Radar System Using Arduino

Sayali Hanmant Alat[1], Vaishanvi Shivaraj Rankhamb[2], Mayuri Manmath Patil[3], Aarohi Avinash Gholve[4], Prof.KaziA.S.M[5]

[1, 2, 3, 4]Dept of Computer Engineering

[5]Guide HOD, Dept of Computer Engineering

[1, 2, 3, 4, 5] Vishweshwarayya Abhiyantriki Padvika Mahavidyalaya, Almala, Latur, Maharashtra, India.

Abstract- *RADAR is an electromagnetic system for the detection and location of target objects such as aircraft, ships, spacecraft, vehicles, people, and the natural environment which can reflect a signal back. It uses electromagnetic radio waves to determine the angle, range, or velocity of objects. RADAR was developed by various nations before and during Second World War. RADAR is a classic example of an electronic engineering system that utilizes many of the specialized elements of technology practiced by electrical engineers, including signal processing, data processing, waveform design, electromagnetic scattering, detection, parameter estimation, information extraction, antennas, propagation transmitters, and receivers. This paper gives an outline of RADAR principle and some of the RADAR applications, which range from air traffic control, forest and climate monitoring and the monitoring of natural disasters, to name just a few*

I. LITERATURE REVIEW

A literature survey on radar systems would involve reviewing a range of academic and industry publications to gain insights into the latest advancements, applications, and challenges in radar technology. Here are key areas you might explore:

CONSTRUCTION

1. Define Requirements:

Clearly outline the specifications of your radar system, including the range, resolution, and any specific functionalities required.

2. Choose Sensors:

Select an appropriate sensor for your radar system. Ultrasonic or microwave sensors are commonly used for proximity sensing with Arduino Uno.

3. Design Circuit:

Create a circuit layout incorporating the Arduino Uno, sensor(s), motor or servo for scanning, and any other required components. Pay attention to power requirements and connectivity.

4. Write Code:

Develop Arduino code to control the sensor(s), motor/servo movement, and signal processing. Implement algorithms for distance measurement and data interpretation.

5. Test and Debug:

Iteratively test your system, checking for proper sensor readings, motor/servo control, and data processing. Debug and refine your code as needed.

6. Implement Scanning Mechanism:

Integrate a mechanism (motor or servo) to enable the sensor to scan the area of interest. Ensure it covers the desired range and resolution.

7. Data Visualization:

If desired, incorporate a display (e.g., LCD) to visualize radar data. This step may involve additional coding and wiring.

8. Power Supply:

Ensure a stable and adequate power supply for the entire system. Consider power efficiency to prolong the system's operation.

9. Optimize and Refine:

Optimize your code for efficiency and refine the system based on testing results. Address any issues that arise during the testing phase.

10. Documentation:

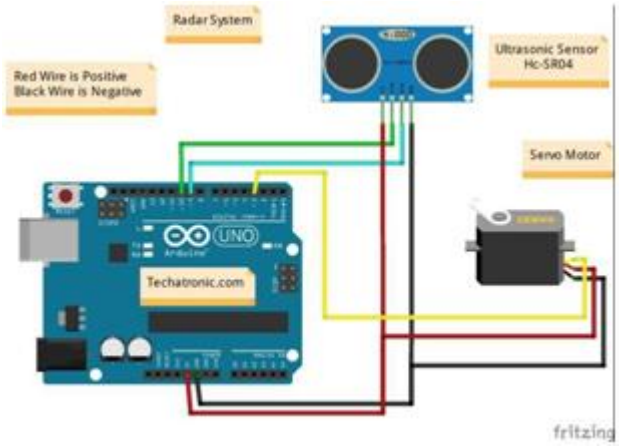
Once your radar system is functional and meets your requirements, you can share your project with the community or deploy it for its intended use.

Arduino Uno

- The Arduino UNO is a standard board of Arduino
- Here UNO means 'one' in Italian. It was named as UNO to label the first release of Arduino Software. It was also the first USB board released by Arduino.
- It is considered as the powerful board used in various projects. Arduino.cc developedthe Arduino UNO board.
- Arduino UNO is based on an ATmega328P microcontroller.
- It is easy to use compared to other boards, such as the Arduino Mega board, etc. The board consists of digital and analog Input/Output pins (I/O), shields, and other circuits.
- The Arduino UNO includes 6 analog pin inputs, 14 digital pins, a USB connector, a power jack, and an ICSP (In- Circuit
- Serial Programming) header. It is programmed based on IDE, which stands for Integrated Development Environment. It can run on both online and offline platforms

Figure 1.1: Arduino Uno

Remember that developing a radar system with Arduino Uno has limitations, and for more complex applications, you might need to consider more advanced microcontrollers or dedicated radar modules.



Circuit Diagram

The ultra sonic sensor is an on-contact type of sensor used to measure an object's distance and velocity. This sensor operates on sound wave property to measure the velocity and distance of the Ultrasonic ranging sensors are inexpensive, have no moving parts, have no lenses to clean, are normally small and unobtrusive, and can measure distances through moderate amounts of dust, smoke, and humidity, so they are well suited to underground mines.

It works by sending out a sound wave at ultrasonic frequency and waits for it to bounce back from the object

Serve Motor

A servomotor (or servo motor or simply servo)[1] is a rotary or linear actuator that allows for precise control of angular or linear position, velocity, and acceleration in a mechanical system.[1][2] It constitutes part of a servomechanism, and consists of a suitable motor coupled to a sensor for position feedback.

It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors.

Jumper Wires

Figure 1.4: Jumper Wires

A jump wire (also known as jumper, jumper wire, DuPont wire) is an electrical wire, or group of them in a cable,with a connector or pin at each end (or sometimes without them simply "tinned"), which is normally use to interconnect the components of a breadboard or other prototype or test circuit, internally or with other equipment or components, without soldering.

Individual jump wires are fitted by inserting their "end connectors" into the slots provided in a breadboard, the header connector of a circuit board, or a piece of test equipment. There are different types of jumper wires.

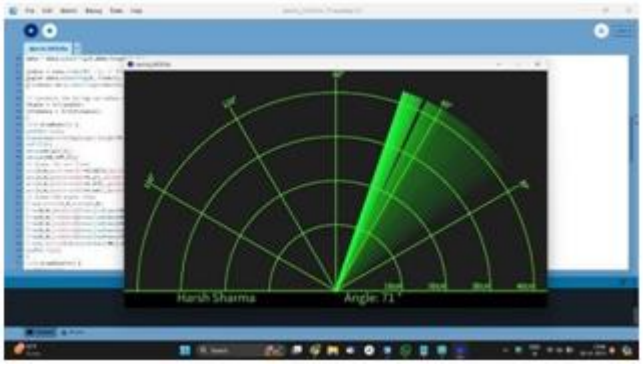
Figure1.3:UltraSonic Sensor

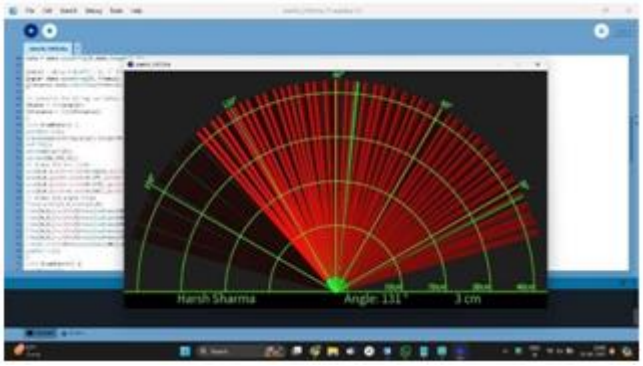
Prototype or test circuit, internally or with other Equipment or components, with out soldering.

Individual jump wires are fitted by inserting their" end connectors" in to the slots provided in a breadboard, the header connector of a circuit board, ora piece of test equipment. There are different types of jumper wires. Some have the same type of electrical connecter at both ends, while other shave different connectors. Some common connectors are:

Program Uploading

Result :





1. Convenience and Comfort: The system aims to provide convenient and comfortable control of home devices, allowing users to remotely manage and automate tasks such as turning lights on/off, controlling appliances, adjusting thermostat settings, and managing security features.

2. Energy Efficiency: Another aim of a Arduino and Bluetooth module-based home automation system is to optimize energy consumption and promote energy efficiency. The system may include features such as scheduling, automated sensors, and remote monitoring of energy usage, allowing users to effectively manage and reduce energy waste in their homes.

3. Security and Safety: Home automation systems using Arduino and Bluetooth module can also incorporate security

and safety features, such as remote monitoring and control of security cameras, door locks, and alarms. The system aims to enhance the security of homes by providing real-time monitoring, alerts, and control of security devices, which can improve the safety and peace of mind of the residents.

4. Customization and Flexibility: The system may aim to provide customization and flexibility to users, allowing them to define their own automation rules, schedules, and preferences. This can enable personalized automation based on individual needs, preferences, and lifestyles, making the system adaptable to different users and home environments.

II. CONCLUSION

In conclusion, utilizing Arduino for radar systems offers a cost-effective and customizable solution for various applications.

By combining Arduino's flexibility with radar technology, users can develop efficient sensing and detection systems tailored to specific needs.

Whether for navigation, surveillance, or environmental monitoring, Arduino-based radar systems provide a versatile platform for innovation and experimentation in the realm of sensing and detection.

Future Scope

This paper presents the design and implementation of a simple radar system using Arduino as microcontroller for short range applications.

The implemented system detects the object and measure the target distance. This Short-range radar system is a low cost, a simple device for distance measurement.

The simulation results have been verified manually with a drawn angle. Hence, the device calculates the distance with suitable accuracy and resolution.

The data is converted into visual information. This radar system can be extended and implemented for long range applications. also try to join a camera with it so that we can continuously keep track of our house.

REFERENCES

[1] ArduinoIDE: https://www.arduino.cc/en/software
[2] Servo_Motor:https://circuitdigest.com/article/servo-motor