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Missile Detection by Ultrasonic and Auto Destroy System

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Abstract

This project is to design and construct automatic missile detection and destroying system. The system is designed to detect the target (missile) moving in multiple directions. The destroying system moves automatically in the direction of missile and fires it upon fixing the target. This system consists of a SONAR based object tracking system that continuously monitors the target. Upon detecting the target it sends the target's location to a Central Control System. The Central Control System takes the action of moving the firing mechanism in the direction of target missile . Upon fixing the direction, it sends the control command to firing system to attack the target.
This project is divided in three part RF Transmitter, RF Receiver, and microcontroller.

Keywords: SONAR, missile, RF Transmitter, RF Receiver, and microcontroller..

Introduction

War is an organized armed conflict that is carried out by states, nations, national and social groups.

This ultrasonic proximity detector comprising independent, battery or AC powered transmitter and receiver section make use of a pair of matched ultrasonic piezo ceramic transducers each operating at around 40 kHz. This circuit is used to get reflected signals of 40 KHz from the a missile to feed that to a program to the microcontroller to switch on appropriate load while the program is executed at the microcontroller end. When the AVR microcontroller receives the signal from ultrasonic receiver it activates the door gun by triggering the gate of MOSFET through a transistor. The power supply consists of a step down transformer 230/12V, which steps down the voltage to 12V AC. Then this is converted to DC using a Bridge rectifier. The ripples are then removed using a capacitive filter and it is then regulated to +5V using a voltage regulator 7805 which is required for the operation of the microcontroller and other components.

The ultrasonic proximity detector comprising independent, battery or AC powered transmitter and receiver sections make use of a pair of matched ultrasonic piezo ceramic transducers each operating at around 40 kHz each. This circuit is used to get reflected signals of 40 KHz from the object (here a missile) to feed that to a program to the microcontroller. OpAmps are used for amplification of the weak signals received upon reflection from the obstacle, by the receiving ultrasonic transducer sent by the transmitting one, to switch on appropriate load while the program is executed at the microcontroller end.

The project consist of the ultrasonic transmitter and receiver each of which works for the frequency of 40 kHz.

At the receiver side the received signal is amplified and given to the microcontroller which is used as to operate the relay driver (ULN2003) for operating the relay to drive the loads.

The power supply consists of a step down transformer 230/12V AC which is converted to DC using a Bridge rectifier. The ripples present are removed using a capacitive filter and it is then regulated to +5V using a voltage regulator 7805 which is required for the proper operation of the microcontroller and other components.

Target acquisition and tracking are frequent domains of active sensing methods such as RADAR, Ultra-sound, or LASER scanning. The ability to track targets at manipulation range can significantly reduce the cost and complexity of manipulator control. Ultrasonic sensors, in particular, provide an ideal platform for experimental development in range detection. They are cheap, readily available, and increasingly possessed of high-resolution sensors. Its various Applications range from robotic security systems to environments such as production lines

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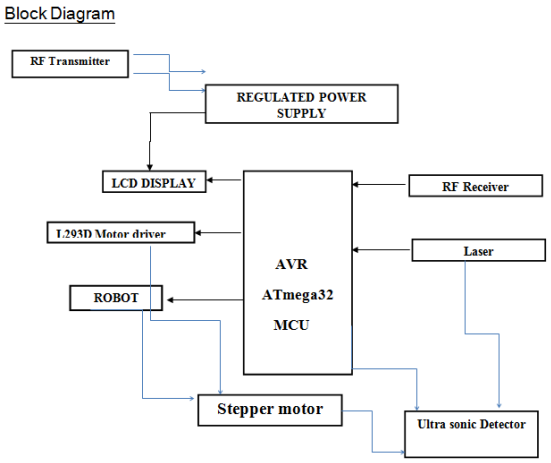
where distance measurement and obstacle measurement and manipulation of objects are routine tasks with potential for wide-scale automation and defence.

Here, a robotic platform along with a stepper motor fitted with ultrasonic sensor is used to automatically locate and aim at a stationary target, moving target at a pre-defined range and destroying it successfully. Let's us, we summarize the project's main advances and indicate possible directions for future work, thus

1. The main objectives of this project are: Monitoring the moving target.
2. Real time monitoring of target
3. Works in any lighting conditions.
4. Automatic target attacking.
5. Controlling the robot using RF TX and RX

Block Diagram



- AVR Atmega 32 Microcontroller
- L293D Motor Driver IC
- Voltage regulator 7805.
- Diode IN4007
- RF Receiver And Transmitter.
- Robotchassis
- Stepper motor
- Ultrasonic sensor
- Laser
- Wireless Video Camera
- Alarm

Avr Atmega 16/32 Microcontroller

ATmega32 is an 8-bit high performance microcontroller of Atmel's Mega AVR family with low power consumption. Atmega16 is based on enhanced RISC (Reduced Instruction Set Computing), know more about RISC and CISC (Complex Instruction Set Computing) Architecture with 131 powerful instructions. Most of the instructions execute in one machine cycle. Atmega16 can work on a maximum Clock frequency of 16MHz.

ATmega32 has 16 KB programmable flash memory, static RAM of 1 KB and EEPROM of 512 Bytes bound by Harvard Architecture. The endurance cycle of flash memory and EEPROM is 10,000 and 100,000 respectively.

ATmega32 is a 40 pin microcontroller. There are 32 I/O (input/output) lines which are divided into four 8-bit ports designated as Port A, Port B, Port C and Port D.

ATmega32 has various in-built peripherals like USART, ADC, Analog
Comparator, SPI, JTAG etc. Each I/O pin has an alternative task related to in-built peripherals.

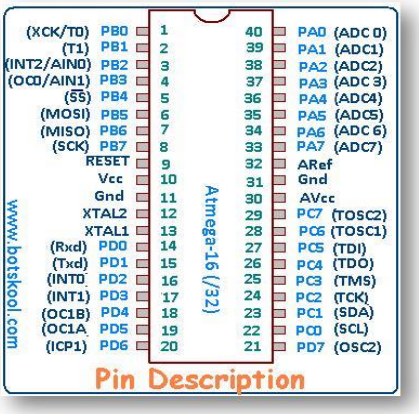


Figure 1: AVR Pin Configuration

L293D Motor Driver IC

The most common method to drive DC motors in two directions under control of a computer is with an H-bridge motor driver. We can make our own H bridge using transistors but it will be better if we use a ready made IC named as L293D, it's a dual half H brige IC.

• We can drive a maximum of two DC motor and one stepper motor using one L293d.

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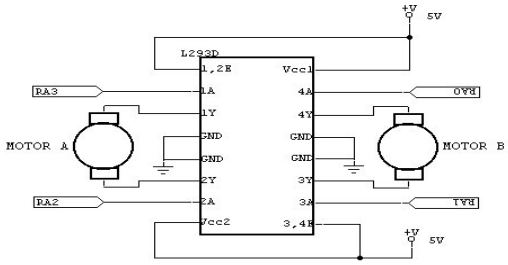

Figure 4. L293D Motor Driver IC

Rf Module

- The RF module operates at Radio Frequency(RF) . The corresponding frequency range varies between 30 kHz & 300 GHz.
- RF signals can travel even through obstruction between transmitter & receiver.
- Any RF module comprises of an RF Transmitter and an RF Receiver.

Figure 5. Rf Module

Robot Chassis

A chassis is a base - the physical frame or structure of an automobile, an airplane, a desktop computer or other multi-component device. In military terms, it refers to the frame on which a cannon carriage moves backwards and forwards.

Figure 6. Robot Chassis

Stepper Motor

- A stepper motor is another kind of electric motor used in the robotics industry.
- Stepper motors move a known interval for each pulse of power. These pulses of power are provided by a stepper motor driver and is referred to as a step.

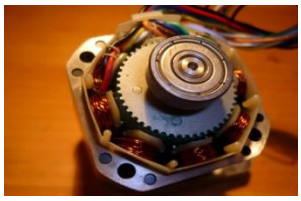

Figure 7. Stepper Motor

Ultrasonic Sensor

- Ultrasonic Rangefinder is used to find range of an obstacle from the sensor.
- It works on a principle similar to RADAR or SONAR which evaluate attributes of a target by interpreting the echoes from radio or sound waves respectively.

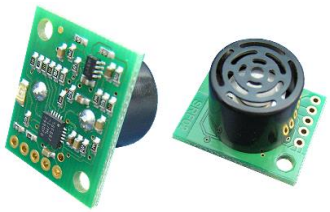

Figure 8. Ultrasonic Sensor

LASER (Light Amplification (by) Stimulated Emission (of) Radiation)

- Any device that emit highly amplified and coherent radiation of one or more discrete frequencies.
- LASER delivers light in an almost-perfectly parallel beam (collimated) that is very pure, approaching a single wavelength.
- Well basically it is used to produce a coherent non dispersing beam of light by multiple refractions inside a highly polished glass cavity.

Figure 9. LASER

Wireless Video Camera

Wireless cameras are basically described as a wireless transmitter carrying a camera signal. The Camera is wired to a wireless transmitter and the signal travels between the camera and the receiver.

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This works much like radio. The sound you hear on a radio is transmitted wirelessly and you tune to a certain frequency and hear the sound. Wireless cameras have a channel also. The receiver has channels to tune in and then you get the picture. The wireless camera picture is sent by the transmitter the receiver collects this signal and outputs it to your Computer **OR** TV Monitor depending on the receiver type.

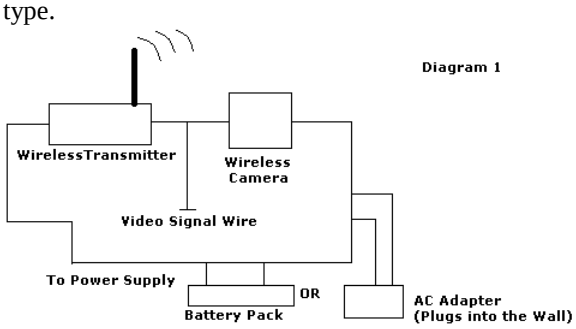


Figure 10. Video Camera

The Camera sees the image, the camera then provides the video to the transmitter, then the transmitter sends the wireless signal to the receiver. There are many types of wireless cameras. You can make most any camera wireless by adding a wireless transmitter and receiver. The camera and transmitter require power. The power is provided by battery and/ or transformer / adapter.

The camera sees an image, sends it to the transmitter, and the transmitter sends the signal out to the air. The receiver picks up the signal and outputs it to a TV / Computer / Digital Video recorder/ This is a basic diagram many wireless cameras and transmitters are very small and the power is provided to both from one source.

The Receiver

A wireless receiver has only one function. After the camera and wireless transmitters have provided the wireless video signal the receiver collects this signal and routes it the Monitor, TV, VCR , DVR or PC (or alternative recording or viewing device). See diagram 2 .

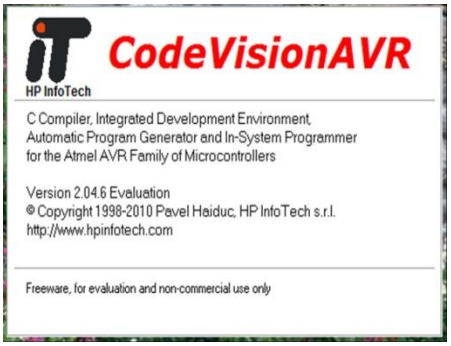
As you can see in Diagram 2 The receiver accepts the wireless transmitters signal and then out puts it to your TV, VCR, Monitor or PC. The receiver needs only power and a Device to view and or record the Signal /Video.

Video Transmitter

Video Transmitters can be obtained separate from cameras. If you have a wired camera now you can turn it into wireless by adding a transmitter and receiver. Instead of the wire from the camera to the recording device or monitor the wireless signal will send the video. Again you will need to provide power to the camera and the transmitter. Most transmitters and receivers are sold as a package but some are not. Be sure to check with the supplier.

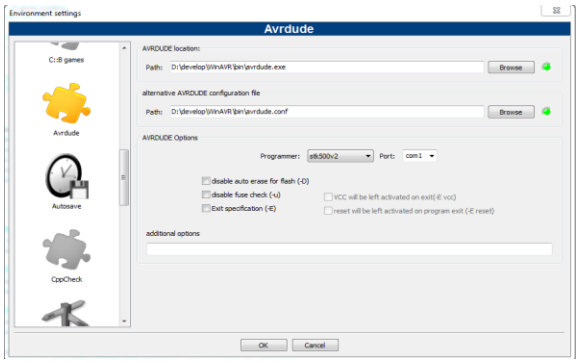
Software

- Code Vision AVR



Code vision AVR is a very powerful and user friendly compiler/IDE for Atmel's AVR series of microcontrollers.

- AVR Dude



Results and Discussion

By using ultrasonic waves we can detect the missile then micro controller activate the destroyer. This can be applied in various defence fields to protect the Nation from foreign attacks. In case of global military conflict, the role of anti-missile defence becomes very important. Although anti-missile defence with a hundred percent reliability was not reached by any country, huge efforts are put into this area. For this purpose early attack detection systems, controllable rockets, high power lasers are used. We would like to believe that such technologies will never be used according to

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their direct destination, but will be applied by mankind for peaceful purposes.

Future Scope

1. By using controller microcontroller we can implement the intelligent system in future.
2. In Future it can be used as an advanced tracking system along with high intensity camera to track a real target(say a Missile or Tank).
3. The advantage of this unit is that to run the system we can use video camera and other sensors to see the live moving target from anywhere in the world.

Further developments could relax these restrictions by allowing range detection from the video image and implementing tracking and prediction of a moving target, but these features proved impossible to include within our timeframe. Target acquisition occurs via processing of an image stream from a single webcam, making use of foreground segmentation and SURF feature detection, together with a calibrated pinhole model to convert from pixel distances into real-world Cartesian coordinates. Because the missile launcher has no sensors to provide feedback on its pose, described in terms of the altitude and azimuth angles of its barrel, we also present results for a visual servicing system. This uses a camera mounted on the barrel to read a calibrated fan pattern printed behind the launcher base, providing pose feedback by detecting and recording movement from a denned origin. We also show results for ballistic light tests conducted on the foam missiles, swhich allow the calculation of the desired launcher pose given a target location.

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The most common method to drive DC motors in two directions under control of a computer is with an H-bridge motor driver.

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