OBSTACLE NAVIGATION AND DETECTION SYSTEM

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ABSTRACT:

Radio detection and ranging uses radio waves to detect the range, angle, altitude, direction or speed of objects. Radars have been used for airtraffic control, highway patrol, missile guidance, military exercise etc. An application is developed by using ultrasonic sensors interfacing with arduino micro controller to detect the target in all directions in range. The ultrasonic sensor works on the principle of echolocation. If there is difference between the return pulse and the generated pulse then it will be considered that target or obstacle is detected . If the target is detected then it gives a sound using buzzer. the LCD displays the distance and the angle of the target from the radar system. Already existing method have only 180º object detection system but In this paper we are comparing results of 180º simulation projection using servomotor, LCD Display and processing development environment (visual display)

KEYWORDS:

Ultrasonic sensor, EchoLocation, Arduino microcontroller, LCD display.

I. INTRODUCTION:

The history of radar started with experiments by Heinrich Hertz in the late 19th Century that showed that radio waves was reflected by metallic objects. During the period 1934 to 1935 Eight major nations developed their own radar systems independently. These Radar systems are essentially used in air traffic control, air craft navigation, ship navigation, guided missiles etc. The term RADAR was coined in 1939 by the united states signal corps as it worked on these systems for the navy. After the war, radar use was widened to numerous fields.

II. IMPLEMENTAION:

The components required in this implementation is

- Ultrasonic Sensor
- Arduino UNO
- Servo Motor
- LCD Display
- LED's

III. HARDWARE DESCRIPTION:

Ultrasonic Sensor:

An ultrasonic sensor is an instrument that measures the distance to an object using ultrasonic sound waves. An ultrasonic sensor uses a transducer to send and receive ultrasonic pulses that relay back information about an object's proximity. Ultrasonic

sensing is one of the best ways to sense proximity and detect levels with high reliability. It sends an ultrasonic pulse out at 40 kHz which travels through the air and if there is an obstacle or object, it will bounce back to the sensor. By calculating the travel time and the speed of sound, the distance can be calculated. Ultrasonic sensors are a great solution for the detection of clear objects.

FEATURES:

- Supply voltage: 5V (DC).
- Supply current: 15mA.
- Modulation frequency: 40Hz.
- Output: 0 – 5V (Output high when obstacle detected in range).
- Beam Angle: Max 15 degrees.
- Distance: 2cm – 400cm.
- Accuracy: 0.3cm.

SERVO MOTOR:

A servo motor is a rotary actuator that allows for precise control of angular position. It consists of a motor coupled to a sensor for position feedback. It also requires a servo drive to complete the system. The drive uses the feedback sensor to precisely control the rotary position of the motor.

Servo mechanism is a closed loop control where the position of object is monitored continuously as per the fixed reference at input. If the position varies from the set value, than it is detected by monitoring system, which in turn will send command to input for correcting the deviation from set value. if servo motor is used in the place of actuator, then the current to the servo motor will pumped until the motor reaches the required position.

FEATURES:

- The operating voltage is 5V
- Rotation is 0 – 180 degrees
- The torque of motor is 2.5kg/cm
- Weight of motor is 9gm

Arduino UNO:

Arduino is a open source electronic platform based on easy-to use hardware and software. It comes with an ATMEGA microcontroller board that process the data and facilitates the proper working of the IoT system. Arduino UNO has 14 digital input/output pins(PWM output pins are 6), and 6 analog input pins,16 MHz quartz crystal, USB connection port, power jack, an ICSP header and a reset button in it. The operating voltage is 5V which projects the microcontroller on the board. The Arduino UNO board is programmed using Arduino IDE (Integrated Development Environment) software which is an official software introduced by Arduino.

Fig: Arduino Uno Board

FEATURES:

- Microcontroller: ATmega328.
- Operating Voltage: 5V.
- Input Voltage (recommended): 7-12V.
- Input Voltage (limits): 6-20V.

- Digital I/O Pins: 14 (of which 6 provide PWM output)
- Analog Input Pins: 6.
- DC Current per I/O Pin: 40 mA.
- DC Current for 3.3V Pin: 50 mA.

LCD Display:

A liquid crystal display is a special thin flat panel that can let light go through it, or can block the light. The panel is made up of several blocks, and each block can be in any shape. Each block is filled with liquid crystals that can be made clear or solid, by changing the electric current to that block. Liquid crystal displays are often abbreviated LCDs.

FEATURES:

- It can displays 32 characters each character contains 40 pixels
- It supports small and low – profile sizes
- The operating voltage of this display ranges from 4.7V to 5.3 V
- The operating current is 1mA without a backlight

LED:

A light-emitting diode (LED) is a Semiconductor light source that emits light when current flows through it.Electrons in the semiconductor recombine with electron holes, releasing energy in the form of photons. The color of the light is determined by energy required for electrons to cross the band gap of the semiconductor.

FEATURES:

- The forward voltage of an LED is between 1.8 and 3.3 volts
- In general, beam angel is around 140 degree
- Low Energy Consumption

BUZZER:

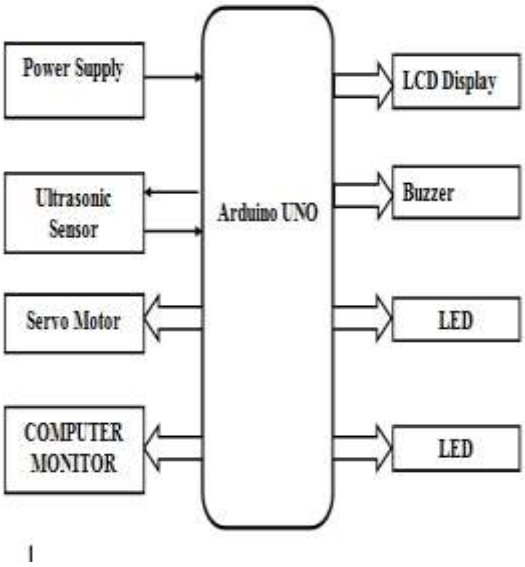
It is an electronic device commonly used to produce sound. Light weight, simple construction and low price make it usable in various applications like car/truck reversing indicator, computers, call bells etc. Piezo buzzer is based on the inverse principle of piezo electricity discovered in 1880 by Jacques and Pierre Curie.

It is the phenomena of generating electricity when mechanical pressure is applied to certain materials and the vice versa is also true. Such materials are called piezo electric materials. When subjected to an alternating electric field they stretch or compress, in accordance with the frequency of the signal there by producing sound.

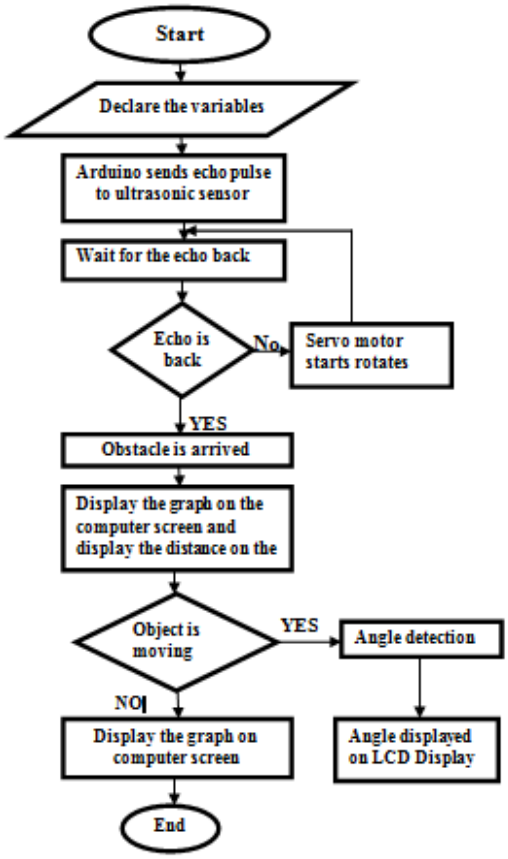
FEATURES:

- The frequency range is 3,300HZ
- The operating temperature ranges from -20^{o}C to +60^{o}C
- The voltage ranges from 3V to 24V DC
- The sound pressure level is 85dBA or 10cm
- The supply current is below 15mA

BLOCK DIAGRAM:



FLOW CHART:



IV.SOFTWARE TOOLS:

- ARDUINO IDE
- Processing Development Environment
- Embedded C

ARDUINO IDE:

Arduino IDE The arduino integrated development environment or arduino software. This software contains a text editor for writing code, a message area, a text consol, a tool bar with buttons for common functions and series of menu. It connects to the arduino hardware to upload programs and communicate with them.

PROCESSING DEVELOPMENT ENVIRONMENT:

Processing is a free graphical library and integrated development environment (IDE) built for the electronic arts, new media art, and visual design communities with the purpose of teaching non-programmers the fundamentals of computer programming in a visual context.

Embedded C

An embedded system is a computer system designed to perform one or few dedicated functions often with real-time computer constraints. It is embedded as part of a complete device often including hardware and mechanical parts. By contrast, a general-purpose computer, such as a personal computer (PC), is designed to be flexible and to meet a wide rangeof end-user needs.

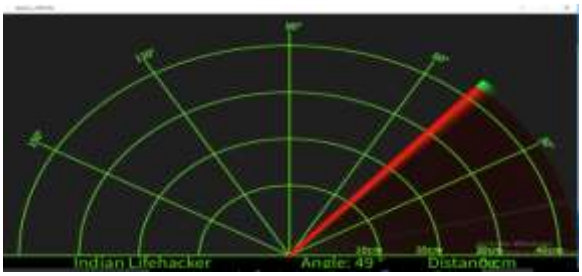
V.WORKING PRINCIPLE:

Our proposed system's working principle is linked by the following components which are is two ultra-sonic

sensors connected to the microcontroller (we have chosen Arduino) digital input and output pins. Then we have servo motor which is also connected to digital output and input pins. Our both main components ultra-sonic sensors and servo motor are connected simultaneously, so that when our servo motor rotates from 0 degree to 180 degree from extreme right to extreme left the motor will rotate nearby its axis. We are adding ultrasonic sensor to servo motor soft. We utilize Computer screen to demonstrate the data (distance and angle) through software called "Processing development Environment" by using the processing development environment to observe the objects on the Computer screen with 180^{o}.

VI.RESULTS:

When the object is detected, the visual display software detects the presence of objects, and also find the angle and distance of the obstacle. Therefore the same result will also be displayed on LCD screen



CONCULSION:

In this paper, a prototype of distance measurement and Obstacle navigation and detection system was designed and implemented successfully using processing development environment technology and ultrasonic sensing technology. This system can monitor a particular area and detect the location, direction and distance of the object that comes its way and convert it into a model that can be visually represented. The Accuracy of two methods is same but the angle is small and negligible.

FUTURE SCOPE:

This paper is extend to 360^{o} detection using processing development environment but in small modification in hardware module that is servo motor is replaced with stepper motor .

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