Security System Using Ultrasonic Sensor

Abstract

Traditional home security systems frequently necessitate installation and detect intrusion based on the opening and closing of doors and windows. Our ultrasonic security system will come in useful in situations where installation is not possible and/or the area of interest has no door because it does not require installation and identifies intruders based on their physical presence.A transmitter and a receiver are installed on a spinning motor in the ultrasonic sensor module. To allow the sensor to move, a motor is used to cover 360-degree .The sound energy of ultrasonics is sent into an area from a transmitting device interest, which in turn reacts to a change in the reflected interest.Essentially, it is based on the echo concept.The microcontroller accepts this signal and continuously monitors the ultrasonic transmitter's receiver output.Once the distance has been computed, the microcontroller checks to see if the object is within the alert range set by the microcontroller. The microcontroller sounds an alarm if the object is within the minimal range.

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1.Introduction

A transmitter and a receiver are installed on a spinning motor in the ultrasonic sensor module. To allow the sensor to move, a motor is used to cover 360-degree .The sound energy of ultrasonics is sent into an area from a transmitting device interest, which in turn reacts to a change in the reflected interest.Essentially, it is based on the echo concept.The microcontroller accepts this signal and continuously monitors the ultrasonic transmitter's receiver output.Once the distance has been computed, the microcontroller checks to see if the object is within the alert range set by the microcontroller. The microcontroller sounds an alarm if the object is within the minimal range.

1.1 Identifying Features

- The system should take the action if the object comes within the range.
- The distance from the object to the sensor should be displayed.
- Once the object is detected the buzzer should be on.
- The motor is used to cover 180 degree coverage of the sensor.

2.Requirements

2.1 High Level Requirements

ID	Description	Status
HLR1	The system should take action if anything comes within the range.	Implemented
HLR2	The distance should be measured.	Implemented
HLR3	The servo motor performs the function of a radar.	Implemented
HLR4	The buzzer should be on if the object detects.	Implemented
HLR5	If the object detects the servo motor should stop otherwise it keeps on rotating .	Implemented

2.2 Low Level Requirements

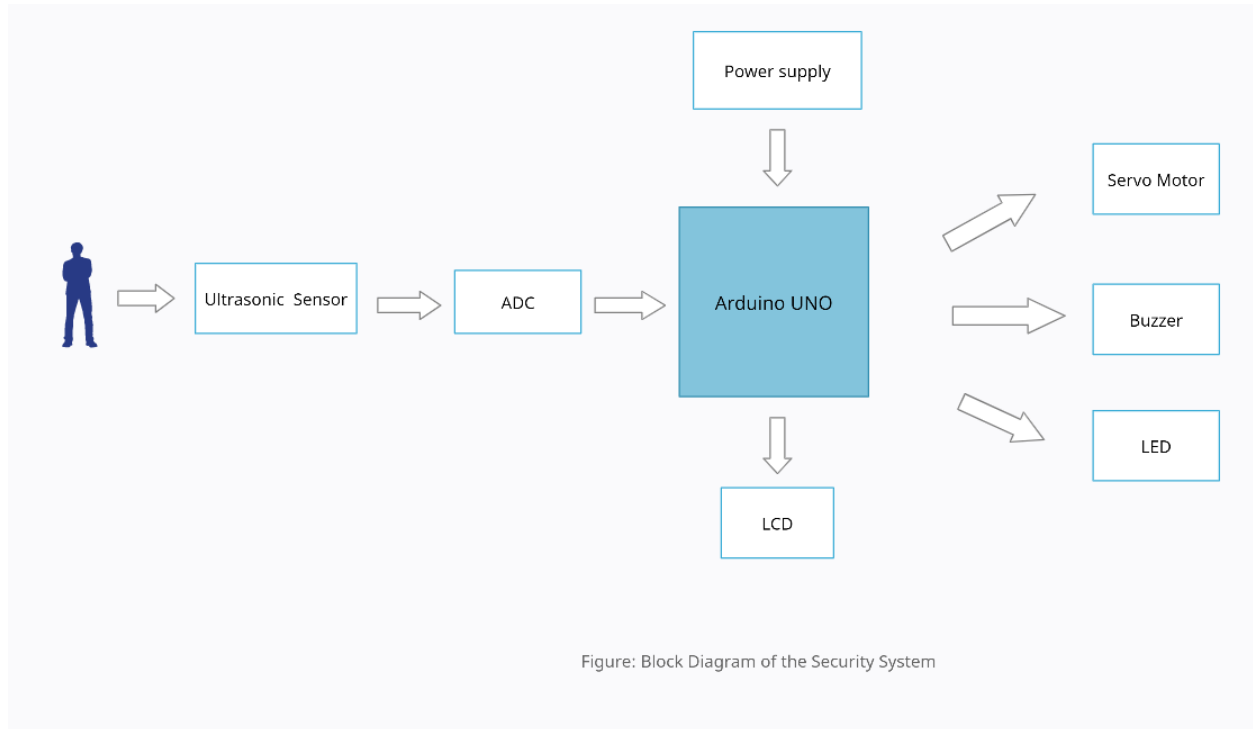| ID	Description	HLR ID	Status
LLR1	The system should alert the user when an object detects	HLR1 HLR4	Implemented
LLR2	The corresponding distance of the object from the sensor should be displayed on the LCD screen	HLR2	Implemented
LLR3	The servo motor should rotates continuously between 0 and 180 degrees if the object is not detects	HLR3 HLR5	Implemented

2.3 SWOT Analysis

Strength
- It gives Security to the systems.
- It can be implemented everywhere.
- It is affordable.
- Easy to use.

Weakness
- It uses power supply so that whenever the power is drained it won't work.
- It is hardware system so the wires are more it can be create a mess.

Threats
- The threats include fire, unstable power supply.
- Humidity in the rooms housing the hardware.
- Lightning, floods, earthquakes, etc.

Opportunities
- It can be used anywhere by adding extra security.
- It can be implemented within the another system to get the security.
- Wireless technologies.

S W T O

2.4 5W's And 1H

How?
If the sensor detects the object within the range it alerts the user and tells about the distance of the object.

What?
It is a security system based on the ultra sonic sensor to secure the surroundings.

Who?
one who is in the need of the security of their properties

Security System

Why?
To secure office ,home ,institute and other secure regions

When?
We can use this system whenever we want security for the home ,institute ,etc

Where?
* Home
* Office
* Institute
* Other Secure Regions

3.Architecture

3.1 Block Diagram

Figure: Block Diagram of the Security System

3.1.1 Components

Arduino UNO

- ➢ The Arduino/Genuino Uno microcontroller board is based on the ATmega328P microcontroller. There are 14 digital input/output pins (six of which can be used as PWM outputs), six analogue inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header, and a reset button on the board.
- ➢ In this project an arduino uno is used to interface all the peripherals.

Ultrasonic sensor

- ➢ An ultrasonic sensor is a piece of electronic equipment that produces ultrasonic sound waves and converts the reflected sound into an electrical signal in order to detect the distance between a target item and the sensor.
- ➢ In this project an ultrasonic sensor is used to sense the object moment.

Servo motor

- ➢ A servo motor is a self-contained electrical device that rotates machine parts with high precision and efficiency.
- ➢ In this project servo motor is used to allow the sensor to move and cover 180-degree.

LCD

- ➢ LCD is a display and LCD's have a backlight, and pixels are turned on and off electronically by rotating polarized light with liquid crystals.
- ➢ In this project LCD is used to display the distance from the sensor to the object.

ADC

- ➢ Only analogue voltage values can be converted into digital values by an ADC. So, whatever parameter we want to monitor, it must first be translated into voltage, which may be accomplished with the help of sensors.
- ➢ In this project ADC is used to convert sensor data to digital data .

Potentiometer

- ➢ A potentiometer is a voltage divider that consists of a three-terminal resistor with a sliding or revolving contact.It operates as a variable resistor or rheostat when only two terminals, one end and the wiper, are employed.
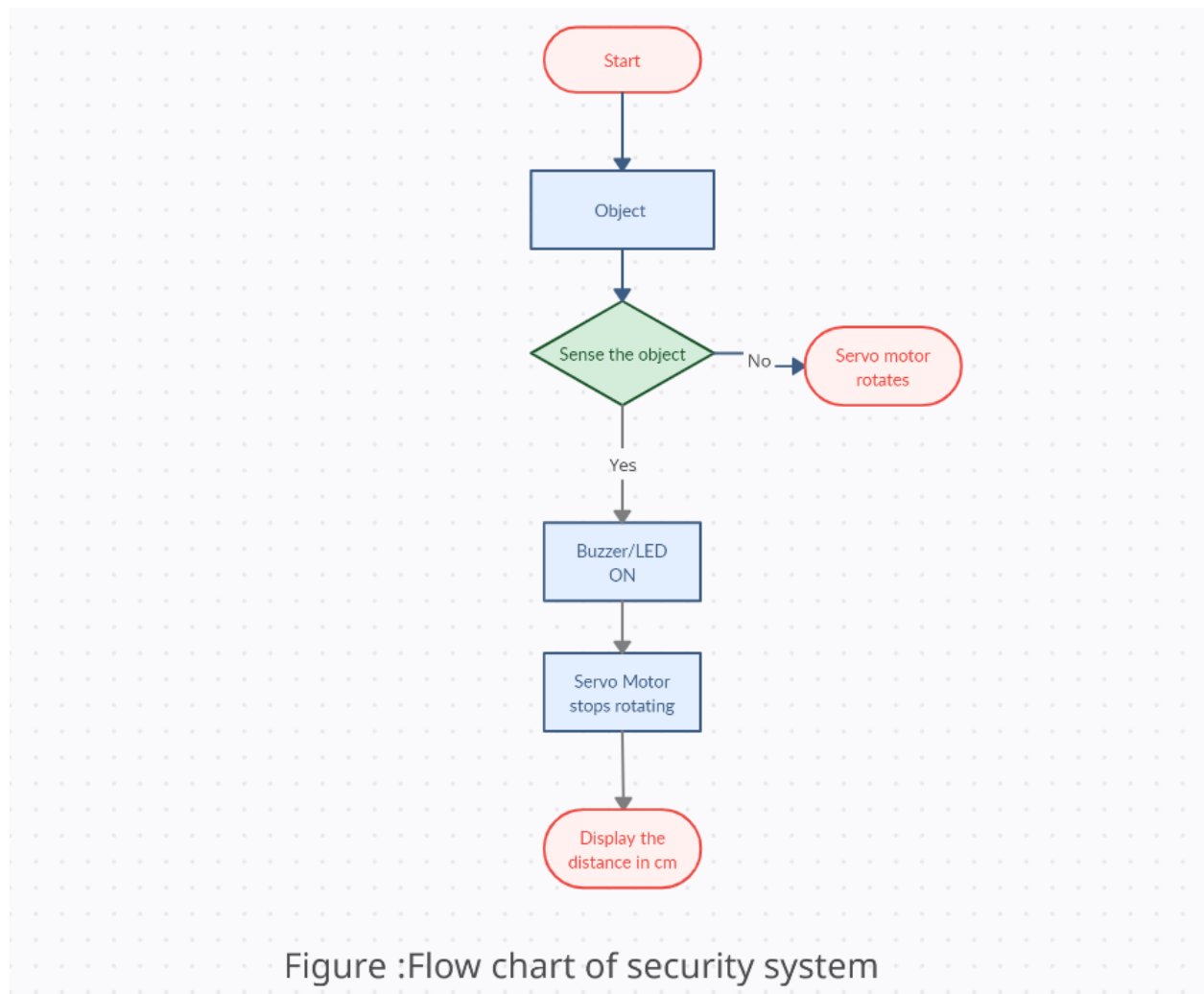- ➢ In this project potentiometer is used to act like an object for the ultrasonic sensor.

Buzzer

- ➢ It is an electric signaling device that makes a buzzing sound.
- ➢ In this project the buzzer is used to alert the user.
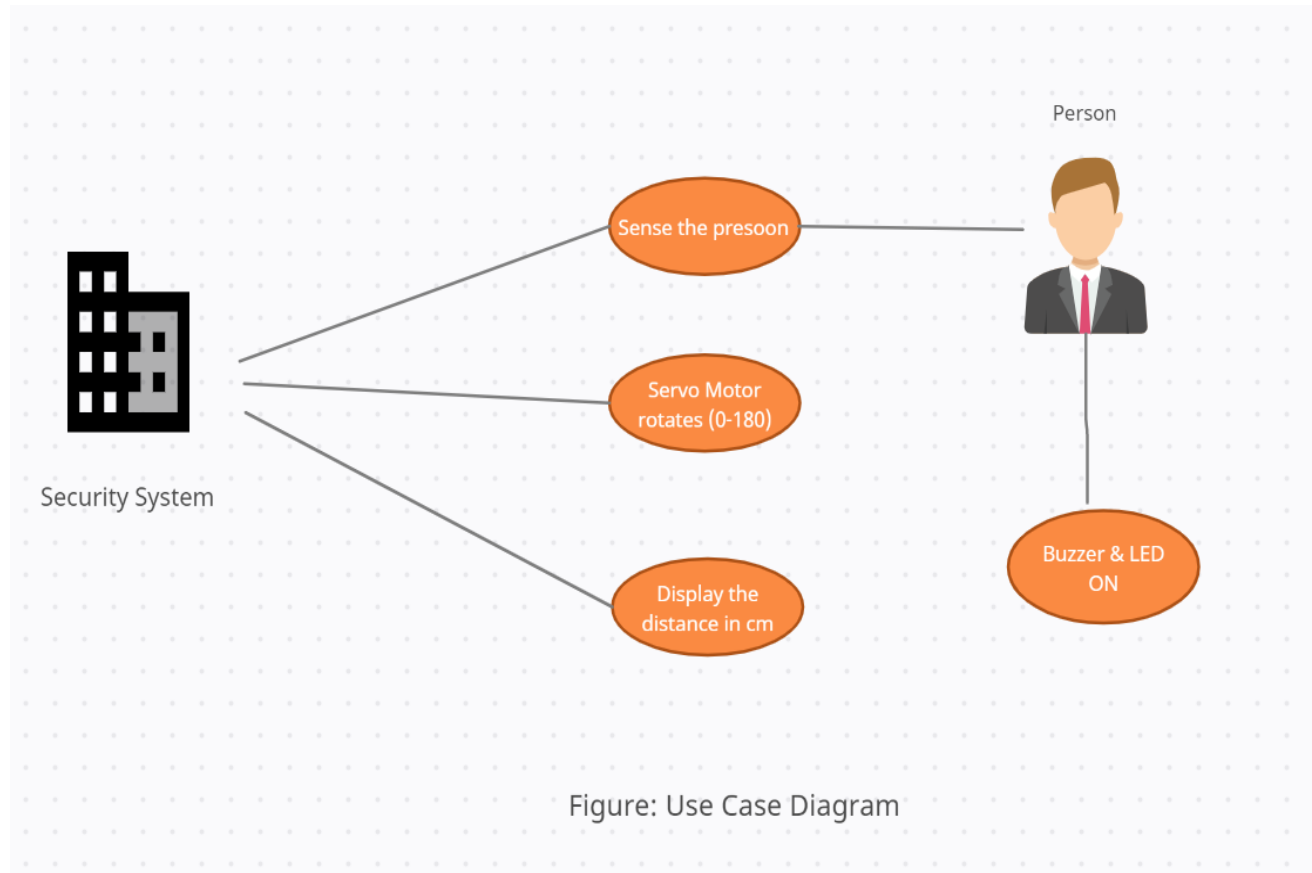
3.2 UML Diagrams
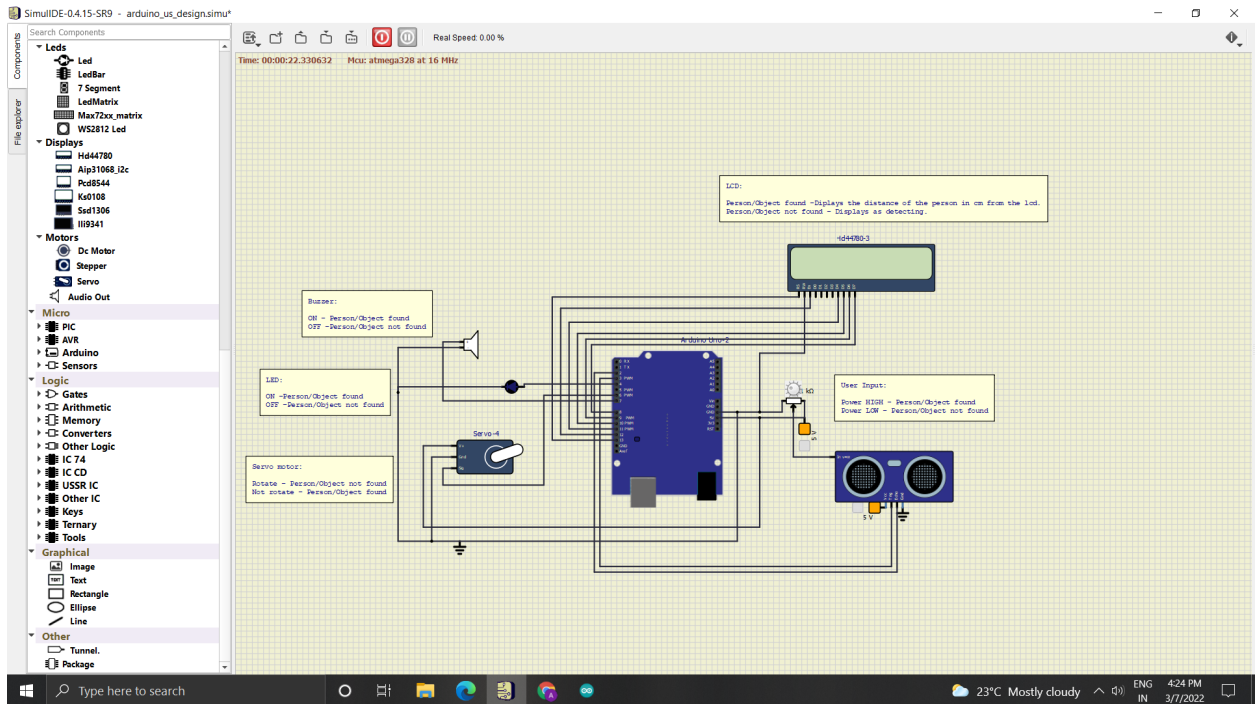
3.2.1 Behavioral Diagram

3.2.1.1 Flow Chart Diagram

Figure :Flow chart of security system

3.2.2 Structural Diagram

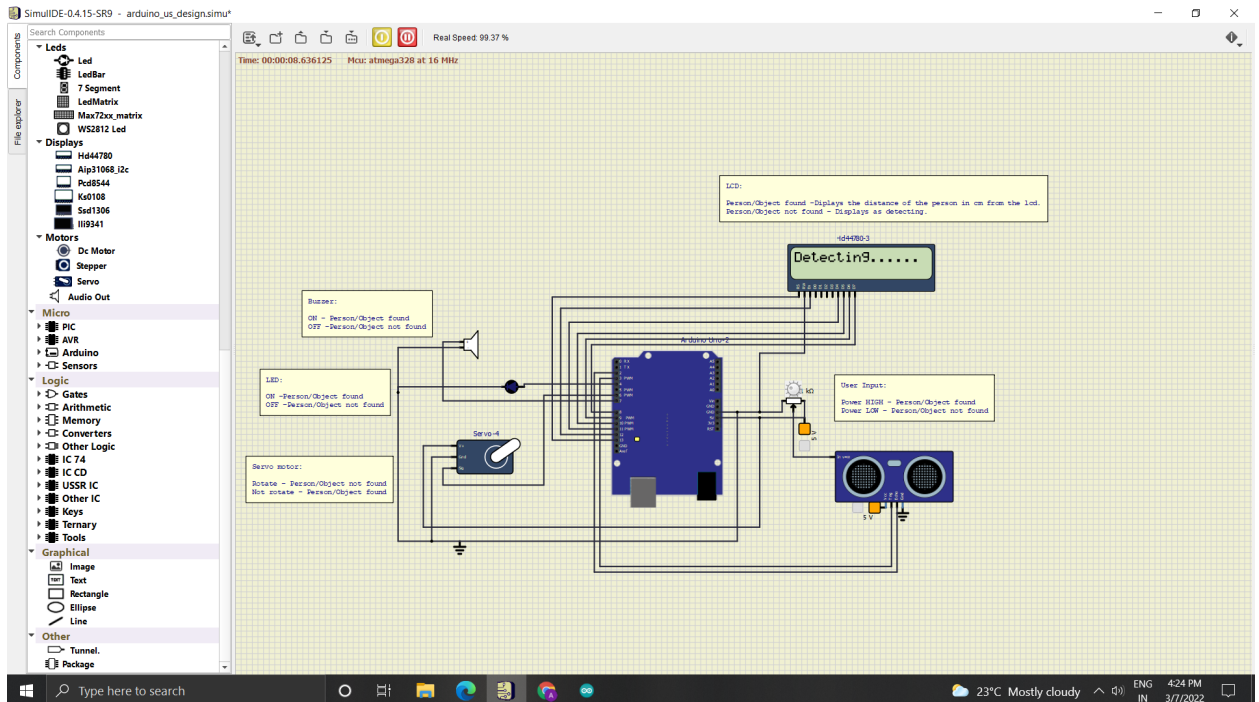### 3.2.2.1 Use Case Diagram

Figure: Use Case Diagram
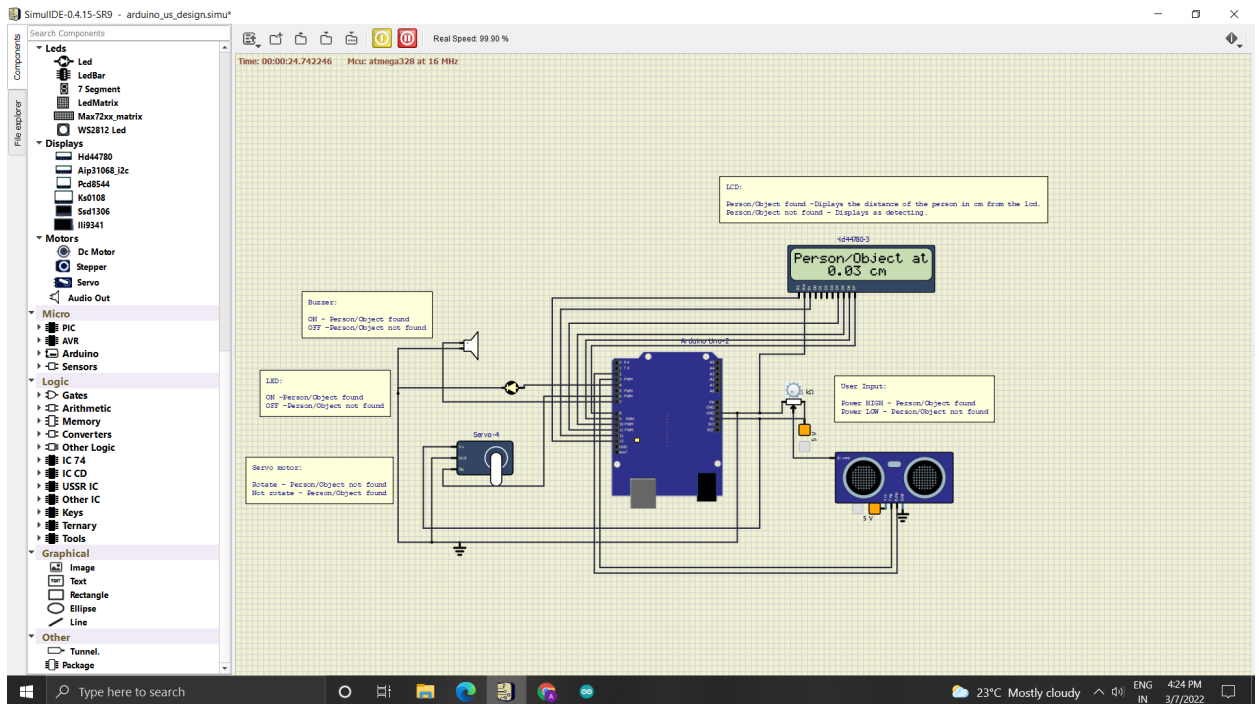
4. Implementation

- Before the starting of the security system.

- When the person/object is not detected the servo motor keeps on rotating.

- When the person/object is detected the buzzer & LED will alert the user and LCD displays the distance of the person (in cm) from the sensor.

- Again if the person/object is not detected then the servo motor rotates continuously from 0-180 degree and vice-versa.
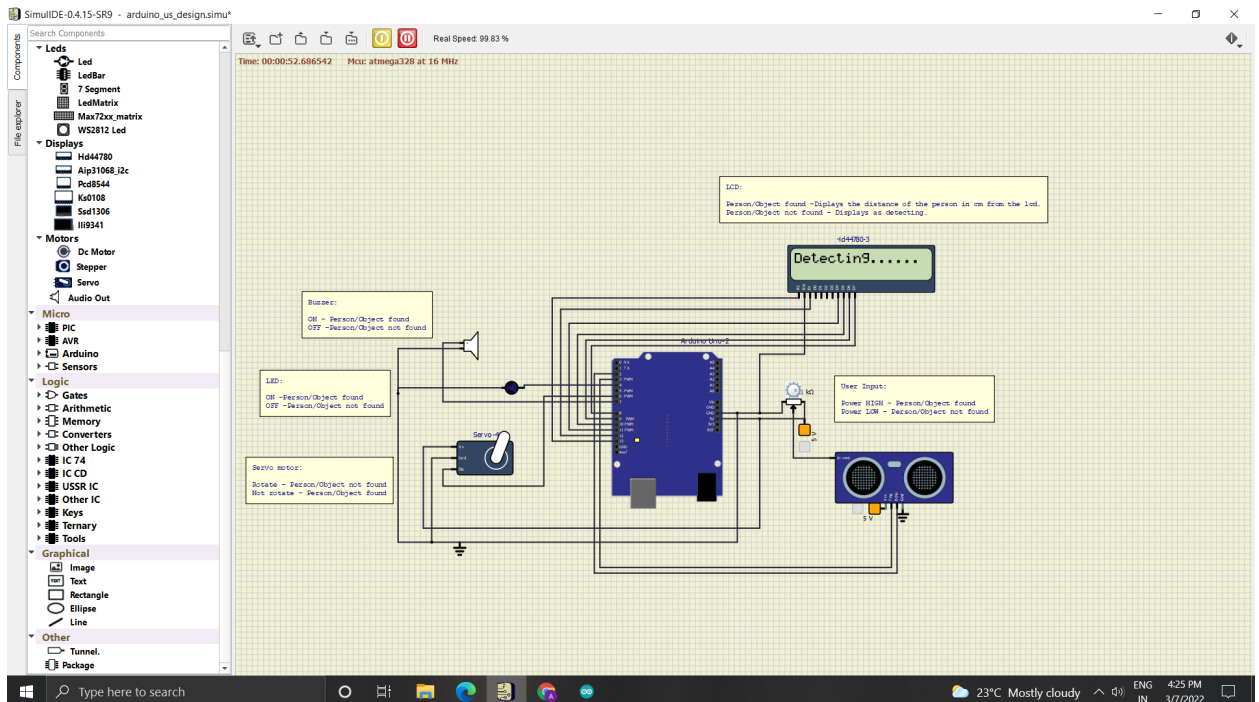
5.Test Plan

Test ID	Test Case Objective	Input Data	Expected Output	Actual Output
TC_01	Object/person detection.	Object/person	Detected/Not detected	Detected/Not detected
TC_02	If the object/person detects.	Detected input of the sensor	Buzzer & LED ON	Buzzer & LED ON
TC_03	If the object/person detects.	Object/person	Display the distance of the person/object from the sensor.	Display the distance of the person/object from the sensor.
TC_04	If the object/person detects.	Object/person	Servo motor should stop.	Servo motor should stop.
TC_05	If the object/person should not be detected.	Object/person	Servo motor keeps on rotating.	Servo motor keeps on rotating.

6.Applications

- Security system is used in houses.
- Security system is used in offices.
- Security system is used in industries.
- Security systems are used in institutes.
- Wherever we require security we can use the security system.