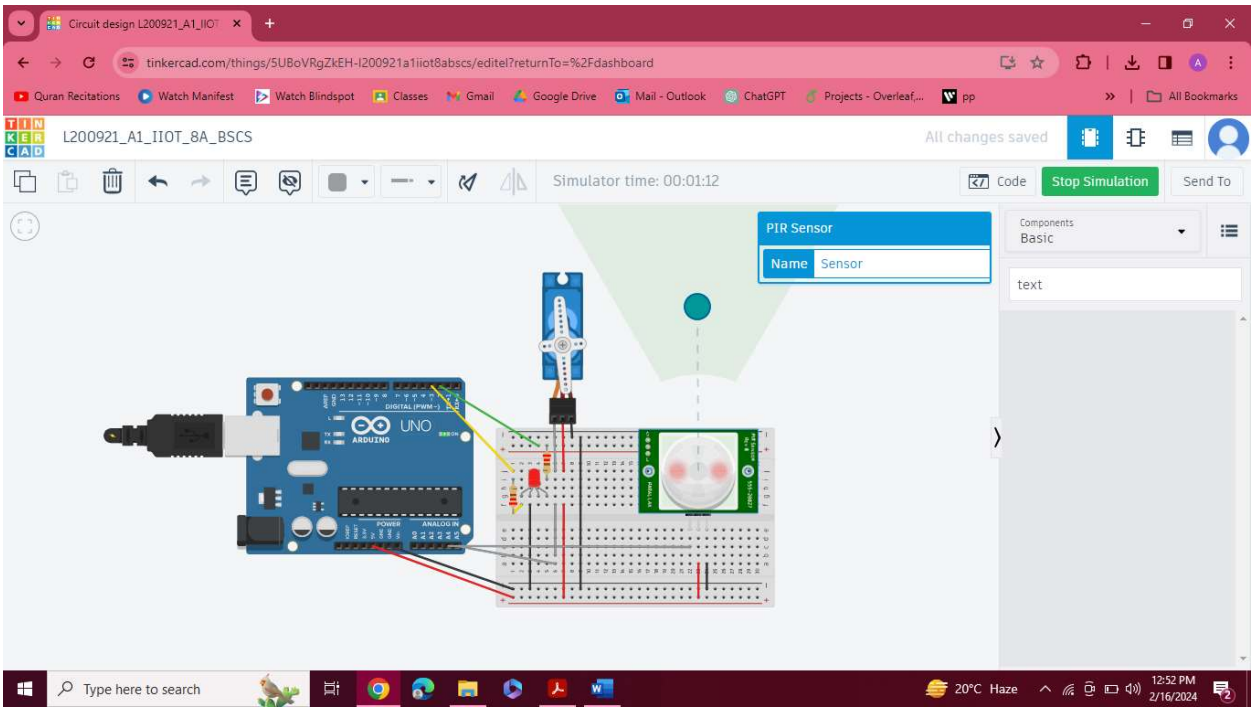
- **Yellow Light ON & Boom Gate Opens (Motion Detected & 60Secs Passed till Green Light ON)**



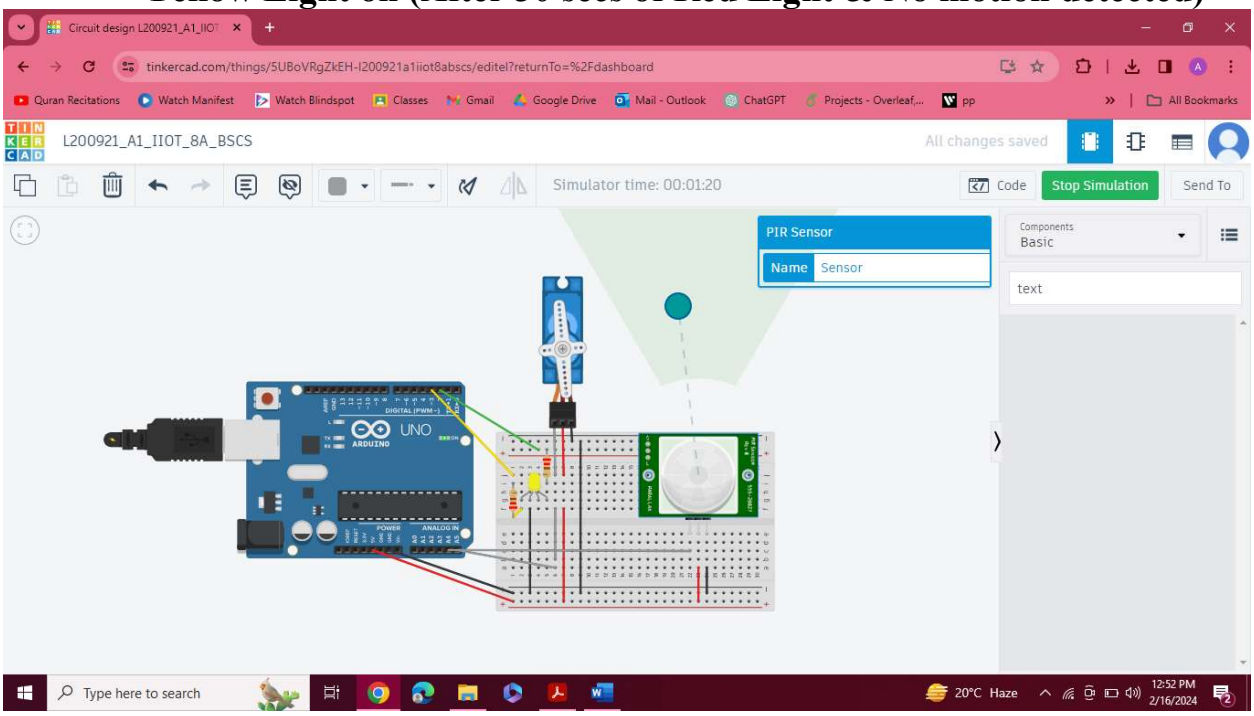
L200921 Aisha Muhammad Nawaz
Spring 2024 BSCS 8A

IO4041 Introduction to Internet of Things
Assignment # 1 Arduino-based System Design

- **RED LIGHT (After 3secs of yellow light)**



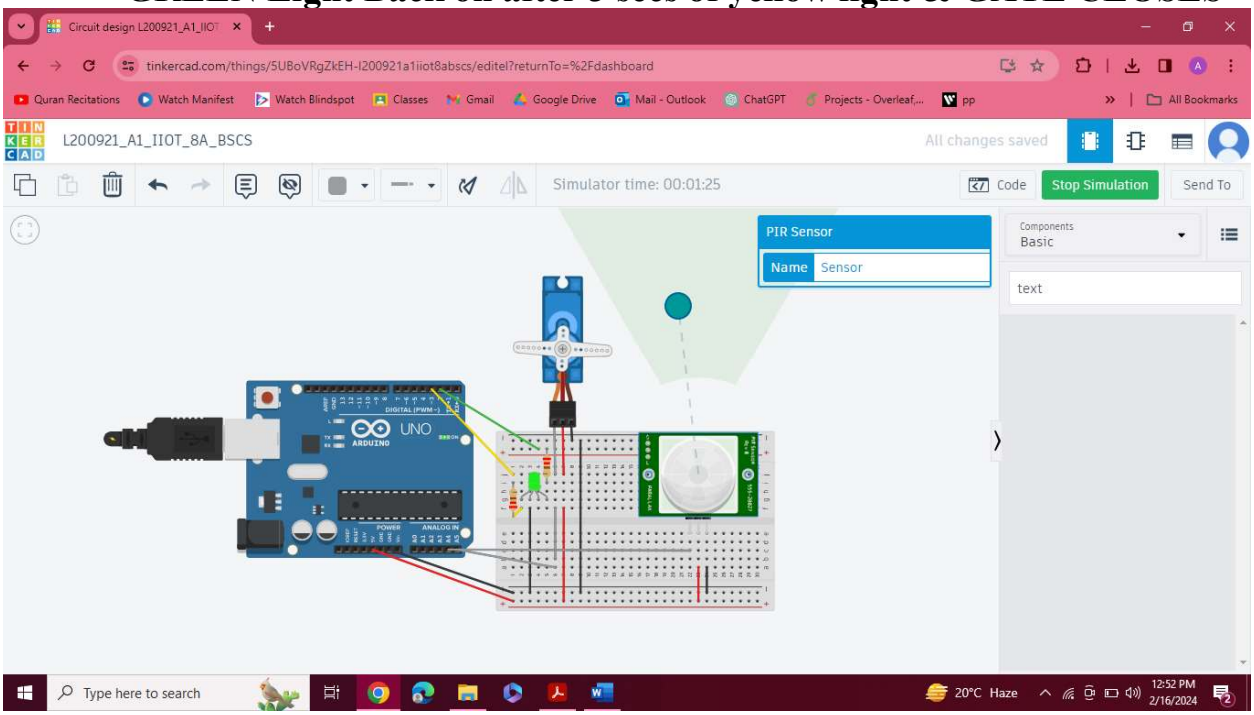
- **Yellow Light on (After 30 secs of Red Light & No motion detected)**

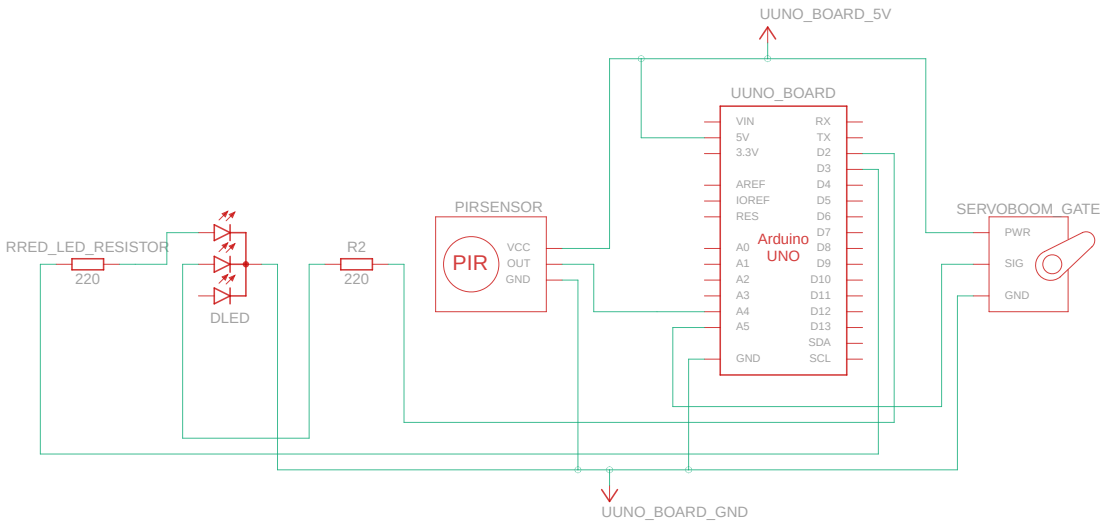


L200921 Aisha Muhammad Nawaz
Spring 2024 BSCS 8A

IO4041 Introduction to Internet of Things
Assignment # 1 Arduino-based System Design

- **GREEN Light Back on after 3 secs of yellow light & GATE CLOSES**





Made with Tinkercad®

Title:	L200921_A1_IIOT_8A_BSCS
Date:	2/16/2024, 12:44:17 PM
Sheet:	1/1