Arduino Based Moving Radar System

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Abstract: *RADAR is an object detection system which uses radio waves to determine the range, altitude and direction of objects. The radar transmits pulses of radio waves or microwaves which bounce off any object in their path. Arduino is a single-board microcontroller to make using electronics in multidisciplinary projects more accessible. This project aims at making a RADAR that is efficient, cheaper and reflects all the possible techniques that a radar consists of.*

Ultrasonic sensor transmits the signal in all direction and if any obstacle that is target is detected then echo pulse sense.

The beauty of the project is it saves the target data and moves the camera in the target direction. Furthermore, this project can be enhanced by using a laser gun. When the target is detected then at this proper direction gun is fired. Arduino controller and ultrasonic sensor is the base of this project

Keywords: *GSM, Ultrasonic sensor, Arduino, Servo motor*

1. INTRODUCTION

RADAR is an object detection system which uses radio waves to determine the range, altitude, direction, or speed of objects. Radar systems come in a variety of sizes and have different performance specifications. A radar system is the heart of a missile guidance system. Small portable radar systems that can be maintained and operated by one person are available as well as systems that occupy several large rooms. Radar was secretly developed by several nations before and during the World War II. The term RADAR itself, not the actual development, was coined in 1940 by United States Navy as an acronym for Radio Detection and Ranging.

The project works on the principle of radar echo effect of the transmitting signal. Arduino control the servo motor for the direction of ultrasonic sensor and it moves from 0 degree to 180 degree. Ultrasonic sensor transmits the signal in all direction and if any obstacle that is target is detected then echo pulse sense. With the help of this echo pulse arduino program find out the distance and direction angle of the target. At this condition Siren is trigger and sends the SMS to the colonel.

A SIM300 GSM modem is interfaced to the controller for sending message. The beauty of the project is it saves the target data and moves the camera in the target direction. Furthermore, this project can be enhanced by using a laser gun. When the target is detected then at this proper direction gun is fired. Arduino co ntroller and ultrasonic sensor is the base of this project.

With the help of RF receiver arduino receives the data from user android phone and moves this whole radar system forward, backward, left and right. Therefore user can shift the radar at the place of required.

2. LITERATURE SURVEY

The idea about Army, Navy and the Air Force make use of this technology. The use of such technology has been seen recently in the self parking car systems launched by AUDI, FORD etc. And even the upcoming driverless cars by Google like Prius and Lexus. The project made by us can be used in any systems the customer may want to use like in a car, a bicycle or anything else. The use of Arduino [1] in the project provides even more flexibility of usage of the above-said module according to the requirements.

The idea of making an Ultrasonic RADAR came as a part of a study carried out on the working and mechanism of "Automobiles of Future". Also, being students of ECE, we have always been curious about the latest ongoing technology in the world like Arduino, Raspberry Pi, Beagle-Bone boards etc. An hence this time we were able to get a hold of one of the Arduino boards, Arduino UNO R3. So, knowing about the power and vast processing capabilities of the Arduino, we thought of making it big and a day to day application specific module that can be used and configured easily at any place and by anyone.

3. METHODOLOGY

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 compaire 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.

4. WORKING

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FLOWCHART
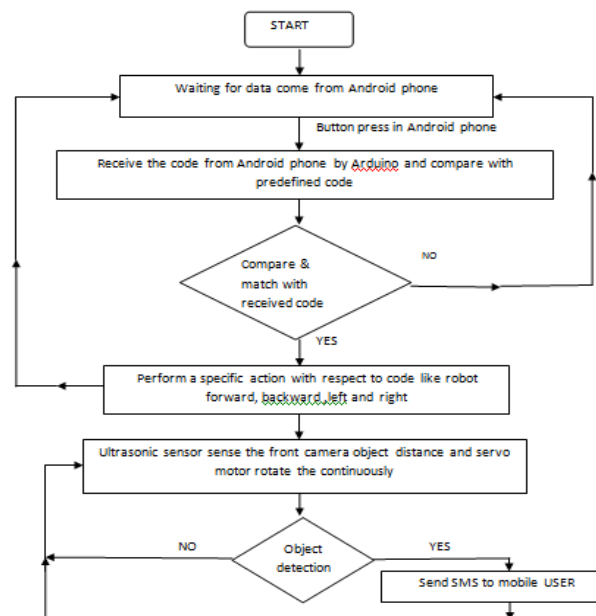
5. COMPONENTS REQUIRED

1]ARDUINO

- The Arduino microcontroller is an easy to use yet powerful single board computer that has gained considerable traction in the hobby and professional market.

- The Arduino is open-source, which means hardware is reasonably priced and development software is free.

TABLE I ARDUINO SPECIFICATIONS Microcontroller ATmega328

[1] Operating Voltage 5V

[2]Input Voltage (recommended) 7-12V

[3] Input Voltage (limits) 6-20V

[4] Digital I/O Pins 14 (of which 6 provide PWM output)

[5] Analog Input Pins 6

[6] DC Current per I/O Pin 40 mA

[7] DC Current for 3.3V Pin 50 mA

[8] Flash Memory 32 KB (ATmega328) of which 0.5 KB used by bootloader

[9] SRAM 2 KB (ATmega328)

[10] EEPROM 1 KB (ATmega328)

[11] Clock Speed 16 MHz

2] ULTRASONIC TRANSMITTER AND RECIVER

- ➢ Ultrasonic sensors (also known as transceivers) work on a principle similar to radar or sonar which evaluate attributes of a target by interpreting the echoes from radio or sound waves respectively.

- ➢ Ultrasonic sensors generate high frequency sound waves and evaluate the echo which is received back by the sensor.

FEATURES

- ➢ Use for motion or distance sensing

- ➢ Frequency: 40kHz ±1.0kHz

- ➢ Aluminum case

- ➢ Capacitance: 2000Pf ±20%

- ➢ Transmitter: bandwidth 5.0kHz/100Db, sound pressure level

  112Db/40 ±1.0kHz

3] MOTOR driver L293D

- ▸ L293D is a dual H-bridge motor driver integrated circuit (IC).

- ▸ Motor drivers act as current amplifiers since they take a low-current control signal and provide a higher-current signal.

- ▸ This higher current signal is used to drive the motors.

4] SERVO MOTOR

A servomotor is a rotary actuator that allows for precise control of angular position, velocity and acceleration. It 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. Servomotors are not a different class of motor, on the basis of fundamental operating principle, but uses servomechanism to achieve closed loop control with a generic open loop motor. Servomotors are used in applications such as robotics, CNC machinery or automated manufacturing.


5] GSM MODEM

- • A GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone

- • From the mobile operator perspective, a GSM modem looks just like a mobile phone.

- • When a GSM modem is connected to a computer, this allows the computer to use the GSM modem to communicate over the mobile network.

6] LCD

- ➢ Most common LCDs connected to the microcontrollers are 16x2 and 20x2 displays.

- ➢ This means 16 characters per line by 2 lines and 20 characters per line by 2 lines, respectively.

- ➢ The standard is referred to as HD44780U, which refers to the controller chip which receives data from an external source (and communicates directly with the LCD.
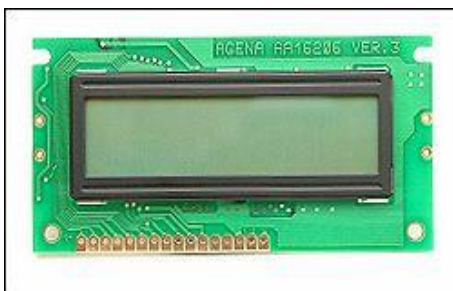
ARDUINO SOFTWARE(IDE)

The Arduino is an open source electronics platform based on easy to use hardware and software. The open source Arduino software(IDE) makes it easy to write code and upload it to the board. It runs on Windows, Mac OS X and Linux..The environment is written in java and based on processing and other open source software. This software can be used with any Arduino board.

The Arduino software IDE contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common function. It connect to Arduino and Genuino hardware t+o upload programs and communicate with them.

Program written using Arduino software(IDE) are called sketches. This sketches are written in the text editor and are saved with the file extension*.ino*. The editor has feature for cutting/ pasting and for searching/replacing text. The message area gives feedback while saving and exporting and also displays error.

6. APPLICATION

1.Air Force

2.Naval Application

3.Applications in Army

REFERANCES

[1] www.arduinoproducts.com

[2] www.atmel.com/atmega328

[3] www.wikipedia.org

[4] Book of Alan G.Smith-Introduction to Arduino

[5] Reference book of Getting Started With Arduino By Massimo Banzi

[6] www.realworldsensor.com

[7] Fundamentals of Radar signal processing-M.A.