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Implementation of Model Radar for Target Identification using Remote Station Alert System

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Abstract: ***Radar may be a system wont to discover objects that uses magnetic attraction waves specifically radio waves to work out the vary, altitude, direction, or speed of each moving and glued objects. The measuring system dish, or antenna (parabolic), transmits pulses of radio waves or microwaves that bounce off any object in their path. the thing returns a small a part of the wave's energy to a dish or antenna that is typically settled at a similar website because the transmitter. This project is employed to spot the direction of the target from that it's coming back and position of the thing and also the distance to the thing. This project uses Arduino Uno that is interfaced with blip symbol system has associate degree supersonic detector . This detector keeps track with the target to search out distance. If the target is found to be affected in any direction then it offers an impact signal to the Arduino uno and also the standing is displayed on the LCD for user identification. This project uses regulated 5V, 500mA power provide. 7805 3 terminal transformer is employed for voltage regulation. Bridge kind full wave rectifier is employed to rectify the ac output of secondary of 230/12V step down electrical.***

Keywords: Arduino uno, LCD, Antenna, Receiver, Transmitter ,Distance, Direction.

I. INTRODUCTION

Radar may be a detection system that uses radio waves to work out the vary, angle, or speed of objects. It may be wont to discover craft, ships, spacecraft, target-hunting missiles, cars, weather formations, and piece of land. A measuring system system consists of a transmitter manufacturing magnetic attraction waves within the radio or microwaves domain, a sending antenna, a receiving antenna (often a similar antenna is employed for sending and receiving) and a receiver and processor to work out properties of the object(s). Radio waves (pulsed or continuous) from the transmitter mirror off the thing and come to the receiver, giving data regarding the object's location and speed. Implementation of model radar microwave radar radio detection associate degreed ranging radio location measuring instrument measuring system measuring device for target identification mistreatment terminal alert system is an Arduino based mostly project. This project features a wide space of usage and scope. This project may be used as marine measuring system to live the bearing and distance of ships to stop collision with alternative ships, to navigate and to mend their position.

It may be wont to find air, ground and ocean targets. This evolved within the civilian field into applications for craft, ships and roads.

II. SYSTEM OVERVIEW

We have used supersonic Distance detector, Arduino Uno, LCD, DC Motor, L293D Motor Driver for the look of this project.

In this project we've got given importance for supersonic detector because it is employed to live distance. The power provide consists of a step down electrical device, a bridge rectifier, a electrical phenomenon filter circuit, a 721 transformer. 30V AC input is given to the step down electrical device that reduces it to 12V and bridge rectifier offers DC output and also the remaining AC elements square measure blocked by filter circuit and also the transformer offers constant DC output. Here 3.3V is needed to drive the Arduino and 5V is needed to drive all the opposite elements of the circuit. L293D Motor Driver controls the antenna movement supported the principle of H-Bridge circuit.

H-Bridge is associate degree electronic circuit that allows a voltage to be applied across a load in either direction. Antenna rotates and if any supply comes in its path, it'll discover the signal reminiscent of specific frequency and produces individual output. counting on the input and alter the motors can rotate in either dextrorotary or anti dextrorotary direction. The microcontroller based mostly supersonic radar microwave measuring system radio detection and ranging radio location measuring instrument measuring system measuring device circuit demonstrates the operating of a radar system. It uses supersonic waves to discover associate degree object and live its distance and spatial relation and displays o LCD screen.

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III. PRINCIPLE OF RADAR

A radar microwave measuring system radio detection and ranging radiolocation measuring instrument measuring system measuring device system features a transmitter that emits radio waves known as radar signal in planned directions. When these get contact with associate degree object, they're typically mirrored or scattered in several directions. Radar signals square measure mirrored particularly well by materials of significant electrical physical phenomenon by most metals. The radar microwave measuring system radio detection and ranging radio location measuring instrument measuring system measuring device signals that square measure mirrored back towards the transmitter are the fascinating ones that build radar works. If the thing is moving either towards or far from transmitter, there is a rather equivalent amendment within the frequency of the radio signals, caused by the Doppler effect.

Frequency shift is caused by motion that changes the quantity of wavelengths between the reflector and also the measuring system. this could degrade or enhance measuring system performance relying upon however it affects the detection method. As associate degree example, Moving Target Indication will move with Doppler to supply signal cancellation at bound radial velocities, that degrades performance. Sea-based measuring system systems, semi-active measuring system orienting , active measuring system orienting , radiolocation, military craft, and measuring system uranology trust the Doppler effect to boost performance.

IV. WORKING

Radar will extract the Doppler frequency shift of the echo created by a moving target by noting what proportion the frequency of the received signal differs from the frequency of the signal that was transmitted. (The Doppler effect in microwave radar ranging radiolocation measuring instrument measuring system measuring device} is comparable to the amendment in hearable pitch tough once a train whistle or the siren of an emergency vehicle moves past the attender.) A moving target can cause the frequency of the echo signal to extend if it's approaching the microwave radar radio detection and ranging radio location measuring instrument measuring system measuring device} or to decrease if it's receding from the radar. as an example, if a measuring device system operates at a frequency of three,000 Mc associate degreed an craft is moving toward it at a speed of four hundred knots (740 klick per hour), the frequency of the received echo signal are larger than that of the transmitted signal by regarding four.1 kHz. The Doppler frequency shift in hertz is capable three.4 f0vr, wherever f0 is that the measuring device frequency in Gc and vr is that the velocity (the rate of amendment of range) in knots.

Since the Doppler frequency shift is proportional to velocity, a measuring device system that measures such a shift in frequency will offer the velocity of a target. The Doppler frequency shift may also be wont to separate moving targets from stationary targets even once the echo signal from unsought litter is way additional powerful than the echo from the required moving targets. A variety of pulse radar microwave microwave radar radio detection and ranging radio location measuring instrument measuring system measuring device radio detection and ranging| radio location measuring instrument measuring system measuring device that uses the doppler Doppler Christian Johann Doppler physicist frequency shift to eliminate stationary litter is named either a moving-target indication (MTI) radar or a pulse Doppler radar, betting on the actual parameters of the signal wave form..

$$R_{max} = \sqrt[4]{\frac{P_t G^2 \lambda^2 \sigma}{(4\pi)^3 P_{min}}} = \sqrt[4]{\frac{P_t G^2 c^2 \sigma}{f_o^2 (4\pi)^3 P_{min}}}$$

P_t = **Transmit power** (power dimensions)
P_{min} = **minimum detectable signal** (power)
λ = **transmit wavelength** (length)
σ = **Target radar cross section** (area)
f_o = **Frequency** (Hz)
G = **Antenna Gain** (ratio)
c = **speed of light**

HC-SR04 unhearable (US) detector could be a four pin module, whose pin names area unit Vcc, Trigger, Echo and Ground severally. This detector could be a very hip detector employed in several applications wherever activity distance or sensing objects area unit needed. The module has 2 eyes like comes within the front that forms the unhearable transmitter and Receiver. The detector works with the straightforward high school formula that

Distance = Speed × Time

The unhearable transmitter transmits associate degree unhearable wave, this wave travels in air and once it gets objected by any material it gets mirrored back toward the detector this mirrored wave is determined by the unhearable receiver module

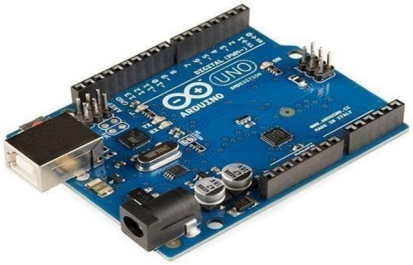
Now, to calculate the space victimisation the higher than formulae, we must always recognize the Speed and time. Since we tend to area unit victimisation the unhearable wave we all know the universal speed :of :US wave at area conditions that is 330m/s. The electronic equipment inherent on the module can calculate the time taken for the US wave to return back and :turns on the echo pin high for that very same specific quantity of your time, this manner we are able to conjointly recognize the time taken. currently merely calculate the space employing a microcontroller or chip.

V. HARDWARE COMPONENTS

1) *Ultrasonic Distance Sensor:* This is the HC-SR04 unhearable distance detector. This economical detector provides 2cm to 400cm of non-contact measuring practicality with a travel accuracy that may reach up to 3mm. every HC-SR04 module includes associate degree unhearable transmitter, a receiver and an effect circuit. Power the detector employing a regulated +5V through the Vcc ad Ground pins of the detector. the present consumed by the detector is a smaller amount than 15mA and thus are often directly hopped-up by the on board 5V pins (If available). The Trigger and also the Echo pins area unit each I/O pins and thus they will be connected to I/O pins of the microcontroller. to start out the measuring, the trigger pin needs to be created high for 10uS so turned off. This action can trigger associate degree unhearable wave at frequency of 40Hz from the transmitter and also the receiver can await the wave to come back. Once the wave is came once it obtaining mirrored by any object the Echo pin goes high for a specific quantity of your time which is able to be capable the time taken for the wave to come back back to the detector.The amount of your time throughout that the Echo pin stays high is measured by the MCU/MPU because it provides the data regarding the time taken for the wave to come back back to the detector. victimisation this data the space is measured as explained within the higher than heading.

Ultrasonic Distance Sensor

2) *Arduino Uno:* The Arduino Uno is associate degree ASCII text file microcontroller board supported the semiconductor device ATmega328P microcontroller and developed by Arduino.cc. The board is provided with sets of digital and analog input/output (I/O) pins that will be interfaced to numerous enlargement boards (shields) and different circuits. The board has fourteen digital I/O pins (six capable of PWM output), vi analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a kind B USB cable. It are often hopped-up by the USB cable or by associate degree external 9-volt battery, tho' it accepts voltages between seven and twenty volts. it's conjointly just like the Arduino Nano and Leonardo da Vinci. The hardware reference style is distributed beneath a clever Commons Attribution Share-Alike two.5 license and is obtainable on the Arduino web site. Layout and production files for a few versions of the hardware are accessible. The word "uno" means that "one" in Italian and was chosen to mark the initial unleash of Arduino code. The Uno board is that the initial in a very series of USB-based Arduino boards, it and version one.0 of the Arduino IDE were the reference versions of Arduino, that have currently evolved to newer releases.



Arduino uno

3) *LCD:* A liquid-crystal display (LCD) is a flat-panel display or other electronically modulated optical device that uses the light-modulating properties of liquid crystals combined with polarizers. To display interactive messages we are using LCD Module. We examine an intelligent LCD display of two lines,16 characters per line that is interfaced to the controllers. The protocol (handshaking) for the display is as shown. Whereas D0 to D7th bit is the Data lines, RS, RW and EN pins are the control pins and remaining pins are +5V, -5V and GND to provide supply. Where RS is the Register Select, RW is the Read Write and EN is the Enable pin.

LCD

4) *L293D Motor Driver:* The L293D is a popular 16-Pin Motor Driver IC. As the name suggests it is mainly used to drive motors. A single L293D IC is capable of running two DC motors at the same time; also the direction of these two motors can be controlled independently. So if you have motors which has operating voltage less than 36V and operating current less than 600mA, which are to be controlled by digital circuits like Op-Amp, 555 timers, digital gates or even Micron rollers like Arduino, PIC, ARM etc.. this IC will be the right choice for you.

L293D Motor Driver

5) *DC Motor:* A dc motor uses electrical energy to produce mechanical energy, very generally through the interaction of magnetic fields and current-containing conductors. The reverse process, producing electrical energy from mechanical energy, is carried out by an alternator, source or dynamo. Many types of electric motors can be run as sources, and vice verse. The input of a DC motor is current/voltage and its output is torque (speed).

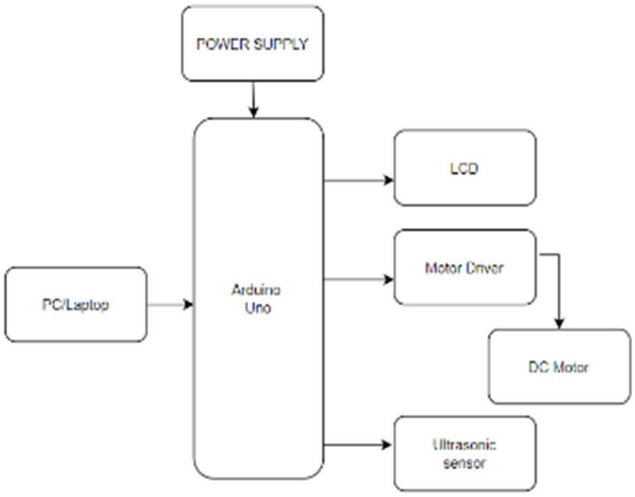
DC Motor

VI. SOFTWARE REQUIREMENTS

The requires software components used in this system are:

A. Arduino IDE
B. LabVIEW

VII. ARCHITECTURE AND FLOWCHART



Block Diagram of System Architecture

VIII. APPLICATIONS AND ADVANTAGES

The applications involved in this project are:

A. Mapping radar scans a large region for remote sensing and geography applications.
B. Wearable radar which is used to help the visually impaired.
C. Air traffic control uses radar to reflect echoes off of aircraft.
D. Weather radar uses radar to reflect echoes off of clouds.
E. Some weather radars use the Doppler Effect to measure wind speeds.
F. Missile Tracking System.
G. Marine radars are used to measure the bearing and distance of ships to prevent collision with other ships.

The advantages of the proposed system are:

1) Very flexible - can be used in a number of ways.
2) Beam spread can incorporate many targets
3) Can often select fastest target, or best reflection
4) Still very reliable.
5) High Penetration capability.
6) Long Range

IX. CONCLUSION

As long as there is no movement or object in the path of the, the sensor remains in stand-by mode. When a person or object crosses the beam, it is displayed on LCD.The Antenna movement is controlled by the Motor Driver L293D circuit. The L293D is based on a principle of H Bridge circuit. An H bridge is an electronic circuit that enables a voltage to be applied across a load in either direction. These circuits are often used to allow DC motors to run forwards and backwards. Now, when the antenna rotates & any source comes in its path, it will detect the signal corresponding to particular frequency and produces a respective output. The prime objective of our project is to find the direction of the target and the distance from the target.

X. FUTURE SCOPE

ZigBee Module can be added to overcome the disadvantage of range. This project will use Arduino Uno which is interfaced with Radar Target Identifier system and has an ultrasonic distance sensor. This sensor is keeping track with the distance to the target. If the target is found to be moved in any direction then it gives a control signal to the microcontroller and the status is displayed on the LCD for user identification. The distance will be displayed using Ultrasonic sensor. These signal transmissions will take place wirelessly between the master ZigBee attached to the transmitter section and the slave ZigBee attached to the receiver section.

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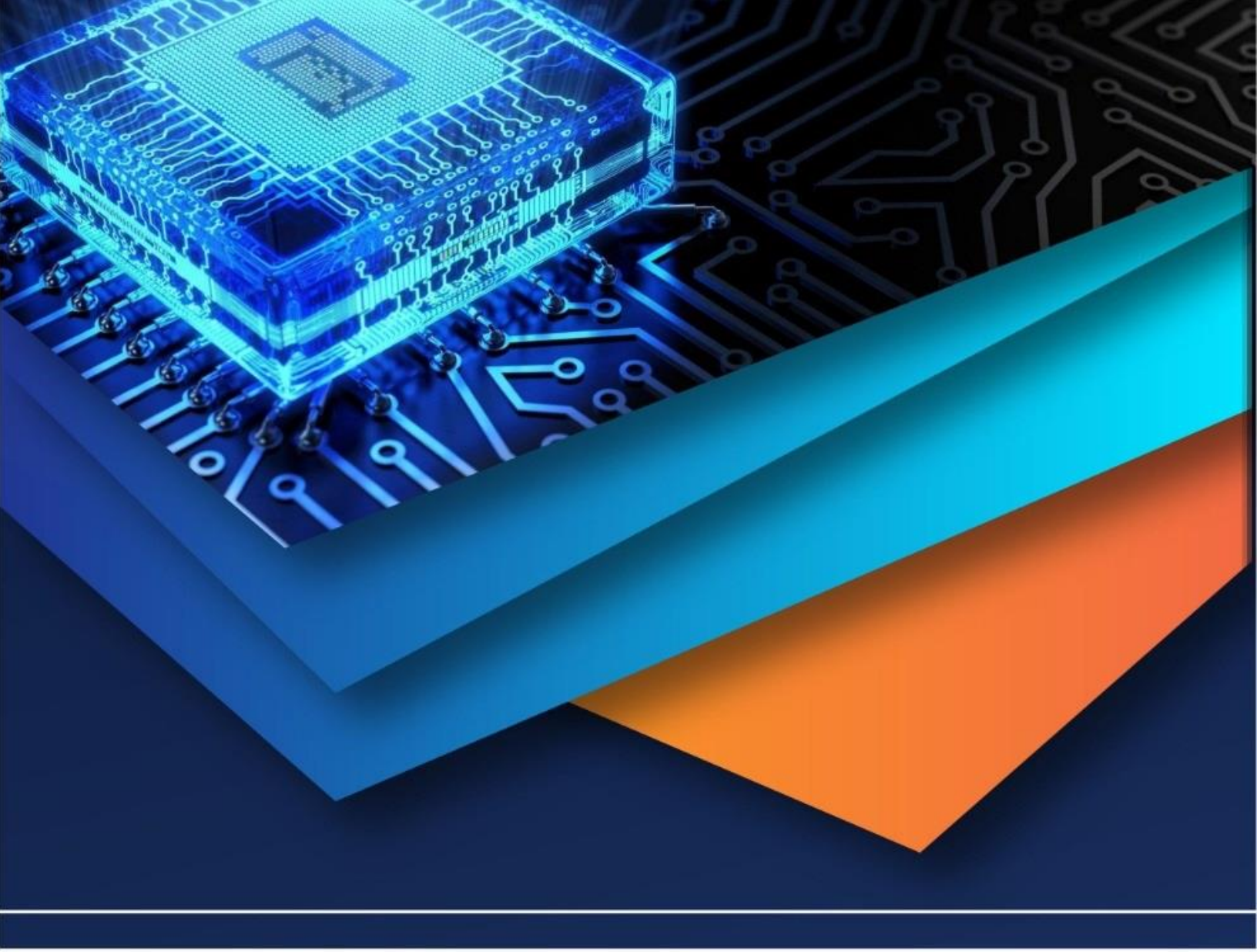

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