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BE

IS45 Microprocessor

Radar system simulation with object identification

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Abstract

The **radar system simulation with object identification** is used to measure the distance of the object from the source(where sensor is employed) in real time and at the same time identify the object. This project basically uses Arduino IDE for the coding for the Arduino, processing IDE for the simulation of the radar and the ML5.js library for object identification.

The system detects objects within a range of 40 cm's and it identifies the object using the webcam (Not an Arduino cam, that can be achieved in future modifications of the same). The accuracy of the same is not much as it is just a pre-trained ml5.js model and not a custom model.

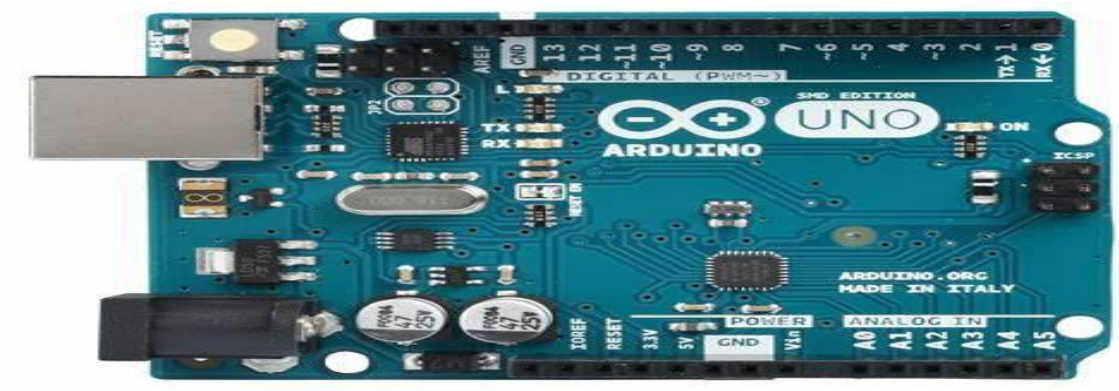
There are various applications of the same and can be applied to different fields and domains. We can apply this in **defense applications**, where we can detect any potential threats with a GUI based system and can alert the admin about the same. This can be applied to various other fields as well.

Aim: To detect an object within 40 cm and identify the object in real time using ML5.js

Devices/software's used:

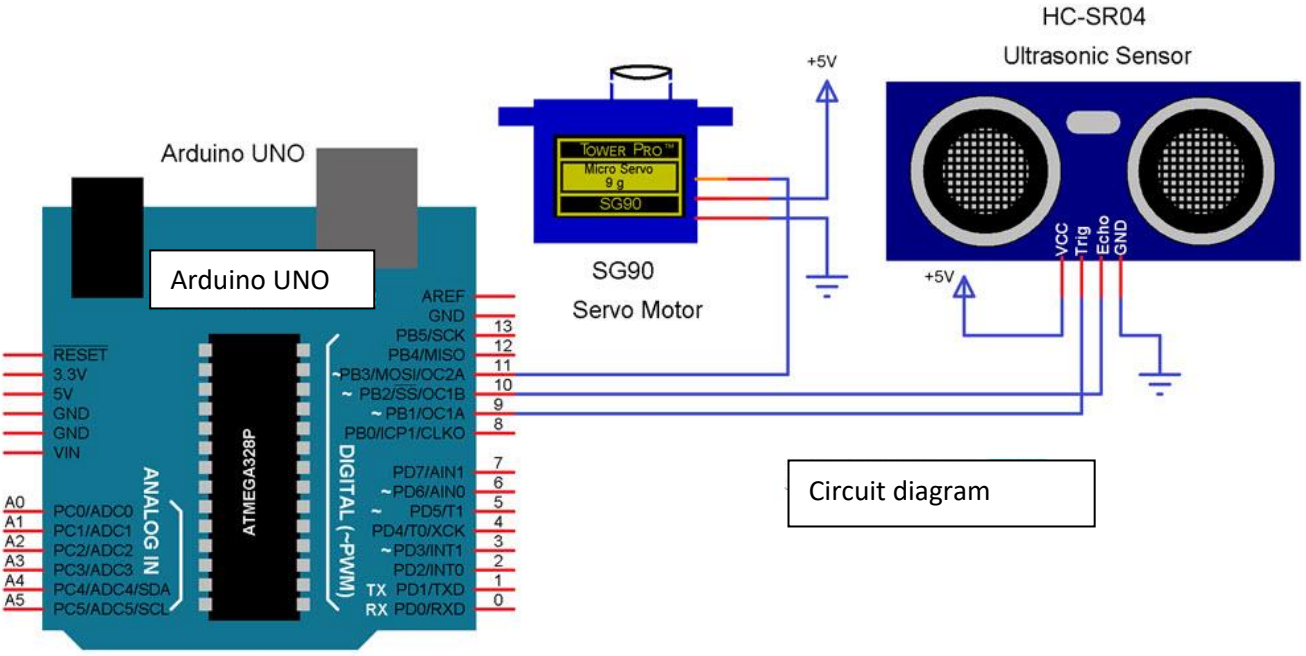
- Arduino UNO
- Ultrasonic Sensor HC-SR04
- Servo Motor
- Bread Board
- Jumper wires
- Arduino IDE
- Processing IDE
- ML5 JS Library

The figures below show some of the basic components used. Ultrasonic sensor, servomotor and Arduino UNO (In order)



Procedure:

1. The ultrasonic sensor is mounted on the top of the servo motor and the connections are made.
2. The code is uploaded to the Arduino and the detection can be first identified in the serial monitor.
3. Now when the code is uploaded to the Arduino and the serial monitor shows the expected results, we write the processing code to simulate the same using a Graphical user interface.
4. The next part is to detect the object using the ML5.js library; we include the library in the script file and the enable the webcam to scan the object in real time.
5. Following the steps, the object can be detected within a range of 40 meters and the object can be identified as well.
6. The circuit for the same looks like:



- **The trig pin of the ultrasonic sensor is connected to the D8 of Arduino (Digital Pin)**
- **The echo pin of the ultrasonic sensor is connected to the D9 of the Arduino (Digital Pin)**
- **The sensor is given a supply of 3.3 volts and the fourth pin is connected to the ground.**
- **The Servomotor has three wires, one is connected to the D10, second one is connected to 5 volts supply and the third wire is connected to the ground.**
- **The Arduino is plugged into the system using the cable and the processing is run on the port where output is received.**

Result:

If all the connections are made properly, the sensor detects objects within a range of 40 cm's and identifies the object according to a pre-trained model in the ML5.js library. The accuracy is not much as it is just the use of a library and not a custom model. The accuracy can be increased if we train the model more properly by making a custom model.

Applications:

This project has variety of applications in various sectors like defense and security. It can play a key role in detecting and identifying objects within a range, and alert the authorities about a probable threat.

Other details:

1. **Code (Arduino and processing): https://github.com/raghavddps2/MicroprocessorProject**
2. **Project report: https://github.com/raghavddps2/MicroprocessorProject**

References:

1. **Processing documentation: https://processing.org/reference/**
2. **ML5 JS library: https://ml5js.org/**
3. **Circuit diagram: https://circuitdigest.com/microcontroller-projects/arduino-radar-using-android-and-ultrasonic-sensor**
4. **Research gate: https://www.researchgate.net/publication/308415857_A_Short_Range_Radar_System**