RESEARCH ARTICLE

ULTRASONIC DISTANCE MEASUREMENT SYSTEM

Sahil Khedekar1 , Mihir Gharat2 , Vaishnavi Bait3 , Parthesh Jadhav4 , Jyoti Mali5

[1](Dept of Electronics and Telecommunication Engineering, Atharva college, Maharashtra, India
Email: sahilkhedekar-extc@atharvacoe.ac.in)
[2](Dept of Electronics and Telecommunication Engineering, Atharva college, Maharashtra, India
Email: mihirgharat-extc@atharvacoe.ac.in)
[3](Dept of Electronics and Telecommunication Engineering, Atharva college, Maharashtra, India
Email: vaishnavibait-extc@atharvacoe.ac.in)
[4](Dept of Electronics and Telecommunication Engineering, Atharva college, Maharashtra, India
Email: partheshjadhav-extc@atharvacoe.ac.in)
[5](Dept of Electronics and Telecommunication Engineering, Atharva college, Maharashtra, India
Email: jyotimali-extc@atharvacoe.ac.in)

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Abstract:

A tool called Radio Detection and Ranging (RADAR) is used to continuously monitor a certain area. This system calculates their distance from the sensor and uses ultrasonic sensing for detection. We also discussed the Arduino programming and the components used in this project. The resultant output provides an example of how the system can identify and follow an object within a specific range. Potential uses for this low-cast and readily replicable radar system include autonomous navigation and security.

Keywords — MATLAB Simulink for Arduino, Arduino UNO, Servo Motor, Ultrasinc sensor.

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I. Introduction

object's angle and range using radio waves. Aerial vehicles, ships, spacecraft, guided missiles, automobiles, weather formations, and terrain can all be detected with it. This project provides a clear understanding of the Arduino, its simulator, and the components utilized in it. The servo motor moves at a precise angle to satisfy the ultrasonic sensor's detection requirement. To enable the ultrasonic sensor to detect objects, the servo motor has been given a fixed angle of movement. Now let's talk about the software. We use the Processing app to process projects and the Arduino IDE to embed code into our Arduino devices. As for implementation, Arduino has eight analog pins, fourteen digital pins, three ground pins, reset and reference pins, and three voltages (3V and 5V). . There are four pins in the ultrasonic sensor: ground, VCC, trig, and echo. Three connections are also included with the servo motor: signal, negative voltage, and positive voltage. Radar signals are radio waves that are emitted by a transmitter in a radar system. Some of these signals will be detected and projected into the target, but most of them are reflected or dispersed when they come into contact with an object. Typically, but not always, radar receivers are the transmitter's position. The radar signals that are reflected and picked up by the receiving antenna. Radar receivers are usually, but not always in the same location as the transmitter Figure 1 depicts the Block Diagram of the short-range radar system. Microcontroller and PROCESSING IDE communicated through UART protocol with the baud rate of 9600. This protocol work on ASCII value.

I. SYSTEM ARCHITECTURE

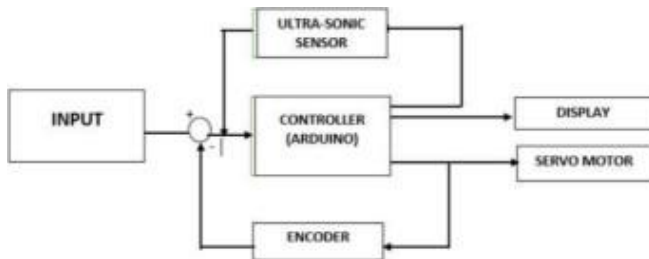Fig shows the block diagram of Short range radar system

Fig-1 Block diagram of the short range radar

1. ARDUINO UNO

The ATmega328 is at the heart of the Arduino Uno microcontroller board. With 14 digital I/o ports (six of which may be used as PWM outputs), 6 Analog inputs , a 16 MHz ceramic resonator, USB connection, a power jack, and a reset button. boasts 32k bytes of in-system programmable flash. An open-source platform called Arduino is used for building and programming circuits. It enables two-way connection with a range of devices, including online control of individual electrical parts. The Arduino Uno circuit board, which is the hardware component, contains all the components required to support the microcontroller. The system is activated by a simple USB connection to a computer or by an AC-to-DC converter or battery for power. "Uno" means "one" in Italian and denotes the impending release of Arduino 1.0; both the Uno and version 1.0 will be the benchmarks for all subsequent Arduino versions. The newest board in the USBArduino board family is called the Uno
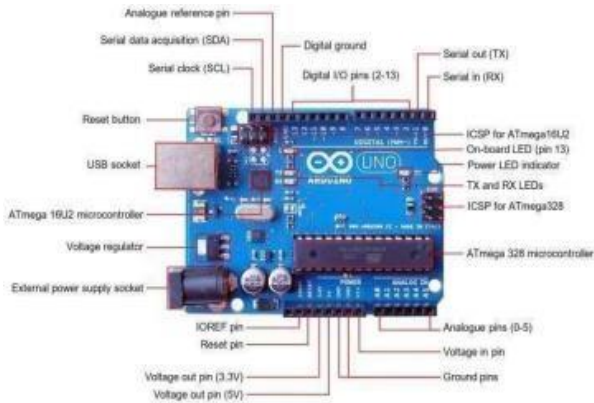
Fig -2: Arduino board

2. ULTRASONIC SENSOR

The basis of operation for ultrasonic sensors is the measurement of the properties of acoustic waves at frequencies higher than human hearing, usually 40 kHz. For a variety of sensing applications, three unique characteristics of the received echo pulse can be evaluated: The flight time, the Doppler shift, and the attenuation of the amplitude. With a ranging precision of up to 3mm, the HC- SR04 ultrasonic ranging module provides non – contact measuring capabilities across a distance of 2cm to 400cm. The module consists of control circuitry, a receiver, and ultrasonic transmitters. The transceiver module initiates and sends a signal to the water using the trigger and echo mechanism, which is used by the ultrasonic sensor. The receiver module then picks up the echo signal that the water subsequently transmits back. By calculating the signal's distance, the ultrasonic sensor determines the water level. The sensor determines the water level by using the speed and transit time data. The ultrasonic sensor utilized in the research is seen in the accompanying image
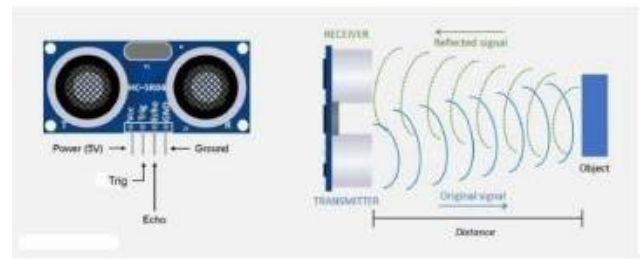

Fig -3 : Ultrasonic Sensor

3. SERVO MOTOR

A component within the realm of electronics capable of precisely exerting force or facilitating rotation is commonly referred to as a servo motor. Whether in linear or rotary form, the servo motor functions as an actuator when integrated into a servo mechanism, enabling targeted adjustments to specific angles or distances. This component offers meticulous regulation over acceleration, velocity, and both angular and linear positioning. Servo motors typically feature three essential wires for operation: power, ground, and signal. The signal wire receives an electrical pulse distinguished by varying width, often referred to as pulse width modulation (PWM). In the case of a DC-powered configuration, the motor is classified as a DC servo motor, while an AC-powered setup typically employs the same trio of wires: power, ground, and signal.
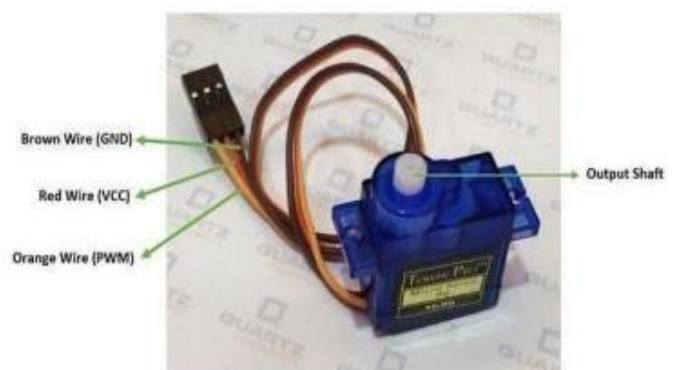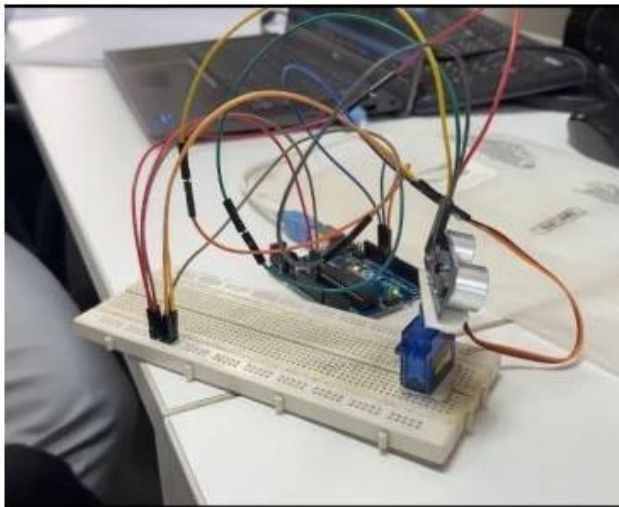

Fig4 SERVO MOTOR
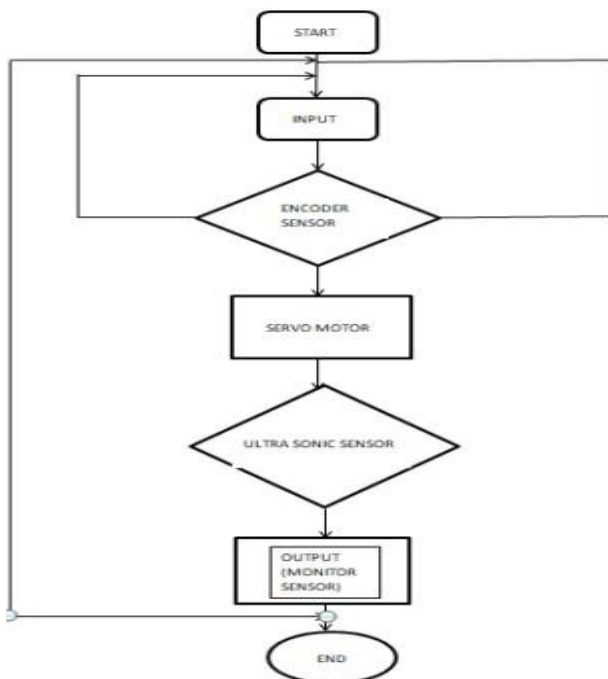
Fig 5. Hardware Design

3. FLOW CHART

FIG 6. FLOW CHART

II. CONCLUSION

A security apparatus designed to detect nearby human or object presence has been realized through the implementation of an ultrasonic radar system. The project has been effectively deployed, achieving its intended objectives with precision. Given its innate capability for enhancing security measures, this endeavor harbors significant potential for various applications

III. REFERENCES

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