

The Radar System Using Arduino

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Abstract – RADAR is an object detection system in which it uses radio waves to determine RADAR is an object detection system which uses radio waves to determine the range, altitude, direction, or speed of objects. RADAR systems come in different variety of sizes and have different performance specifications. Some RADAR systems are used at air-traffic control at airports and others are used for long range surveillance and also early-warning systems. A RADAR system is known as the heart of a missile guidance system. Small portable RADAR systems which can be maintained and operated by one person are available as well as system that occupy several large rooms. The investment required in developing RADAR is for less critical purposes like surveillance in close proximity, auto parking systems in vehicles, and object detection in small ranges it would unreasonable to spend capital in large amounts. So, this is an attempt to use the Ultrasonic Sensor (HC SR04) to implement the similar working concept as used in RADAR to detect any nearby objects. Arduino UNO board is sufficed to control the ultrasonic sensor and to interface the sensor and also as a display device.

1. INTRODUCTION

RADAR is an object detection system uses radio waves to determine the range, angle, and velocity of objects. It can be used to detect aircraft, ships, spacecraft, guided missiles, motor vehicles, weather formations, and also terrain. This project gives sufficient knowledge of Arduino, MATLAB Simulink for Arduino and also mechanics. Servos are small but powerful motors that can be used in a multitude of products ranging from the toy helicopters to robots. In this project we are using the Ultrasonic Sensor for operate by emitting a burst of sound waves in a rapid succession. These sound waves hit the intended target, bounce back to the sensor, and travel at a particular speed.

An ultrasonic sensor, radar is much less affected by temperature, improving consistency and also accuracy. Radar was developed secretly for military use by several nations during the period of World War II. The term RADAR coined in 1940 by the United States Navy as an acronym for Radio Detection and Ranging. It can track storm systems, because precipitation reflects electromagnetic fields at certain frequencies. Radar can also render precise maps. Radar systems are mainly used in air traffic control, air craft navigation and marine navigation. United States and four common wealth countries are: Australia, Canada, New Zealand and south Africa also developed their own radar systems

2. RELATED WORK

Arduino program controls the all interfaced devices. For moving the radar we have robotics setup. WI-FI is connected to arduino serially. Arduino controls the motors clockwise and anti-clockwise by giving signal to the motor driver IC (L293D IC). User sends the command by mobile to the WI-FI and gives this command to the arduino. Arduino program compare this code with the predefined code. If it is match then program gives digital signal to motor driver IC and perform the required operation like left, right, forward and backward. Arduino control the servo motor in angle between 0 to 180 degree. On this servo motor we are putting ultrasonic sensor which is connected to the arduino board. Ultrasonic sensor work on the trigger and echo pulse. As per object distance it will generate echo pulse. If object is having less distance than threshold distance saved in program then program will find out the angle of servo motor. In next operation distance data and angle data is send to the predefined mobile number in SMS using SIM900 module which is interfaced to the Arduino. The beauty of the project is camera application. If object is detected then camera move in the object direction with the help of another servo motor

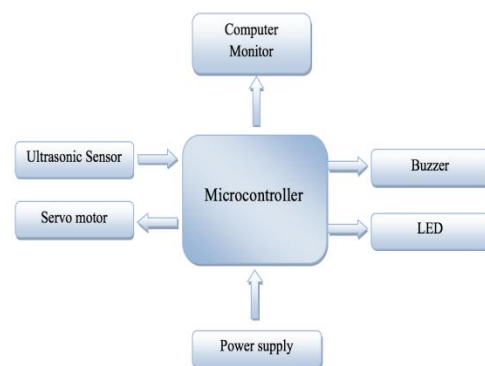


Fig.1 System architecture

3. PROPOSED MODELLING

3.1 Arduino Uno

The ArduinoUNO is a microcontroller board based on the ATmega328. It has 32k byte in a system programmable flash, 14 digital I/O pins, 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack and a reset button.

Arduino is an open-sourced platform which is used for constructing and programming of electronics. It can receive and also send information to most devices, and even through the internet to command the specific electronic device. It uses hardware called Arduino Uno circuit board. It contains everything which is needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. Uno and version 1.0 will be the reference versions of Arduino, moving forward to it. The Uno is the latest in series of USB Arduino boards.

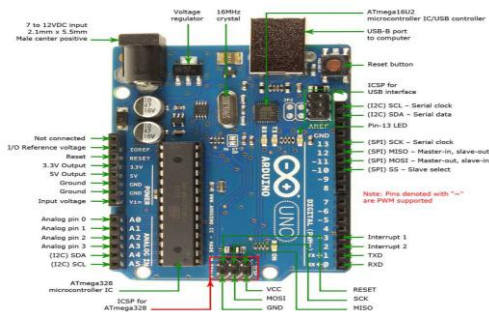


Fig -2: Arduino board

3.2 Ultrasonic Sensor

Ultrasonic sensors are based on the measurement of the properties of acoustic waves with frequencies above the audible range of human often at roughly 40kHz. Three different properties of the received echo pulse may be evaluated for different sensing purposes such as, 1) Time of flight, 2) Doppler shift, 3) Amplitude attenuation. Ultrasonic ranging module will be from HC-SR04 provides 2cm-400cm non-contact measurement function, the ranging accuracy can reach to 3mm. The module includes ultrasonic transmitters, receiver and also control circuit. The ultrasonic sensor works using trigger and the echo method. The transceiver module triggers and then sends the signal to the water the water sends back an echo signal which is read by the echo. The Ultrasonic sensor calculates the distance of the signal and returns the level of the water. The travel time value and the speed value allow the sensor to calculate level of the water. The diagram below is the image of the ultrasonic sensor used in the project.



Fig.3 Ultrasonic sensor

3.3 Servo Motor

A servo motor is an electrical device which is used to push or rotate an object with great precision. If you want to rotate an object at some specific angles or distance, then you use servo motor. It is just made up of a simple motor which runs through servo mechanism. Servo Motor is a rotary actuator or linear actuator that allows for precise control of angular or any linear position, velocity and acceleration. Servos are then controlled by sending an electrical pulse of variable width, or pulse width modulation [PWM] through the control wire. Servo motors have three wires such as, power, ground, and signal. If motor is used is DC powered then it is called DC servo motor, and if AC powered motor is used then it is called AC servo motor. The position of servo motor is decided by electrical pulse and also its circuitry is placed beside the motor.



Fig -4: Servo Motor

3.4. Processing Software

Processing is open source programming language and integrated development environment (IDE) built for the electronic art, new media art, & visual design communities with the purpose of teaching the fundamentals of computer programming in a visual context, and to serve as the foundation for electronic sketchbooks.

4. RESULTS AND DISCUSSIONS

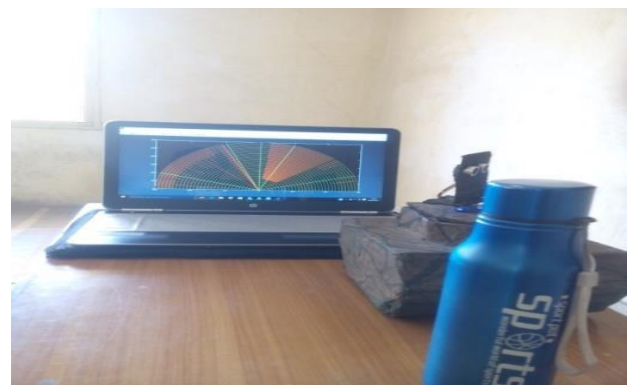


Fig.5 Hardware System

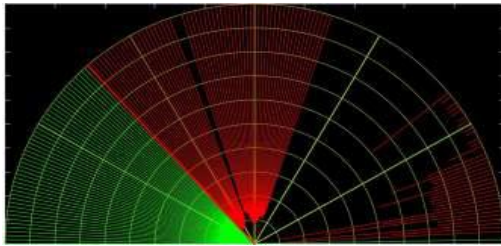


Fig.6 Output Screenshot

5.CONCLUSION

We have represented a project about Ultrasonic RADAR for security system for human or object interference in a short range. The system has been successfully implemented and the aim have been achieved without any deviation. There is a lot of future scope of this project because of its security capacity. It has many applications in many fields. This project can also be developed or modified according to the rising needs and demand in our daily life.

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