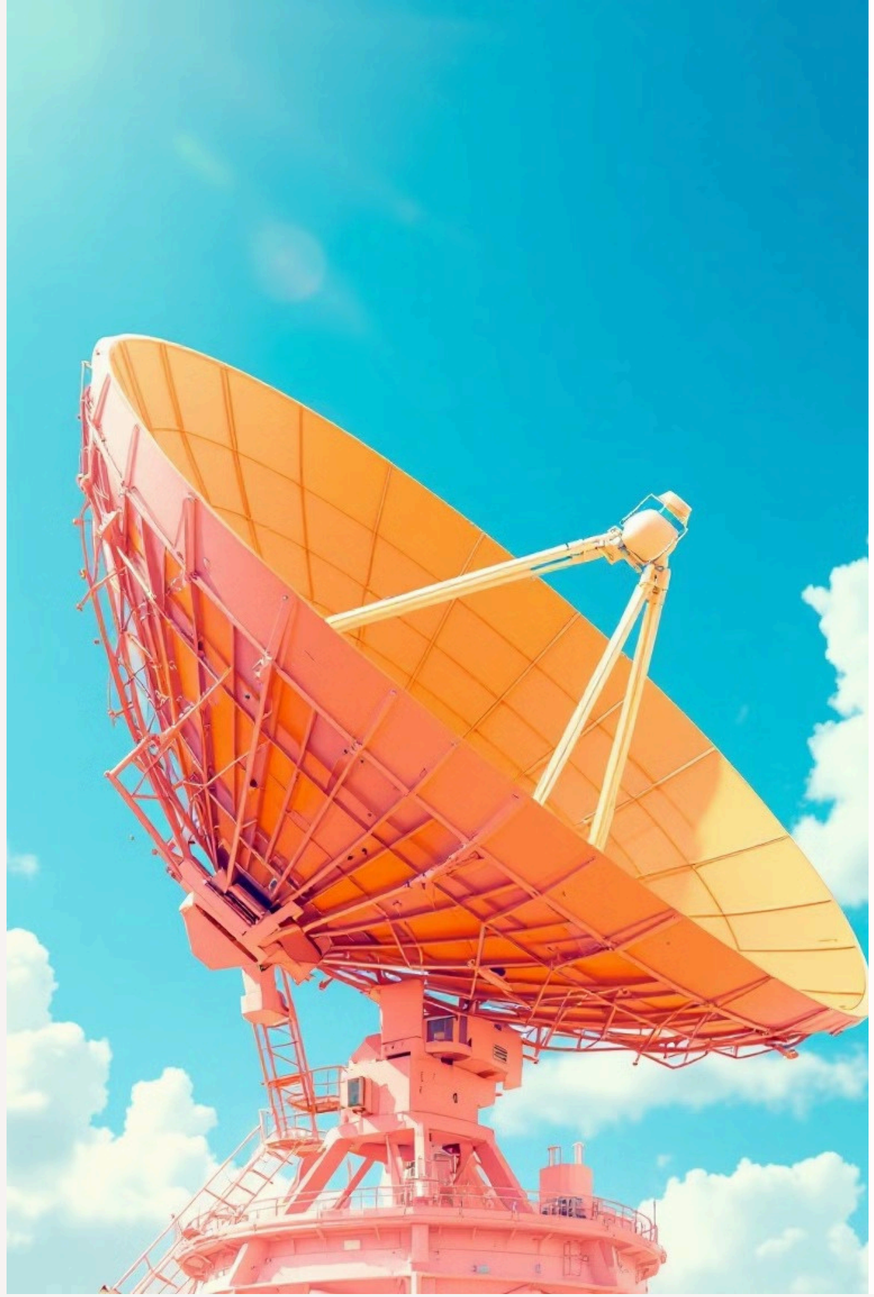


Introduction to Radar with Arduino

This presentation will introduce the fundamentals of radar technology. It will also show how it can be implemented using the Arduino platform. We will begin with radar principles, its history and evolution, and then how Arduino makes radar projects accessible and cost-effective. Get ready to explore the world of Radio Detection and Ranging!

Radar Fundamentals

Radio Waves

Radar relies on radio waves. Key properties include frequency, wavelength, and amplitude.

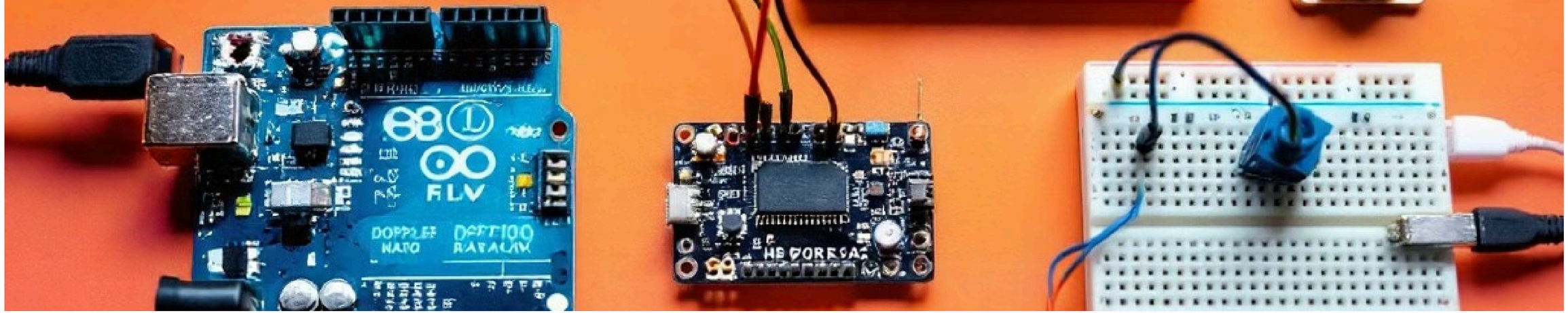
Distance Measurement

Radar measures distance using the time-of-flight principle. This involves calculating the speed of light.

Doppler Effect

The Doppler effect enables velocity measurement. The measurement is determined by frequency shift of the wave.

The formula Distance = (Speed of Light * Time Delay) / 2 calculates distance.



Hardware Components

1 **Arduino Board**

Choose the right board for your project. Consider memory and pin requirements.

2 **Radar Sensor**

Use a Doppler radar module like HB100. It is an inexpensive and accessible sensor.

3 **Servo Motor**

Use a servo motor for scanning purposes. It offers a standard range of motion.

4 **Other Components**

Connecting wires and a breadboard are necessary. Also consider voltage and current needs.

Circuit Setup and Wiring

Connect the radar sensor to the Arduino. Follow the wiring diagram for pin assignments.

Control the servo motor using Arduino. Use a PWM signal for angle control.

Power the circuit appropriately. An external power supply may be necessary.

Connect radar module VCC to 5V, GND to GND, OUT to Analog Pin A0; Servo signal to Digital Pin 9.

Arduino Code: Scanning and Data Acquisition

1

Include Libraries

Include necessary libraries, like Servo.h.

2

Initialize Pins

Initialize servo motor and radar sensor pins.

3

Sweep Servo

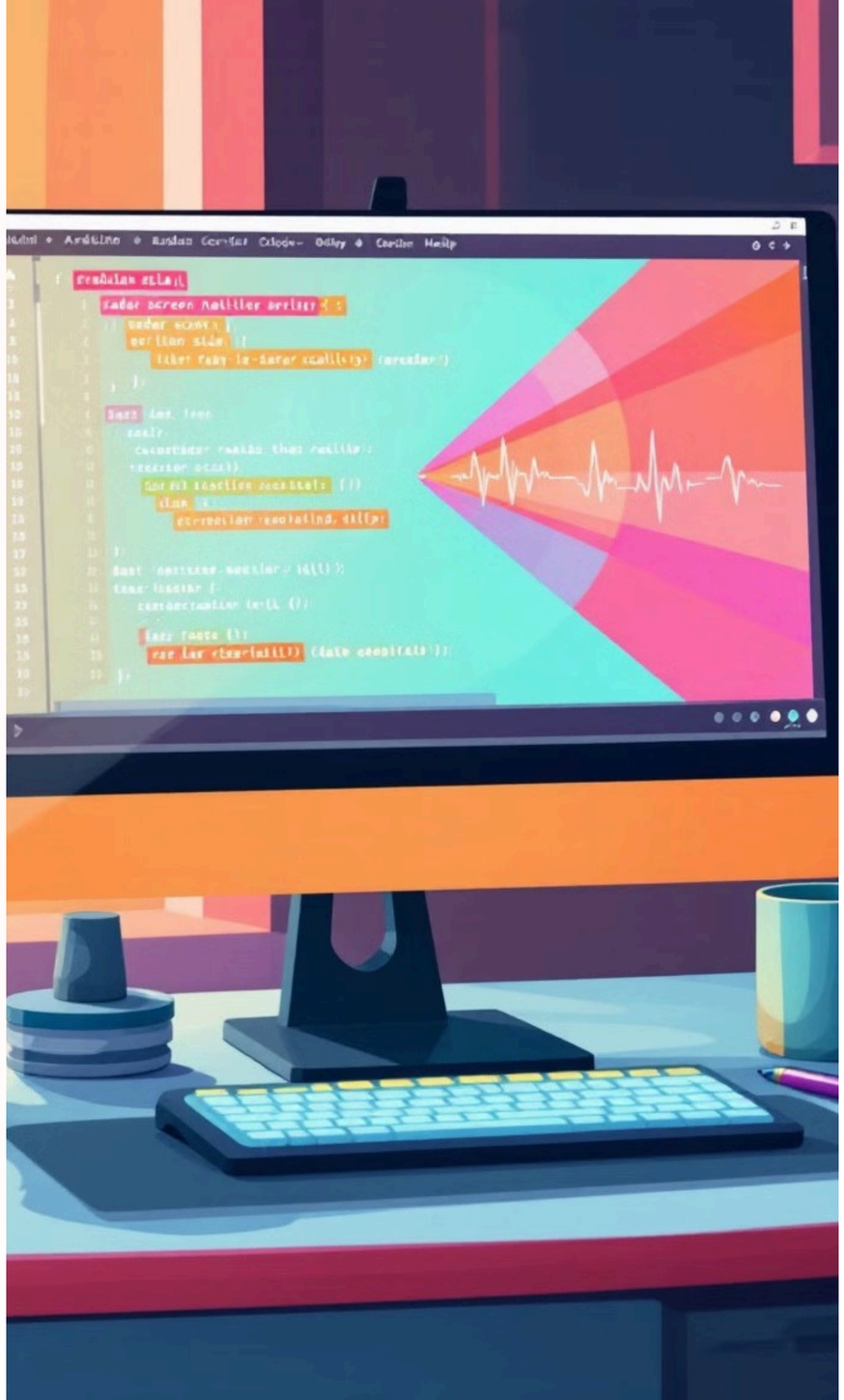
Sweep the servo motor across a range of angles.

4

Read Data

Read analog data from the radar sensor.

Example: myservo.write(angle); delay(15); reading = analogRead(radarPin);



Processing and Displaying Radar Data

1

Filter Data

Filter and smooth the radar data. Averaging helps reduce noise.

2

Convert Readings

Convert analog readings to distance. Use calibration and mapping.

3

Display Data

Display the radar data effectively. Use Serial Monitor or a custom GUI.

Use Processing IDE to create graphical output of radar data in real time.

Applications and Projects

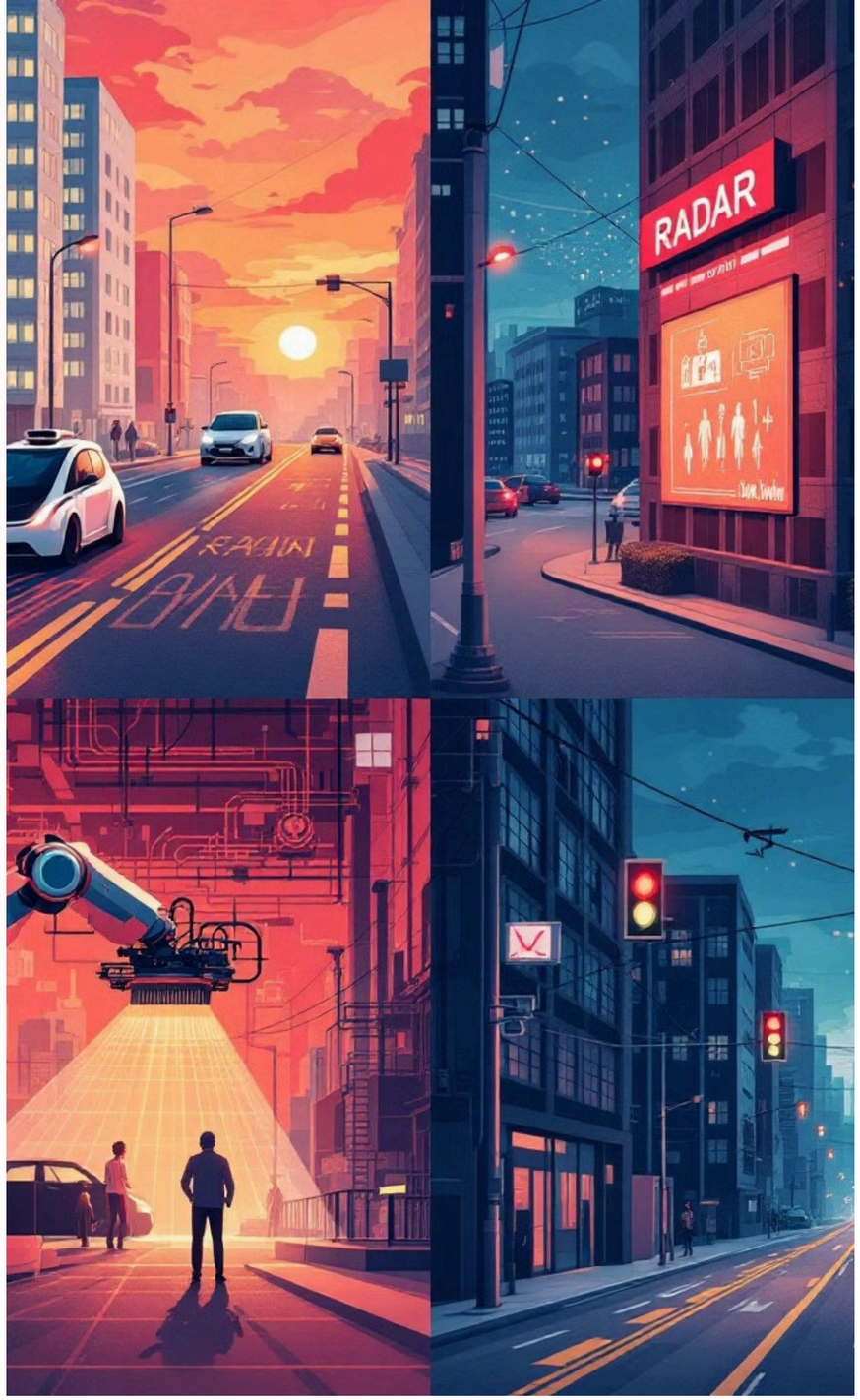
Object Detection
Detect objects and measure distance.

Security Systems
Implement motion detectors for security.

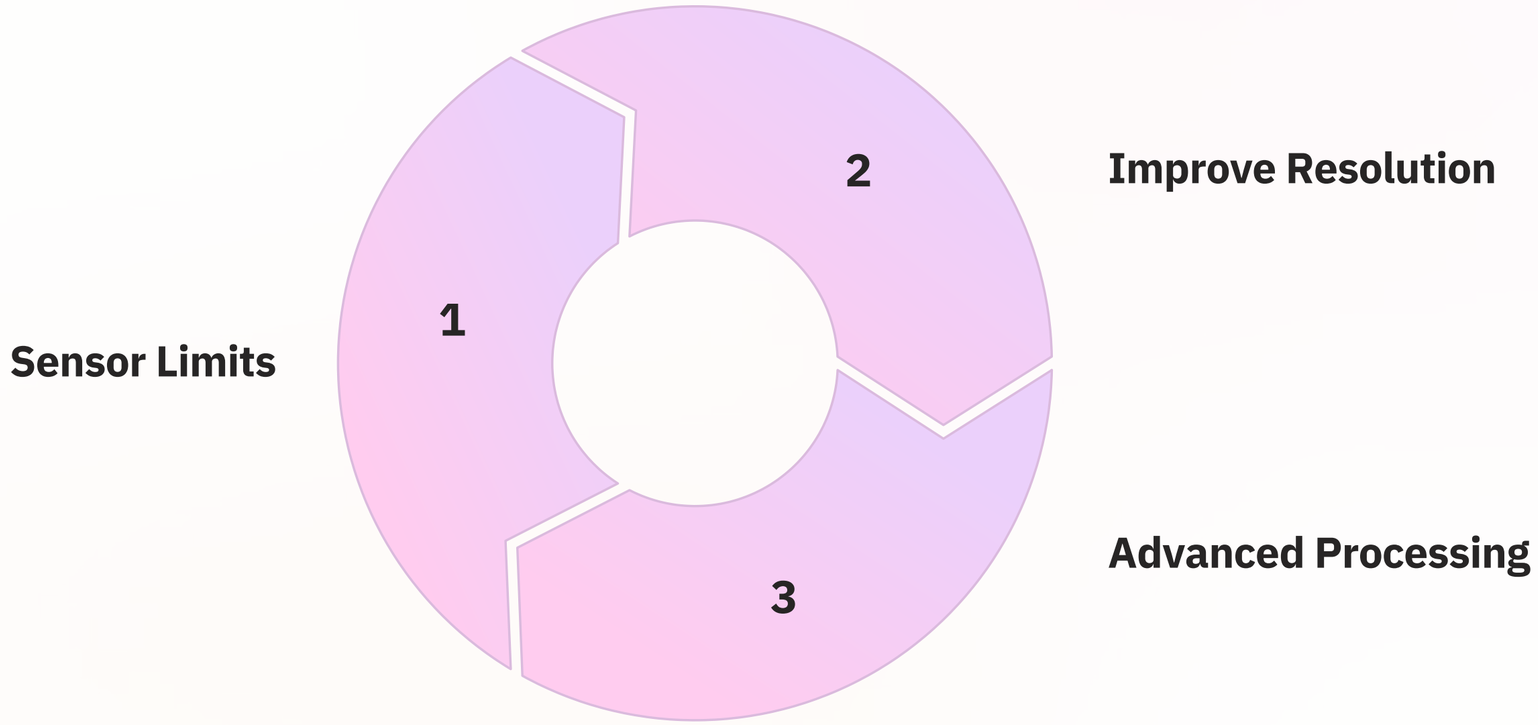
Robotics
Enable autonomous navigation for robots.

Traffic Monitoring
Detect speed and monitor traffic flow.

A simple radar system can detect objects within 2 meters.



Challenges and Future Improvements



Address radar sensor limitations like range and accuracy. Reduce noise with advanced signal processing. Explore AI integration and other radar technologies for future development.