Ultrasonic Security System

Project by: Yasa, Joshua, Prince

Made for electronics workshop as part of 1st year I.T.

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Contents

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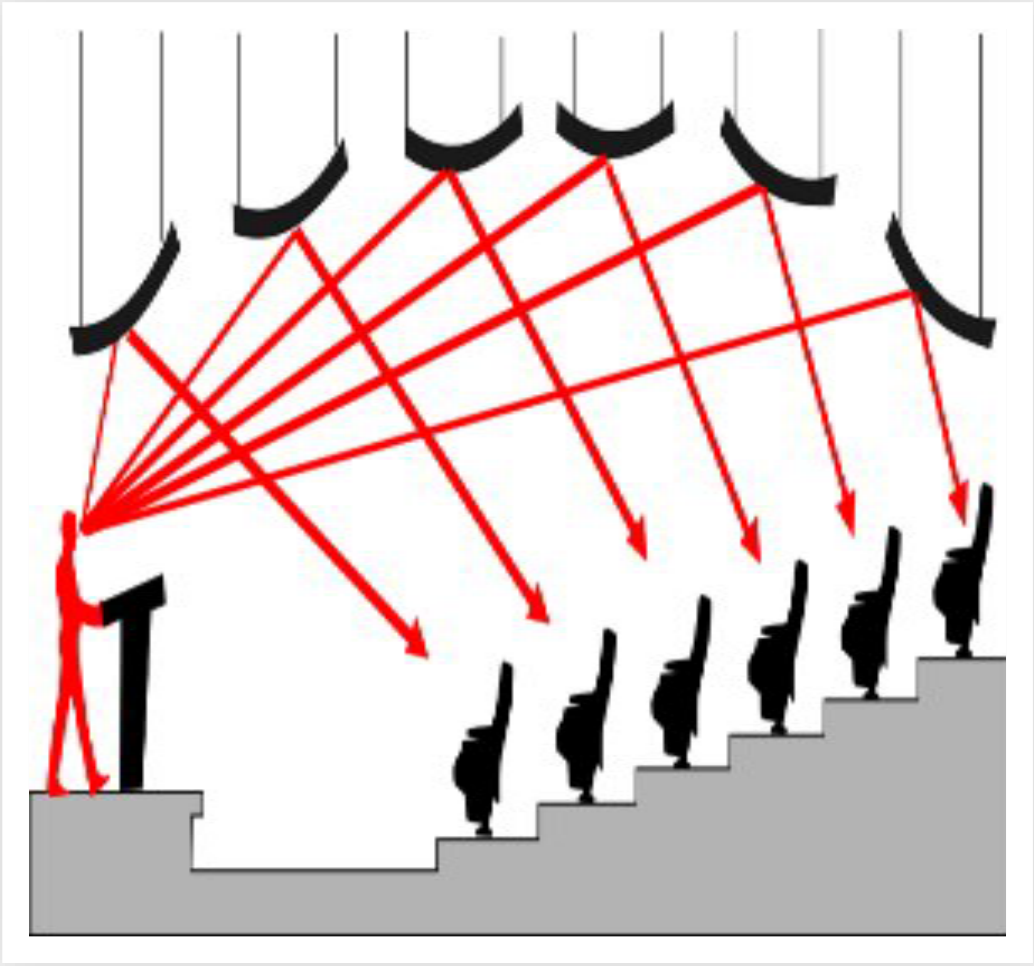
What is ultrasonic security system?

- Keeping your private things safe from intruders can be a challenging job. But with this Ultrasonic Alarm project, it is easy to keep your accessories safe.
- The circuit makes a sound via a piezo buzzer when an object comes near the sensor. The distance to which the sensor will respond can be easily adjusted in the program.
- An ultrasonic security system works on the principle of reflection of sound waves which can be seen in sound boards installed in auditorium halls and various other phenomena such as echo and reverberation.



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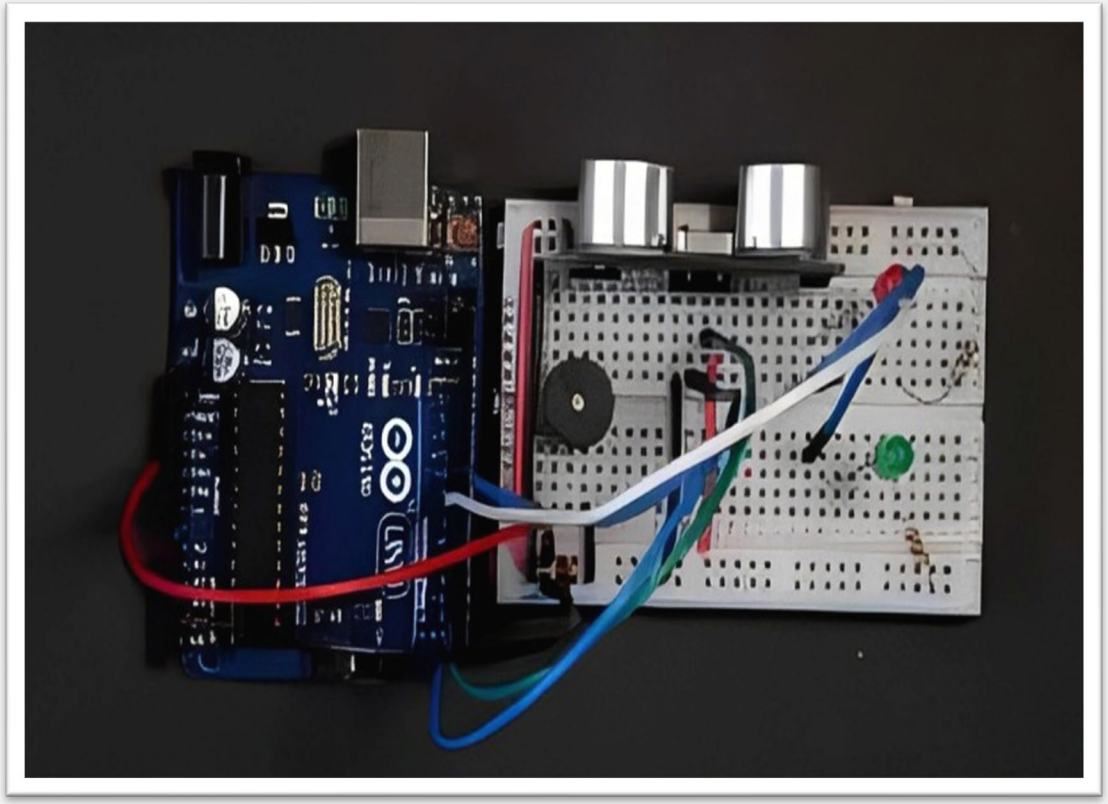
Components used in the project…

- Arduino Uno(**DIP**) with usb2.0 cable
- **60-pin*** breadboard
- 9Volt battery(optional)
- HC-SR04 Ultrasonic sensor
- Red & Green LED
- 2×220 ohm resistors
- Jumper Wires
- Piezo Buzzer

*You can also use compact 30-pin breadboard.



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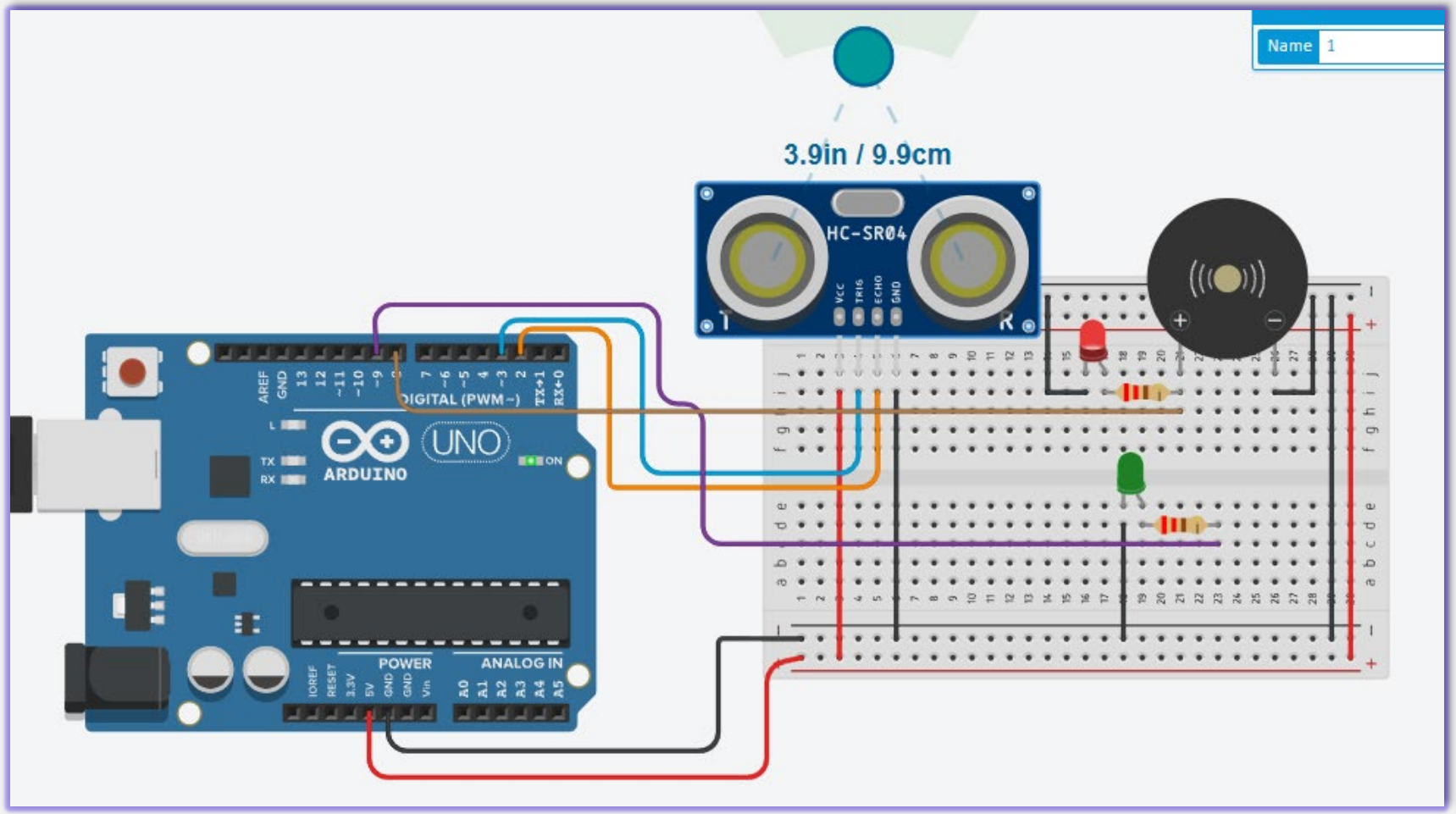
Circuit Diagram



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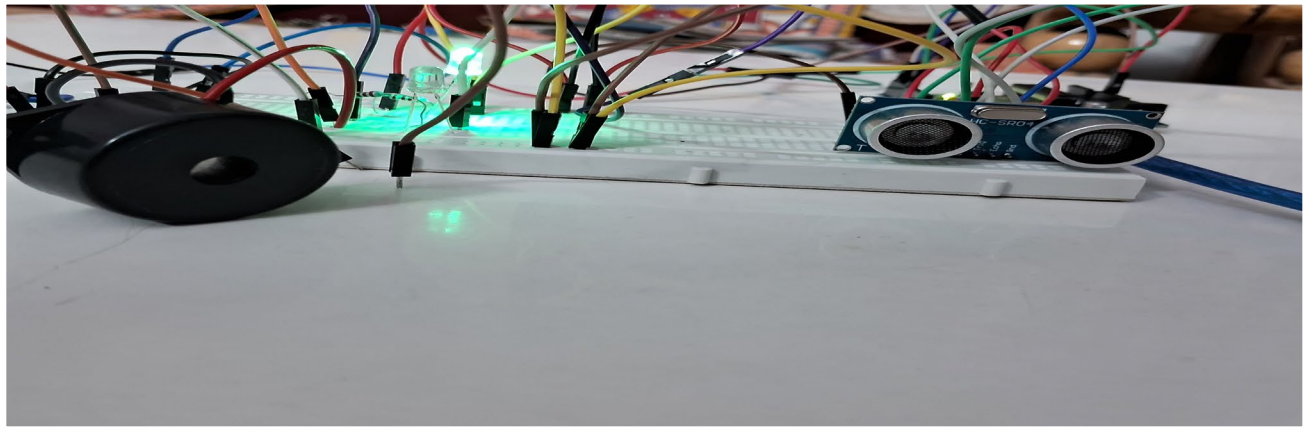
Preparation of the project:



1) Gather the required components as mentioned before.
2) Install the official Arduino IDE from the website[a]. Insert the required libraries[b] and code[c].
3) Compile the code and debug it.
4) Prepare the connections of the circuits according to the circuit diagram.
5) Connect the usb2.0 cable to the Arduino Board and to the code carrier device. Open the IDE and run the code.
6) Once the code is uploaded to the Arduino it will be stored in it's internal memory until it gets reset.[d]
7) Now you can run the code and see the working project.
8) OPTIONAL: After inserting the code in the inbuilt Arduino memory you can also use the 9V battery to power the Arduino.

[ab] Refer to 'resources' slide. [c] Refer to 'code of the program' [d]Use the red colored 'reset button' on the Arduino to reset the code.

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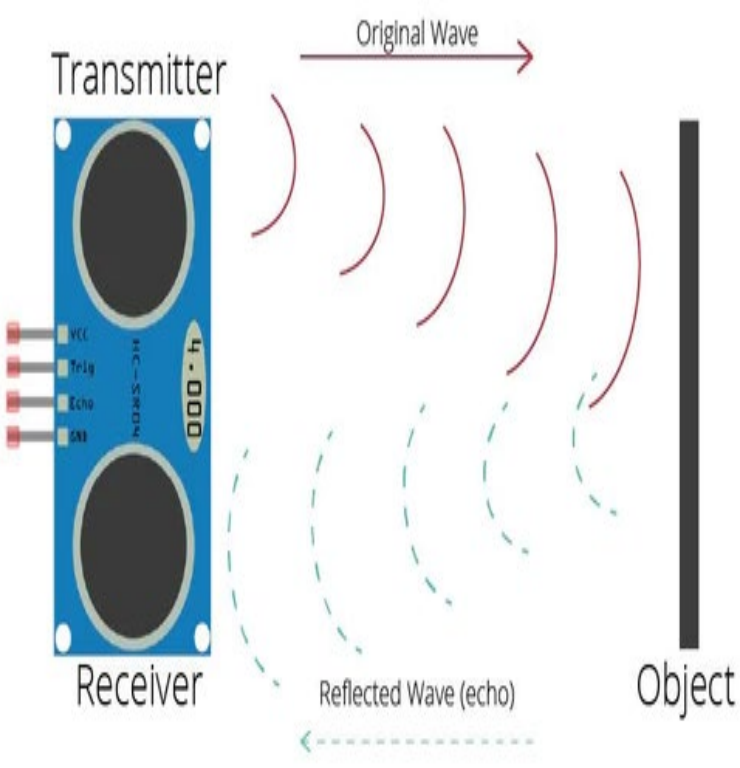
Working of the Project:-

- During the idle condition, the only the green LED on the breadboard shall glow. The transmitter of the HC-SR04 will send ultrasonic sound pulses having **40kHz** frequency which is inaudible to humans.
- When an object comes in close proximity of the HC-SR04 sensor, the ultrasound having a speed of **330m/s** approx., shall be reflected from the object which will be detected by the receiver.
- Upon receiving the reflected ultrasound, the green LED shall stop glowing and simultaneously the red LED shall start glowing along with the beep sound of the Piezo Buzzer indicating that an intruder has been detected.
- This will allow us to take timely action to remove the unwanted intrusion.
- The Arduino Board **shall control the flow of voltages** in every component as per the programmed code.



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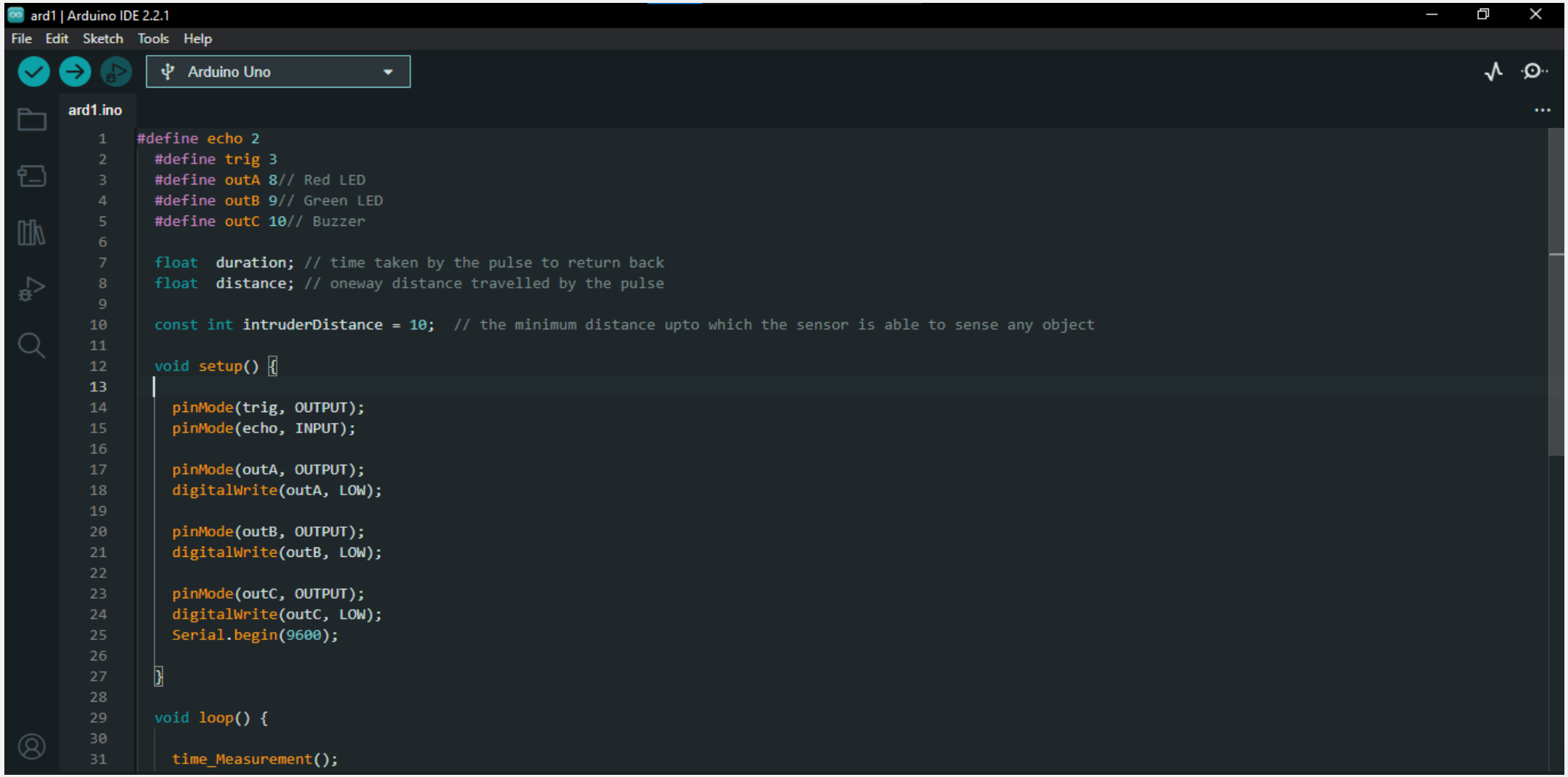
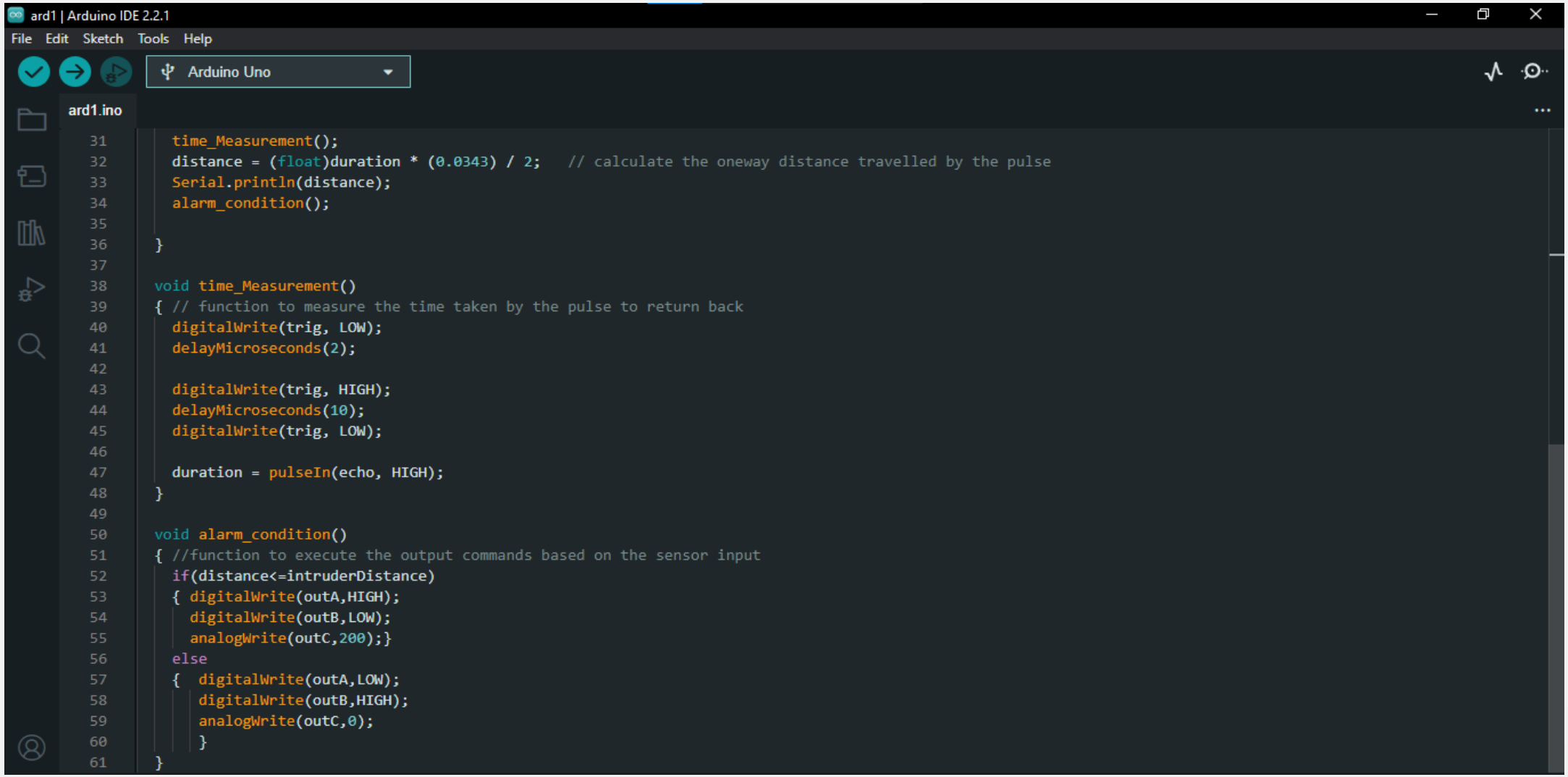
Code of the Project:-



Code of the Project:-



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Applications of the project…

As Vehicle Parking Sensor

- Ultrasonic sensor when installed in vehicles will allow to monitor the immediate surroundings of the vehicle.
- While reversal or parking of heavy vehicles such as cars, buses, etc. the ultrasonic sensor will detect objects in the surrounds and shall alert the driver in case of active obstruction in close distance.
- This shall allow the driver to take timely action to avoid collisions in narrow parking spaces.

As Intruder Detection Alarm

- The key feature of ultrasonic security system is intruder detection.
- In intruder detection the ultrasonic sensor will act as a small radar in a restricted area and when an unwanted person or object such as an animal or bird enters the space, the alarm buzzer shall be activated which will alert the guardian/owner.
- This feature can be exploited in agriculture and wildlife to keep fields away from birds, animals, etc. and to warn domestic flock owners of an incoming wild animal at night.

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Conclusion

Ultrasonic Security System:

- Enhances the security, swiftly identifies and detects intruders.
- Is cost effective.
- Isn’t prone to bad weather conditions such as rain/snow/dust, etc.
- It can work in adverse conditions.
- It has higher sensing distance as compared to inductive/capacitive proximity sensor types.

Thank You!

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