Creating a Smart Home Security System

CEIS101 Final Course Project

January 2025

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DeVry University

Introduction

- **Project Description:**
  This project focuses on developing a **smart home automation and security system** using a virtual emulator. The system integrates various IoT components to monitor and enhance home security.
- **Project Objective:**
- To design and simulate a smart home security system.
- To integrate a door sensor to detect intrusions.
- To implement LEDs and a buzzer for security alerts.
- To apply conditional programming to control the system's behavior.
- **Tools Used:**
- **Tinkercad** (Virtual Emulator for circuit simulation)
- **Arduino IDE** (Programming environment)
- **Hardware Components** (LEDs, buzzer, slide switch, and Arduino board simulation)

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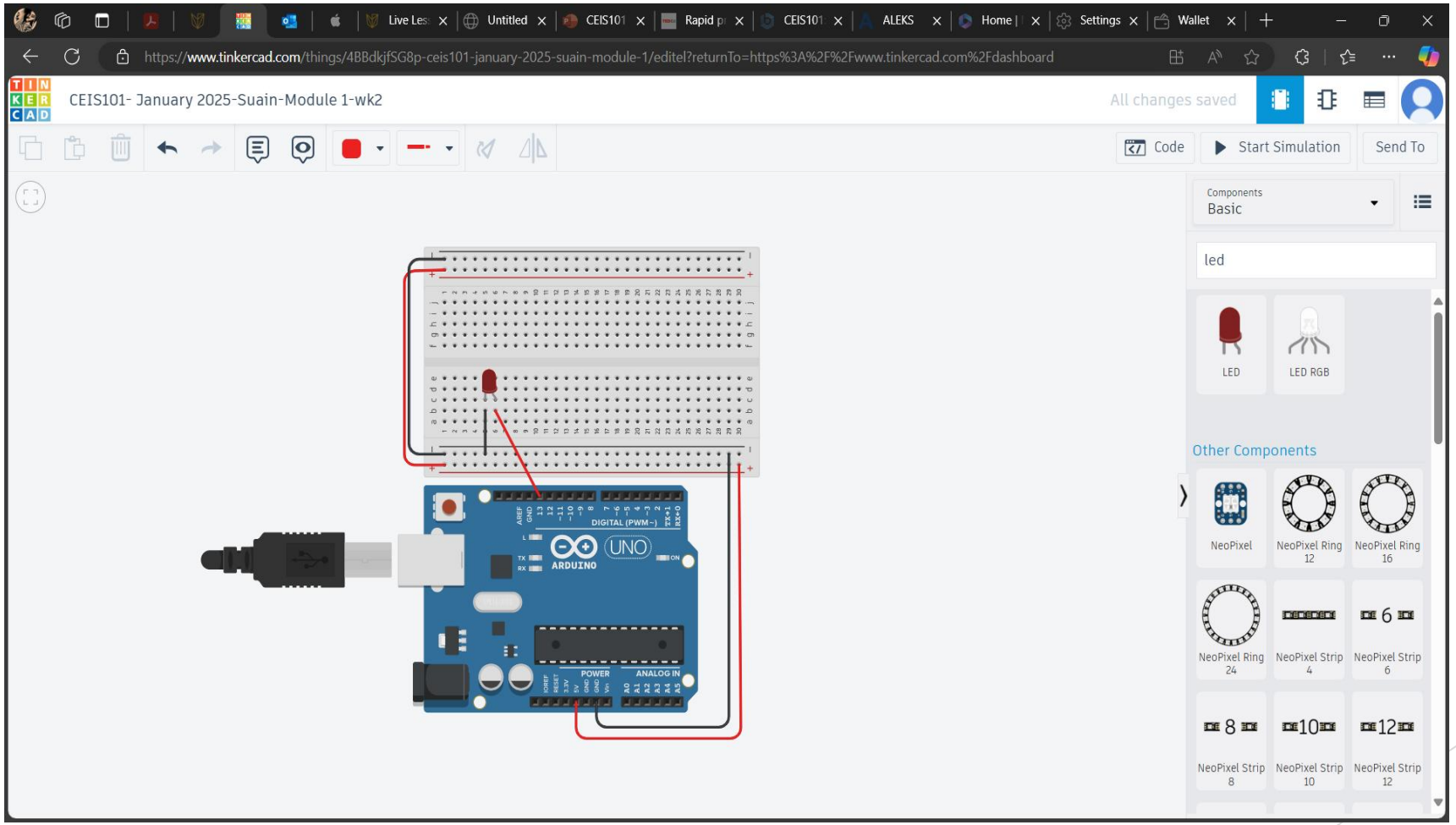
Circuit (Screenshot)



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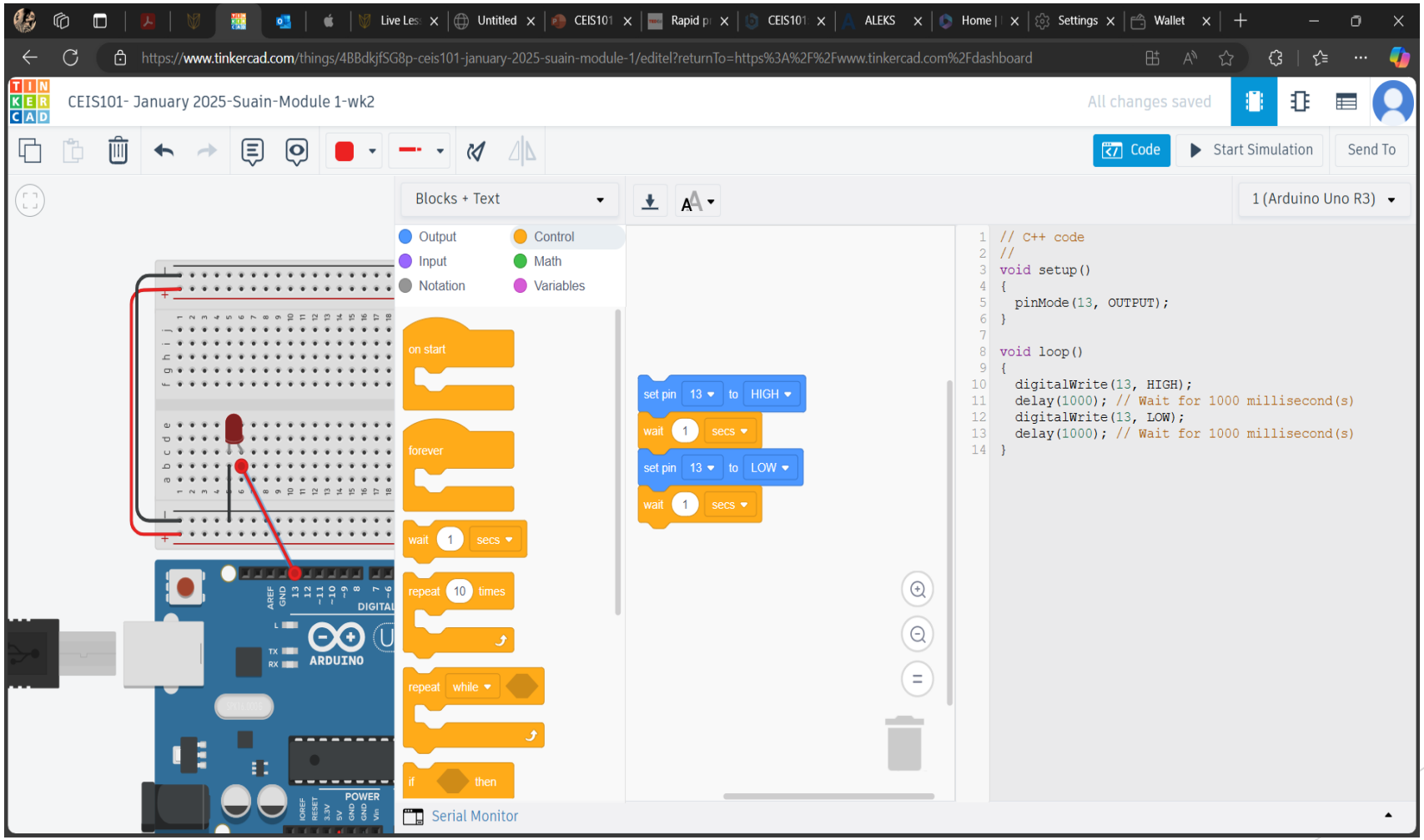
CODE (screenshot)



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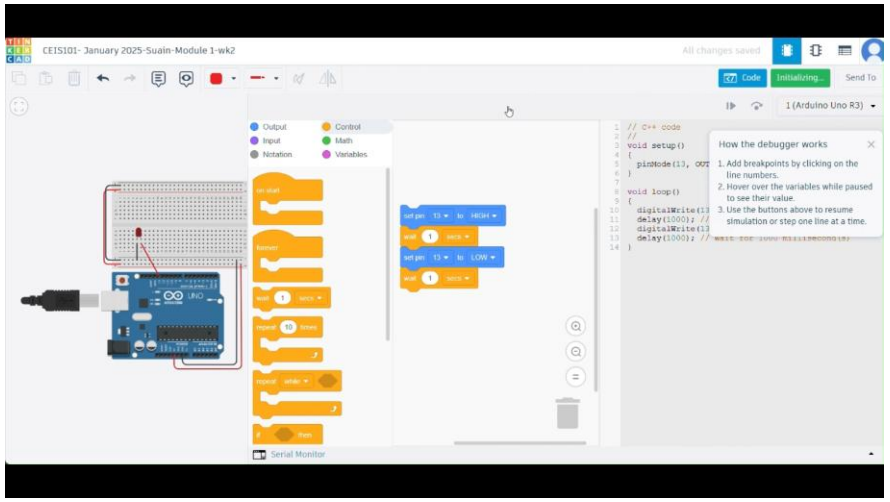
Prototype (Circuit + Code)



- This project delves into circuit simulation in Tinkercad, highlighting essential components for IoT applications. It begins with the design of basic circuits, focusing on wiring, polarity, and Arduino programming. Key components such as sensors, microcontrollers, and actuators are identified for their respective functions. The integration phase combines these elements to create systems featuring LEDs, buzzers, and motion sensors. Finally, message display is achieved through LCDs and serial monitors, enabling real-time communication of sensor data. Each phase contributes to the development of a functional IoT-based home automation system.

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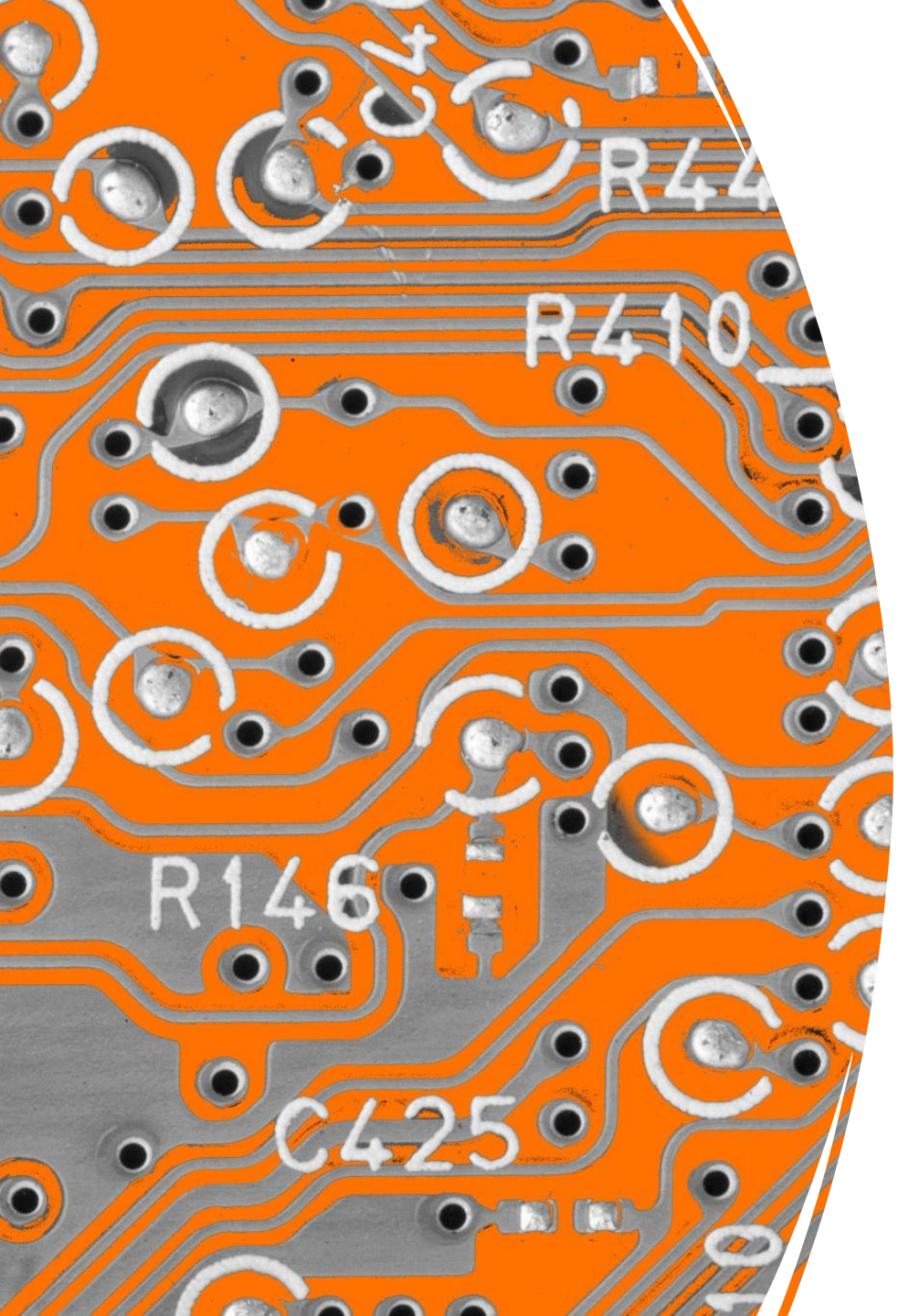

CEIS101 Module 03

Inventory of Parts, Circuit Building, and Displaying Messages

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January 26th, 2025

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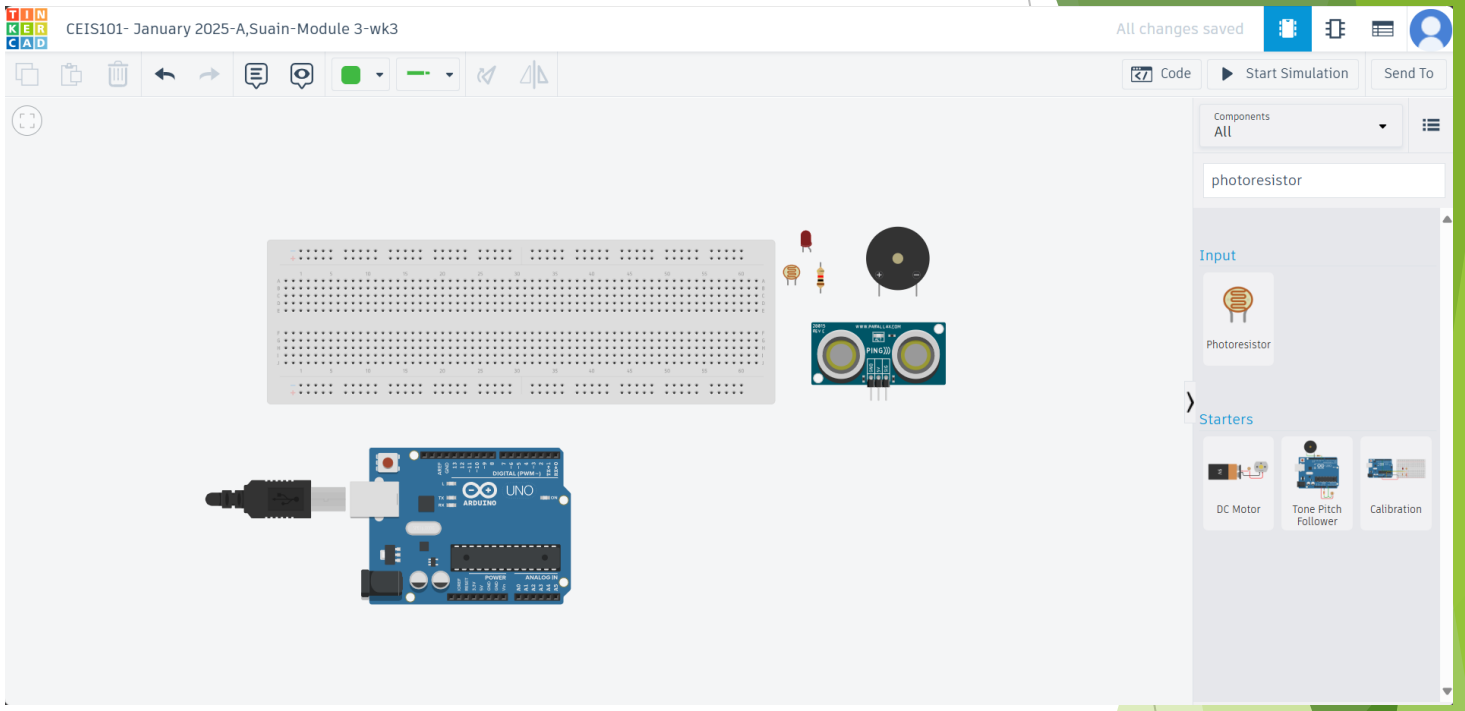
Organization of Project Components (picture)



- Arduino Uno
- Breadboard
- Resistor 10kΩ
- LEDs
- Ultrasonic Sensor
- Piezo
- Photoresistor

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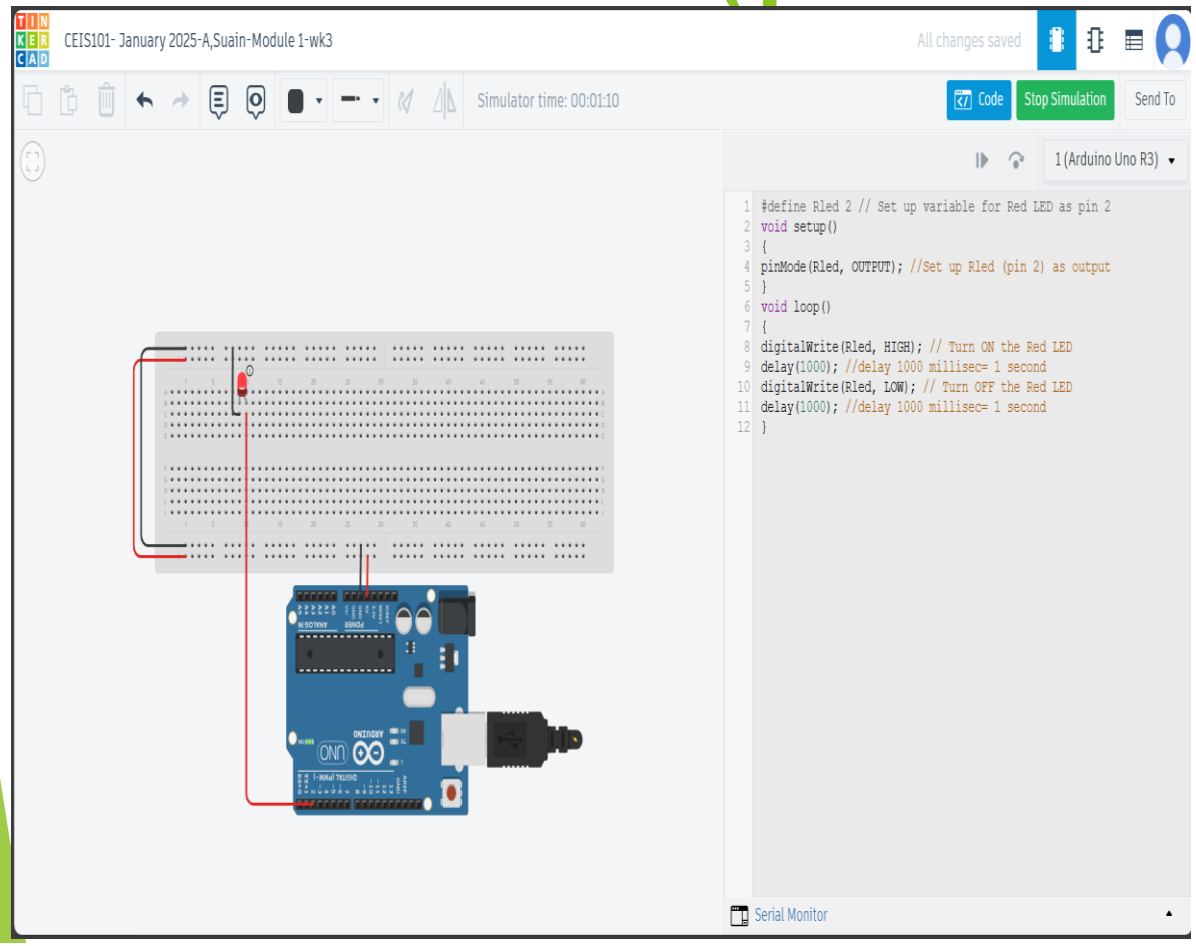
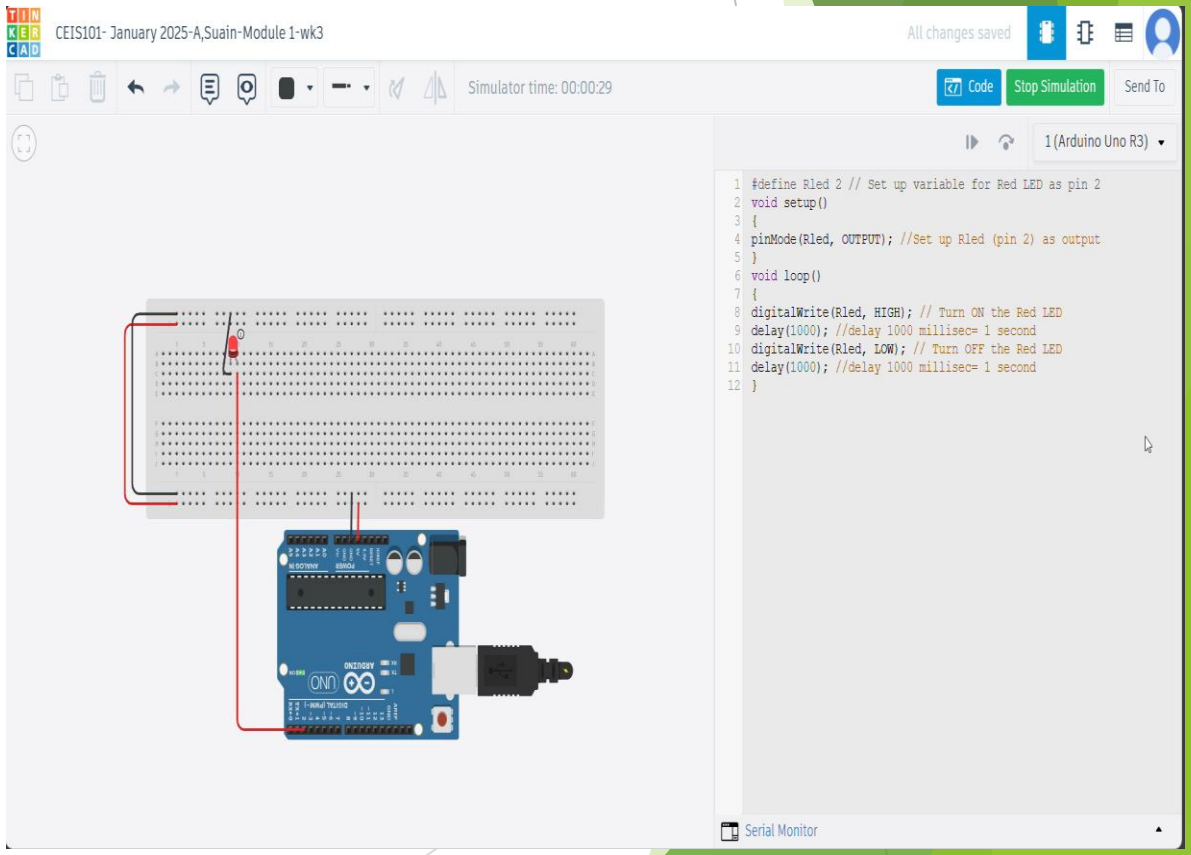
Circuit with red LED on (picture)





Added to reflect active code/ successful simulation .

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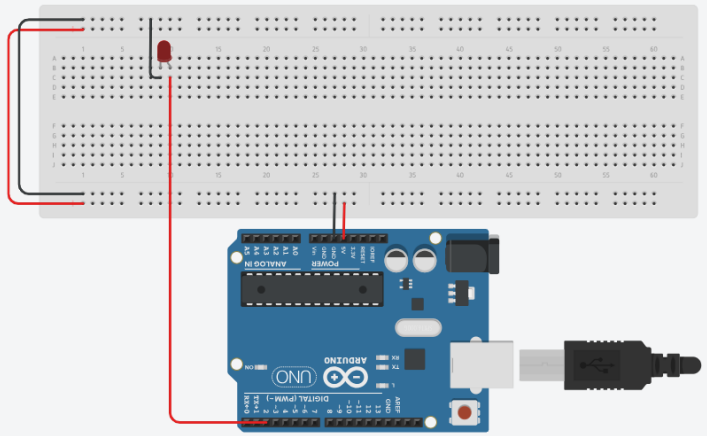
CEIS101- January 2025-A,Suain-Module 1-wk3

All changes saved

Code | Start Simulation | Send To



Text | 1 (Arduino Uno R3)

```
#define Rled 2 // Set up variable for Red LED as pin 2
void setup()
{
Serial.begin(9600); // Sets the baud rate for logging
pinMode(Rled, OUTPUT); //Set up Rled (pin 2) as output
Serial.println("CEIS101C Course Project Module 3");
Serial.println("Name: Akira Suain "); //replace xxxxx with your n
}
void loop()
{
digitalWrite(Rled, HIGH); // Turn ON the Red LED
Serial.println("Red LED is ON");
delay(1000); //delay 1000 msec= 1 second
digitalWrite(Rled, LOW); // Turn OFF the Red LED
Serial.println("Red LED is OFF");
delay(1000); //delay 1000 msec= 1 second
}
```

Serial Monitor

```
CEIS101C Course Project Module 3
Name: Akira Suain
Red LED is ON
Red LED is OFF
Red LED is ON
Red LED is OFF
Red LED is ON
Red LED is OFF
Red LED is ON
```

Send | Clear

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Building a Smart Home System: From Circuit Assembly to Door Sensor Integration

This project begins with an inventory of essential parts for a smart home system, covering components like sensors, microcontrollers, and actuators. Afterward, the focus shifts to circuit building, where participants wire the components together and write Arduino code to bring the circuit to life. The next phase involves displaying messages, using LCDs or serial monitors to communicate real-time data, such as sensor status. The final stage introduces a door sensor to the system, enhancing home security by detecting whether doors are open or closed. This addition integrates seamlessly with the existing system, contributing to the overall functionality of the smart home project.

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Adding Door Sensor to Smart Home System

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Module 04

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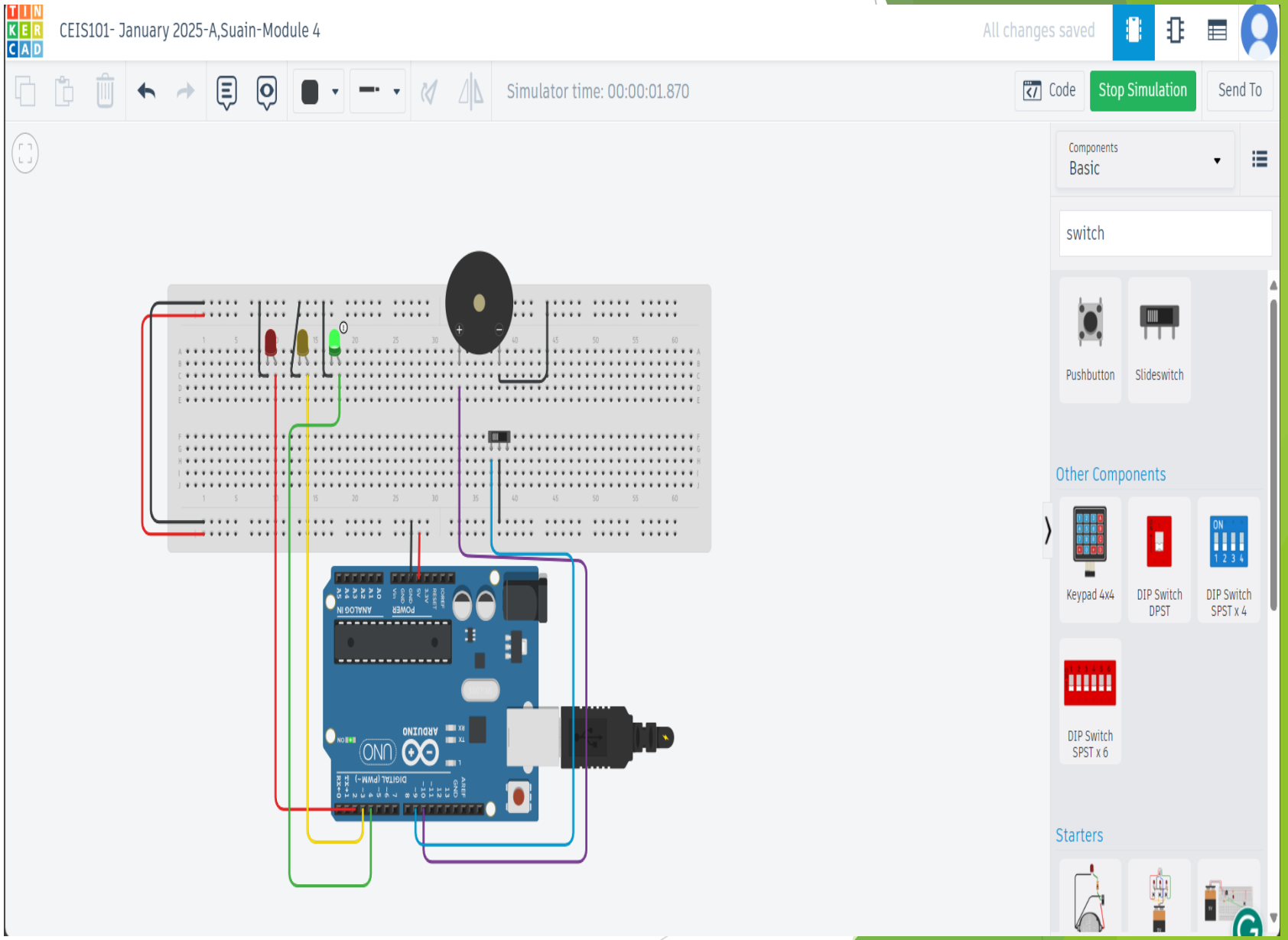
Circuit of door closed with Green LED ON (picture)



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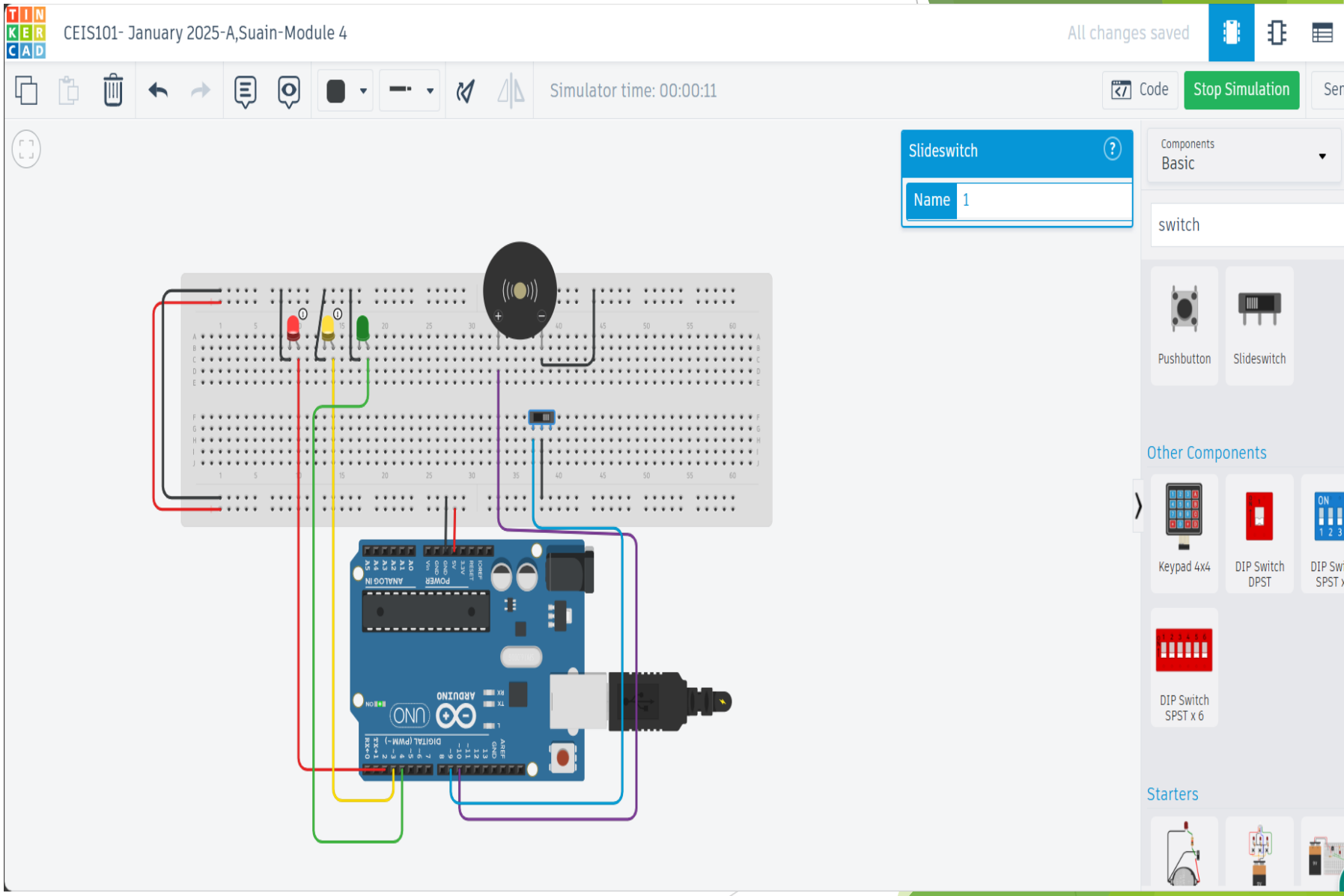
Circuit of door open with Green LED OFF (picture)



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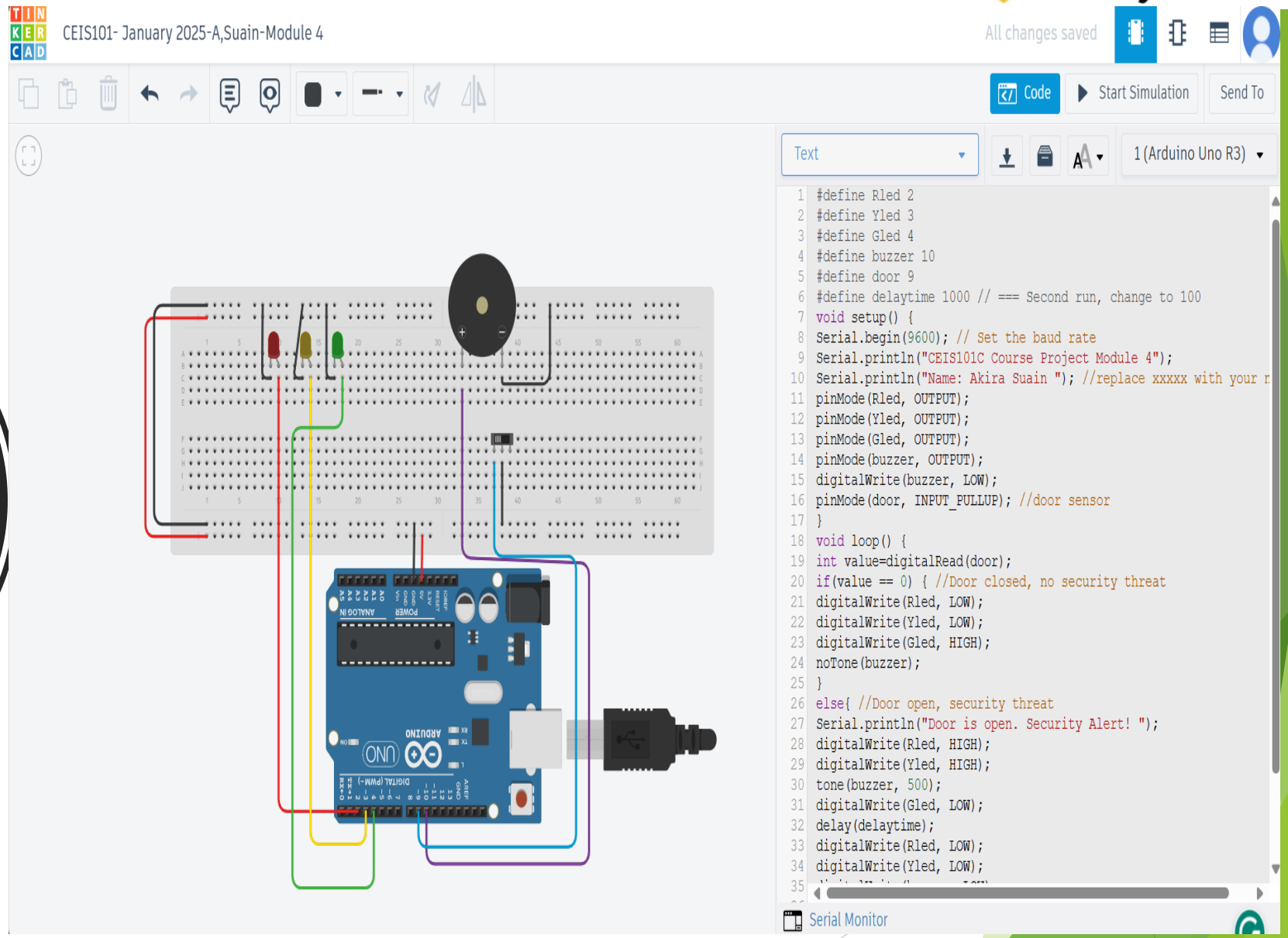
Arduino Code (screenshot)



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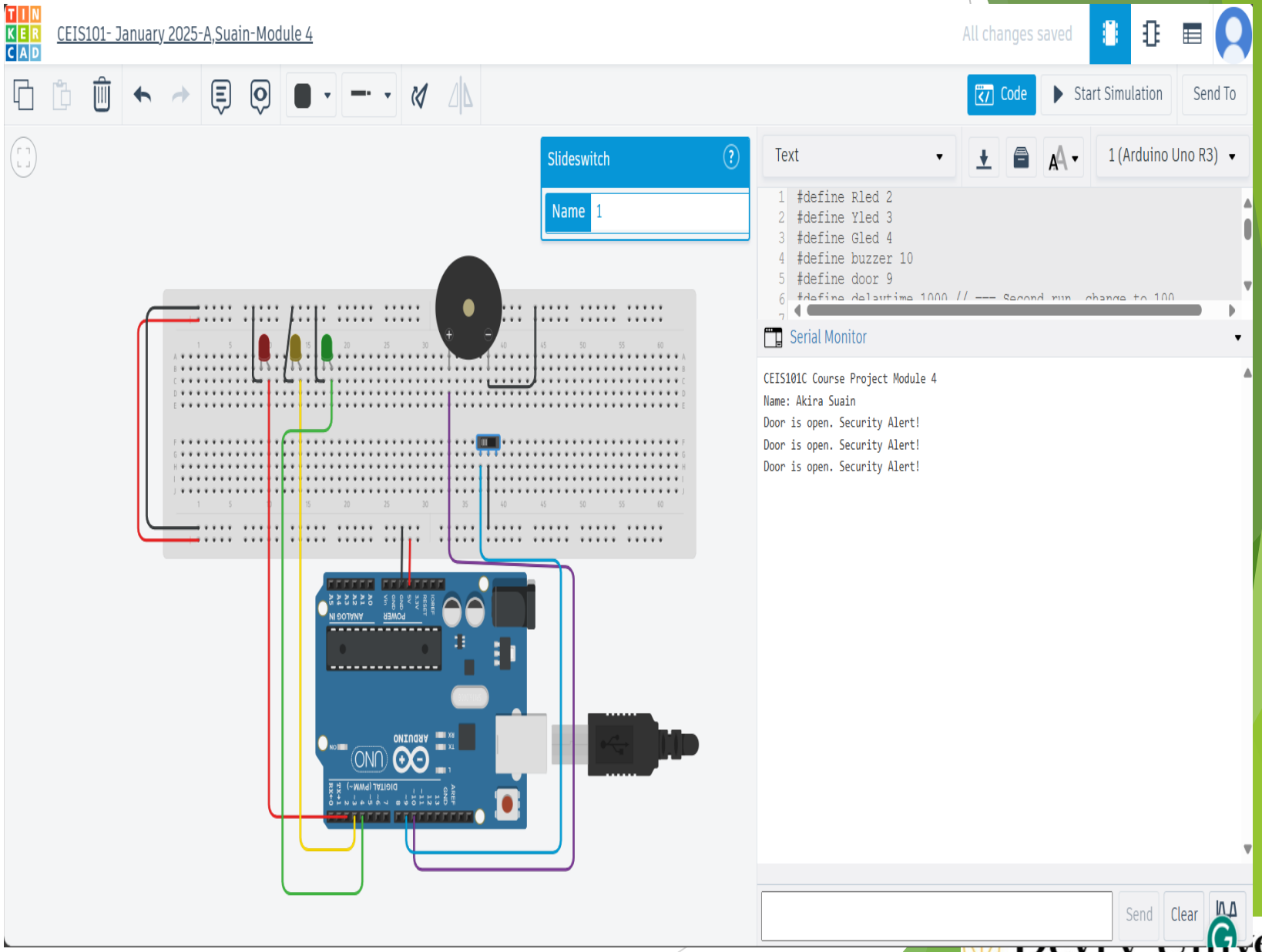
Serial Monitor (screenshot)



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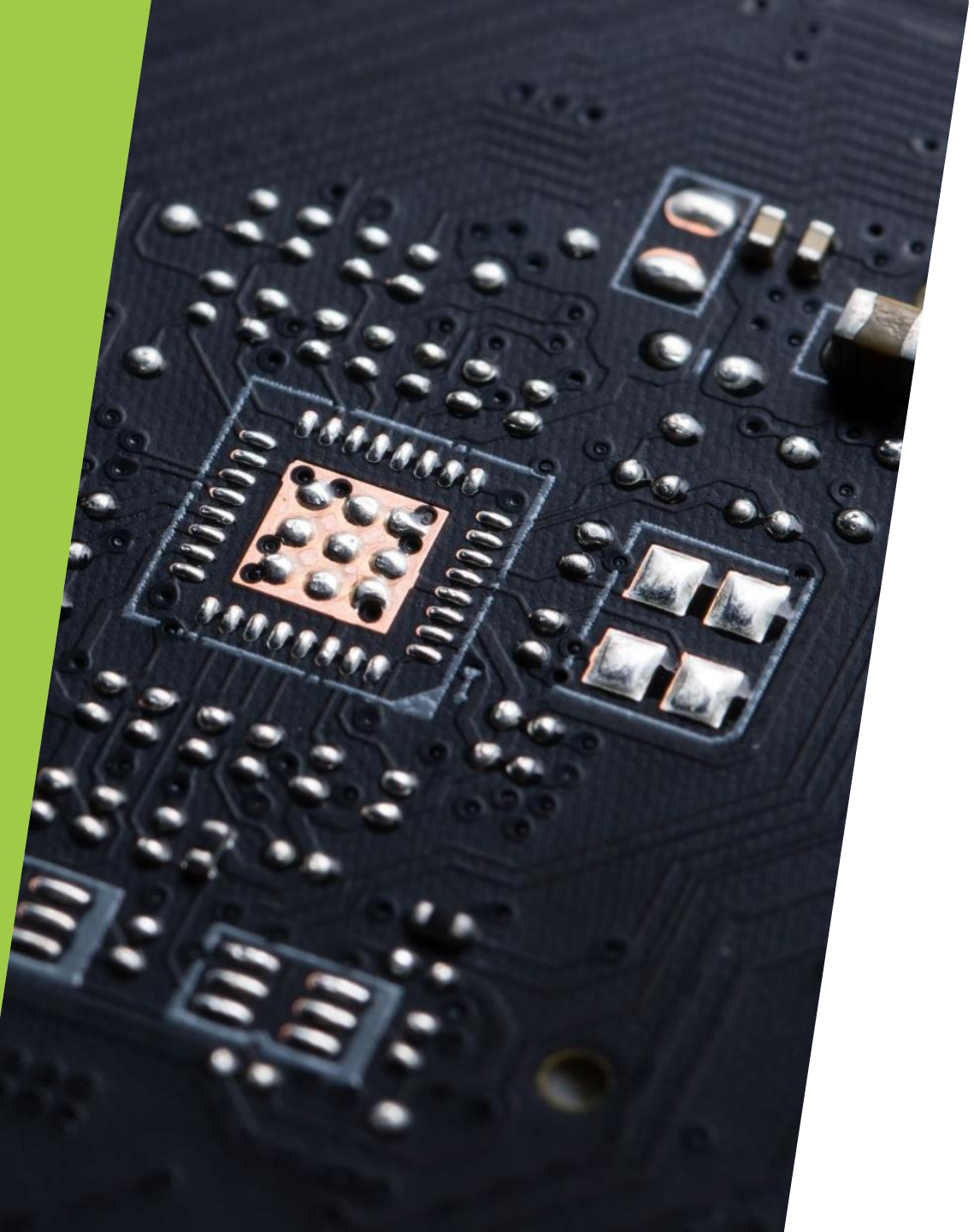
Enhancing Smart Home System: Door Sensor to Distance Sensor Integration & Data Analysis

The objective of this series of projects was to enhance the functionality of a smart home system by integrating sensors for increased automation and efficiency. The first step involved adding a door sensor, enabling the system to detect door status (open or closed), thereby improving home security through automated actions such as notifications or triggering other devices. Building upon this, a distance sensor was incorporated to measure proximity and movement within the system. The data collected from this sensor was then analyzed to assess performance, identify trends, and inform system optimizations, further enhancing the system's responsiveness and overall effectiveness.



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Adding Distance Sensor to Smart Home System and Conducting Data Analysis

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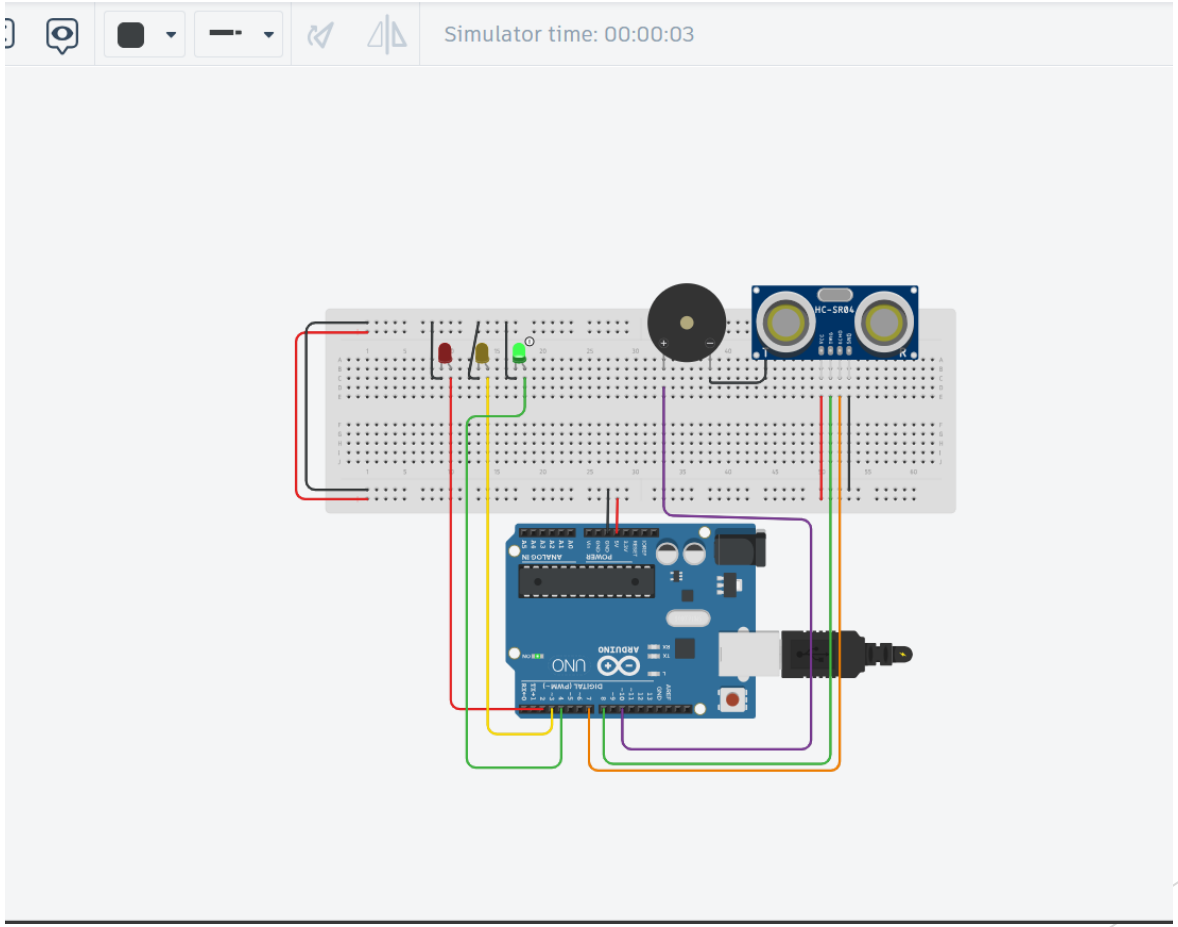
Circuit with green LED on (picture)



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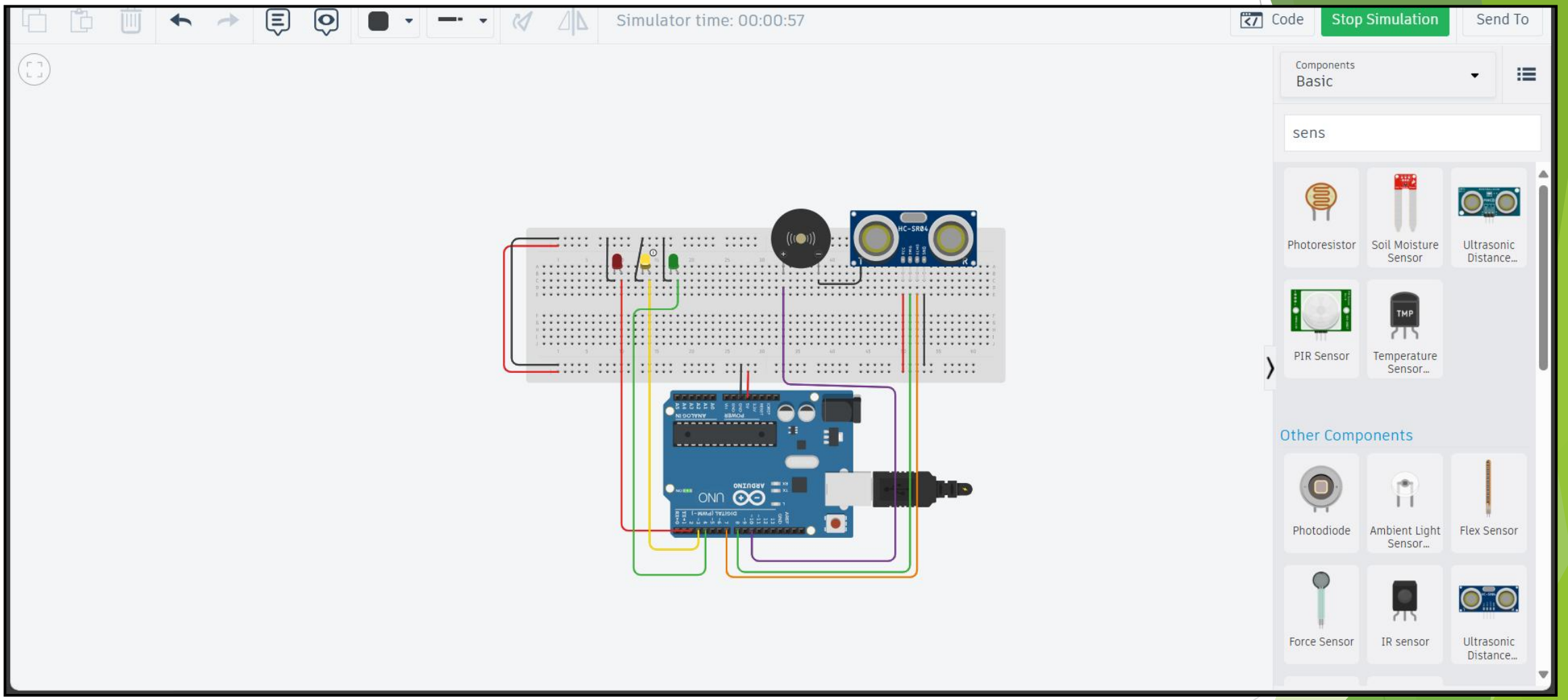

Circuit with yellow LED on (picture)

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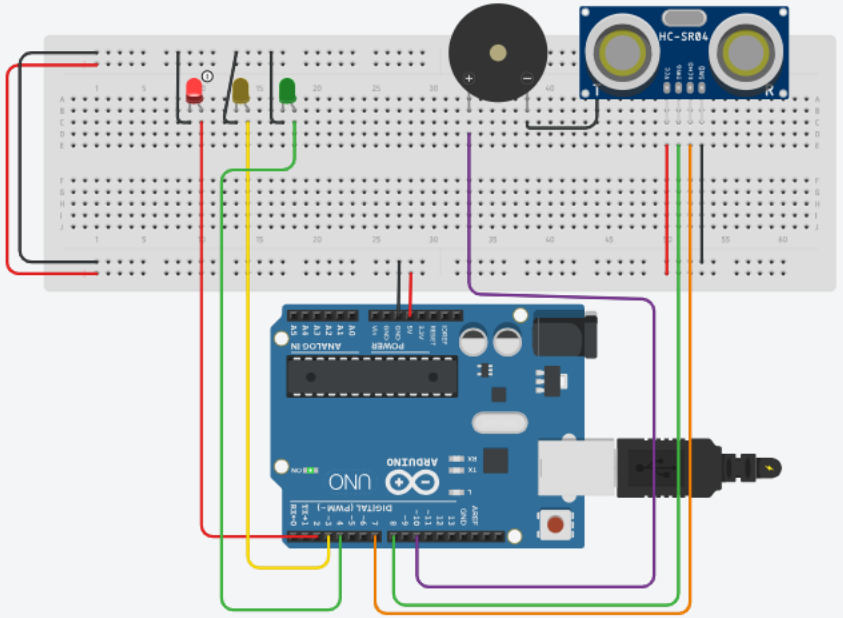

Circuit with red LED on (picture)

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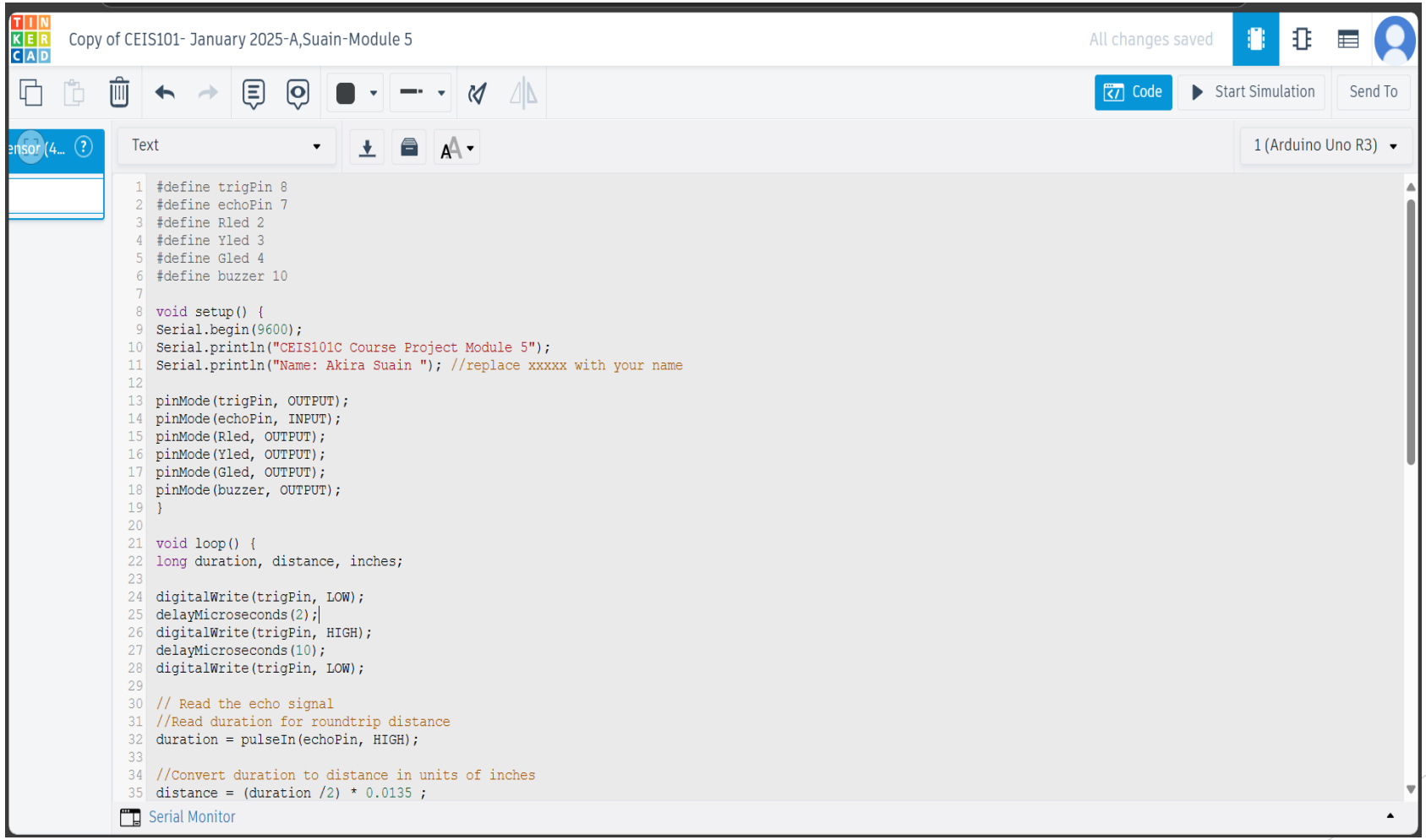
Arduino Code (screenshot)



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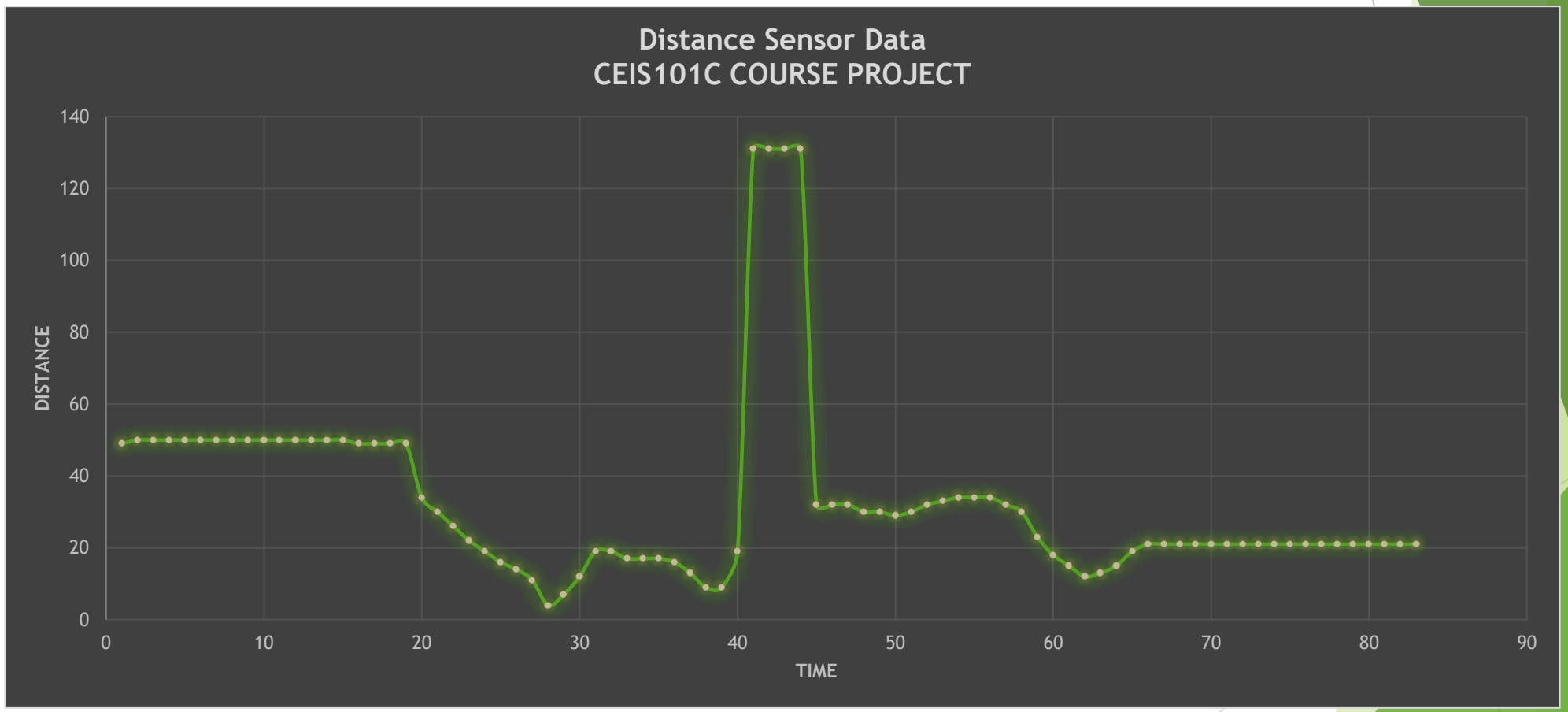
Plot of data (graph from Excel)



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Integration of Distance Sensor into Smart Home System and Data Analysis to Adding Automated Light to Smart Home System

This phase of the project focused on expanding the capabilities of the smart home system by integrating a distance sensor to measure proximity and detect movement. The sensor data was analyzed to evaluate its impact on system performance and to identify opportunities for further enhancement. Building on these insights, an automated light system was introduced, allowing lights to turn on or off based on proximity, time of day, or other predefined conditions. This integration enhanced the system's automation, improving energy efficiency and user convenience through responsive environmental adjustments.

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Module 6

Adding Automated Light to Smart Home System

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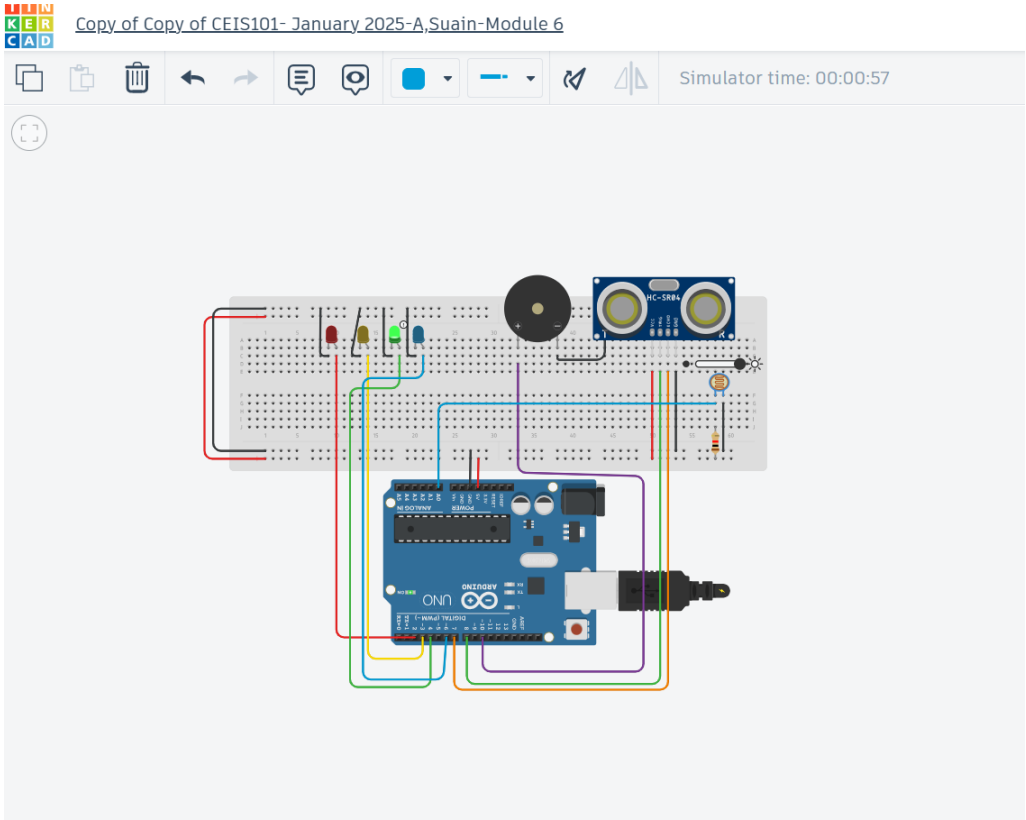
Circuit with automated LED off (picture)



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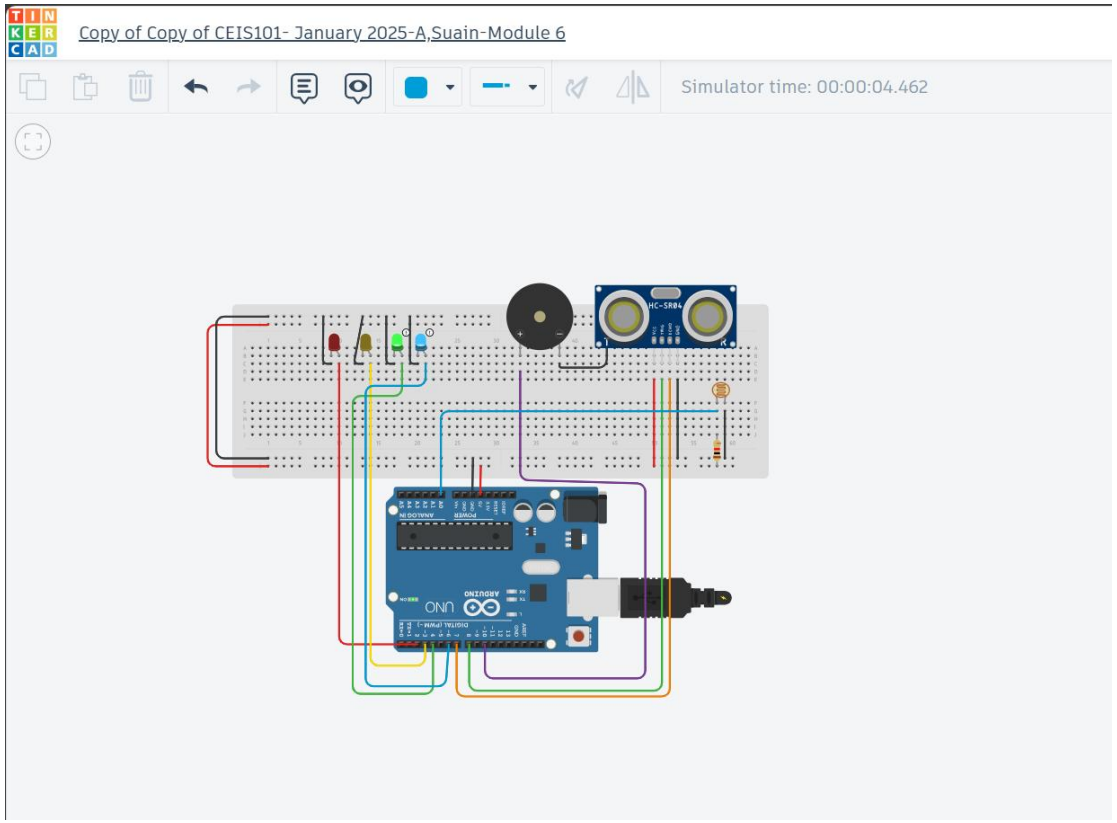
Circuit with automated LED on (picture)



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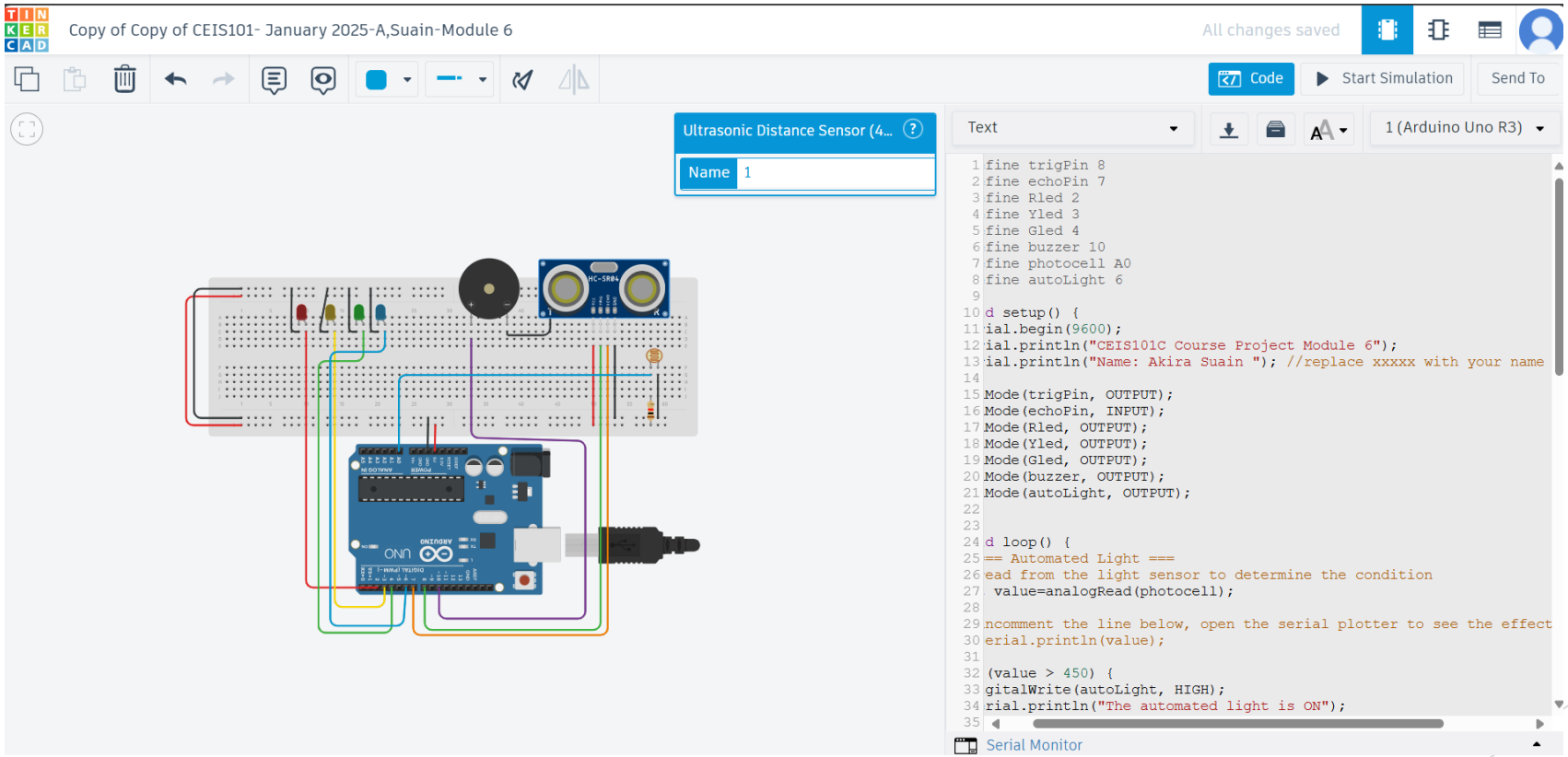
Arduino Code (screenshot)



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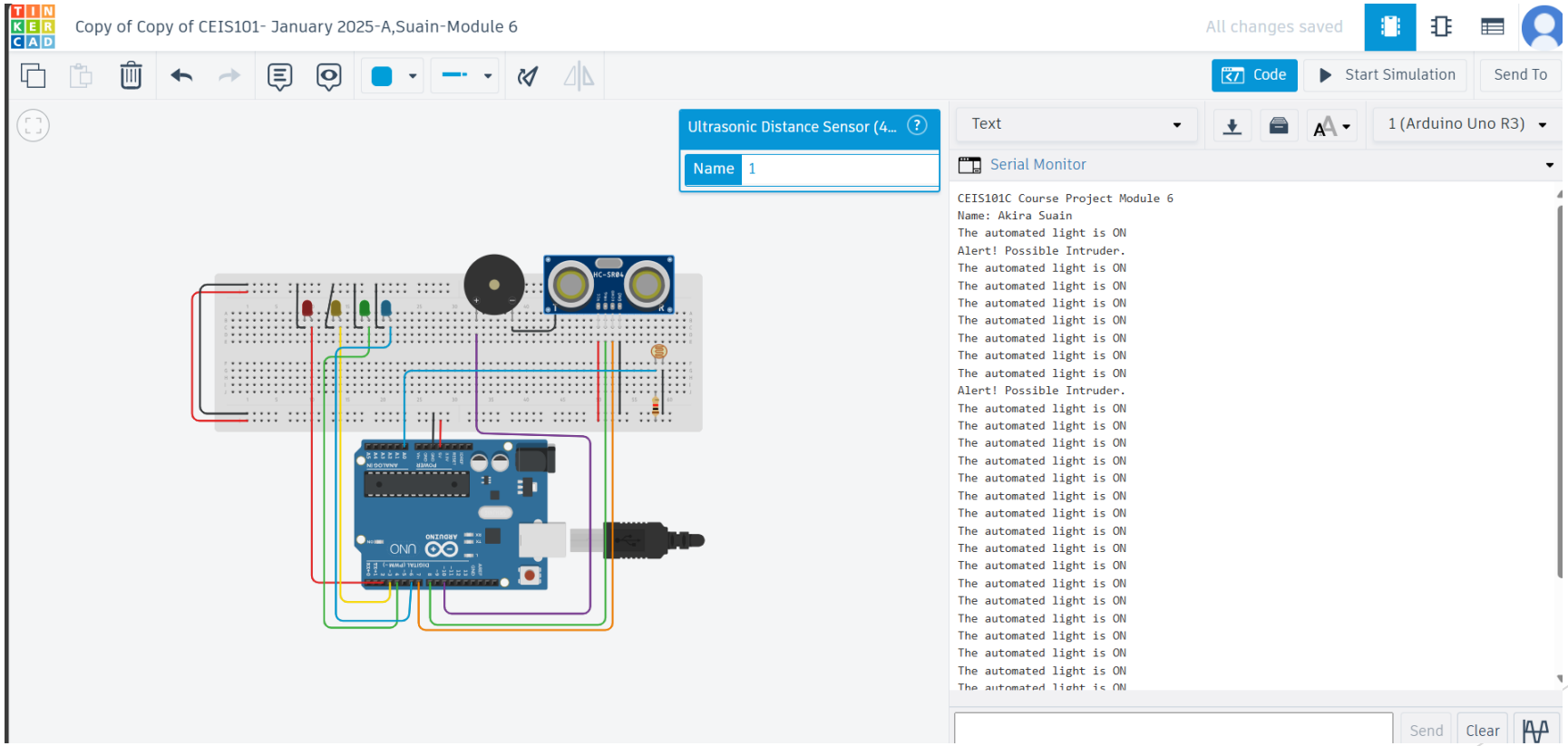
Serial Monitor (screenshot)



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Adding Automated Light to Smart Home System

The objective of this project phase was to enhance the smart home system by incorporating an automated lighting system. This system was designed to automatically control lighting based on specific conditions, such as time of day, movement, or proximity. By integrating sensors and programming logic, the automated lights offer increased convenience, energy efficiency, and user control, allowing for a seamless, intelligent interaction with the home environment. This step also laid the groundwork for future automation features within the broader smart home system.

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Challenges/Lessons Learned

Overcoming Challenges By:

- ✓ Deep immersion in learning
- ✓ Hands- On Experimentation
- ✓ Slowing Down and Paying Attention
- ✓ Following Guides and Documentation

Lesson Learned:

- ➢ Patience & Persistence
- ➢ Embracing New Learning Methods
- ➢ Attention To Detail
- ➢ Enjoyment of the Process

Challenges Faced:

- Transitioning to a Digital Platform:
  - I have previous experience with physical electronics (smartphones, gaming systems, and laptops) but had no experience with digital stimulators.
- Initial Nervousness:
  - I felt unsure about starting from scratch in a virtual environment.
- Technical difficulties
  - Faced challenges with zoom sensitivity, component selections (breadboard, buzzer, sensors), and wiring connections.

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Career Skills & Competencies from the Project

Competencies For Career Advancement:

- IoT & Embedded Systems Knowledge-
  - Understanding device communication and interaction.
- Software & Hardware Integration
  - Bridging physical components with programming logic.
- Programming Proficiency
  - Strengthening coding skills for real-world applications.
- Attention to Detail
  - Ensuring accuracy in circuits and logical code execution.
- Project Management
  - Developing structured workflows for system development.

Future Career Applications:

- Smart home automation development
- Embedded systems engineering
- IoT device programming
- Security and surveillance technology
- Hardware-software integration roles

Skills Developed:	
Circuit Design & Simulation:	•Built and tested electronic circuits using Tinkercad.
Arduino Programming:	•Developed and debugged code in Arduino IDE
Sensor Integration:	•Worked with door sensors, LEDs, and buzzers for security automation.
Conditional Logic and Debugging:	•Implemented IF- ELSE logic to handle different security states.
Problem-solving and Analytical Thinking:	•Identified and resolved issues in circuit and code

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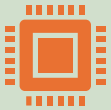
Conclusion

During my development of the smart home system, I successfully integrated door sensors, distance sensors, and automated lighting systems. Each phase built on the last, emphasizing how important system integration and data analysis are for creating a responsive environment.



I faced challenges like troubleshooting hardware connections, refining sensor calibration, and ensuring smooth communication between components. I also learned the importance of testing and iteration, as attention to detail in wiring and program logic was crucial for accurate functionality. Adaptability and problem-solving proved essential when unexpected issues arose.

This experience enhanced my skills in circuit design, coding, and sensor integration, while also improving my critical thinking and communication abilities. Overall, it deepened my understanding of the impact of automation and IoT technologies and set a solid foundation for pursuing a career in smart technology development and related fields.

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References

Arduino Official Website
Website: https://www.arduino.cc
Arduino offers a range of tutorials and documentation on circuit building, sensor integration, and automating systems using Arduino boards.

Coursera – Smart Home Automation Courses
Website: https://www.coursera.org
Coursera offers specialized courses in IoT and smart home technology from universities and institutions, which dive deep into the theory and practical implementation of these systems.

Tinkercad
Website: https://www.tinkercad.com
Tinkercad provides easy-to-follow tutorials and resources on building circuits, including smart home automation and sensor integration.

Youtube – Intruder Alert: Building a Powerful Security System| Tinkercad| 60 seconds Design Prep

Website: https://youtu.be/aDE3FW4M21o

Provides an instructional video that goes over the fundamentals of the course in an easy step-by-step guide to follow with making a home security system, little difference in components but extremely helpful

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