# MISSILE DETECTION AND ALARMING FOR MILITARY APPLICATIONS

A Dissertation submitted in partial fulfillment of the requirement
for the award of degree of

**BACHELOR OF TECHNOLOGY**

**IN**

**ELECTRONICS & COMMUNICATIONS ENGINEERING**

Submitted By


| | |
|---|---|
| **B SUSHMITHA** | **(18251A04F4)** |
| **AKHILA** | **(18251A04F8)** |
| **MUDRAKOLA MANSI RAO** | **(18251A04G9)** |
| **RAMAGONI CHANDANA** | **(19255A0413)** |

Under the esteemed guidance of

**N. HARINI, ASST. PROFESSOR, ECE, GNITS**

## DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGG
## G. NARAYANAMMA INSTITUTE OF TECHNOLOGY & SCIENCE

(For Women)

**(AUTONOMOUS)**

**ACCREDITED by NBA & NAAC**


2021-2022

# DEPT. OF ELECTRONICS & COMMUNICATION ENGG

# CERTIFICATE

THIS IS TO CERTIFY THAT THE PROJECT ENTITLED

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IS THE BONAFIDE WORK OF

| | |
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SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF DEGREE OF BACHELOR OF TECHNOLOGY IN ELECTRONICS AND COMMUNICATION ENGINEERING DURING THE YEAR 2021-2022

| | |
|---|---|
| Dr.B.Venkateshulu | N. Harini |
| PROF & HOD, ECE | Asst.Professor, ECE |

GNITS - ECE DEPT

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B SUSHMITHA (18251A04F4)

AKHILA (18251A04F8)

MUDRAKOLA MANSI RAO (18251A04G9)

RAMAGONI CHANDANA (19255A0413)

GNITS - ECE DEPT

# INDEX

# ABSTRACT

War is an organized armed conflict that is carried out by states, nations, national and social groups. The purpose of this project is to design and construct automatic missile detection and alarming system. This proposed system uses an ultrasonic module interfaced to a microcontroller of 8051 family. This system is designed to detect the target (missile) by rotating in multiple directions. The target identifying system rotates automatically in the direction of missile. In this project the system is made up by the use of an ultrasonic sensor and a ESP32 camera module interfaced with a microcontroller-based control unit. An ultrasonic transducer comprising of a transmitter and receiver are used. The transmitted waves are reflected back from the object and received by the transducer again. The total time taken from sending the waves to receiving it is calculated by taking into consideration the velocity of sound. Then the distance is calculated by a program running on the microcontroller.

The ESP32 camera module is mounted on the rotating arm which rotates from 0-180 degrees. It provides live streaming as it rotates in different directions. Upon detecting the target with the help of ultrasonic sensor and visuals from the camera module, both devices help in sending the target's location to a Central Control System(Arduino UNO microcontroller). The Central Control System takes the action of producing alarm and shooting a laser exactly in the direction of the target and alerts the militant about the location of it. The mobility, hardness and functionality of this system allows a reliable replacement for human beings in harsh and hostile environments, ultimately sparing a life.

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# ACRONYMS

| S.No. | Abbreviation | Full form |
|---|---|---|
| 1 | IoT | Internet of Things |
| 2 | LCD | Liquid Crystal Display |
| 3 | TX | Transmitter |
| 4 | RX | Receiver |
| 5 | AC | Alternating Current |
| 6 | DC | Direct Current |
| 7 | RAM | Random Access Memory |
| 8 | MOSFET | Metal Oxide Semiconductor Field Effect Transistor |
| 9 | RADAR | Radio Detection and Ranging |
| 10 | LASER | Light Amplification by Stimulated Emission of Radiation |
| 11 | ROM | Read Only Memory |
| 12 | ASIC | Application Specific Integrated Circuit |
| 13 | LED | Light Emitting Diode |
| 14 | USB | Universal Serial Bus |
| 15 | CPU | Central Processing Unit |
| 16 | TTL | Transistor-Transistor Logic |

# 1. INTRODUCTION

## 1.1 About Project In Brief

Wars are intense armed conflicts between states, nations, countries or any paramilitary groups. The purpose of this project is to design and construct automatic missile detection and alarming system for military applications. The device can be used in the war-field to detect missiles if any. This system is designed to detect the target (missile) moving in multiple directions. The proposed system uses an ultrasonic module interfaced to 8051 family microcontroller to detect missile object. The 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. 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.

The ultrasonic transducer produces sound waves. The transmitted sound waves are reflected back from the object and received by the transducer again. There is also an ESP32 camera module interfaced with a microcontroller-based control unit. The ESP32 camera module is mounted on the rotating arm which rotates from 0-180 degrees. It provides live streaming as it rotates in different directions.When the microcontroller receives the signal about the missile from ultrasonic receiver and visuals from the camera, it activates the buzzer system by triggering the gate of MOSFET through a transistor or relay and it also activates the laser and makes it point in the direction of the missile. We prefer ultrasonic sensor to IR sensor, because the Ultrasonic sensors covers larger sensing distance and it can detect the target in all the lighting conditions (day or night). Then this is converted to DC using a Bridge rectifier.

Op-Amps 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. 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 load. . 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. The distance is calculated by a program running on the microcontroller and displayed on a liquid crystal display screen interfaced to the microcontroller. The programming of Microcontroller is done using Embedded “C”.

The missile tracking and auto alarming system using the Arduino mictrocontroller is an exclusive project that can move the target aiming according to the instructions given by microcontroller and also alerts through Laser and buzzer when any missile is being detected by it. The thesis explains the implementation of “Missile alarming and auto alarming system” using Arduino microcontroller.

## 1.2 Literature Survey

- **Missile Detection and Automatic Destroy System**

This proposed system uses an ultrasonic module interfaced to a microcontroller of 8051 family. An ultrasonic transducer comprising of a transmitter and receiver are used. The transmitted waves are reflected back from the object and received by the transducer again. The circuit is used to receive the reflected signals of 40 KHz from the missile object, to feed that to a program of the microcontroller and to switch on appropriate load while the program is executed at the microcontroller.

When the microcontroller receives the signal from ultrasonic receiver it activates the door gun by triggering the gate of MOSFET through a transistor or relay. The sensor is fitted on antenna and is rotated and controlled by stepper motor through 360 degrees. If there is any target within the detection range, the application will turn the launcher to the nearest detected target and fires.

- **The Wireless Remote Control Car System Based On ARM9**

Current wireless robot system is usually composed by a microcontroller system, bare microcontroller constrained by hardware characteristics, it is difficult to satisfy many complex controls while ensuring system real-time. View of this, the article based ARM9-structured processor and embedded Linux system, optimized and improvement the versatility and real-time capacity of wireless remote-control car. The robot system collected the data by sensors and transmits the data to the PC console which designed as the main calculate and determine center in the system by WIFI. PC sent the final commends to robot and the robot executes them. Through a simple hand signal recognition test, with several times experiments, as a consequence, has proven the wireless remote control car system might accomplish the complex multi-task controls under the safeguard timely premise.

- **Missile Detection and Automatic Alarming System**

The purpose of this project is to design and construct automatic missile detection and alarming system. This system is designed to detect the target (missile) moving in multiple directions.

Upon detecting the target, it sends the target's location to a Central Control System. The Central Control System takes the action of producing alarm and alert the militant about the location of it.

# 2. EMBEDDED SYSTEMS

## 2.1 Introduction

Each day, our lives become more dependent on 'embedded systems', digital information technology that is embedded in our environment. More than 98% of processors applied today are in embedded systems, and are no longer visible to the customer as 'computers' in the ordinary sense. An Embedded System is a special-purpose system in which the computer is completely encapsulated by or dedicated to the device or system it controls. Unlike a general- purpose computer, such as a personal computer, an embedded system performs one or a few pre-defined tasks, usually with very specific requirements. Since the system is dedicated to specific tasks, design engineers can optimize it, reducing the size and cost of the product. Embedded systems are often mass-produced, benefiting from economies of scale. The increasing use of PC hardware is one of the most important developments in high-end embedded systems in recent years. Hardware costs of high-end systems have dropped dramatically as a result of this trend, making feasible some projects which previously would not have been done because of the high cost of non-PC-based embedded hardware.

Typically, an embedded system is housed on a single microprocessor board with the programs stored in ROM. Virtually all appliances that have a digital interface -- watches, microwaves, VCRs, cars -- utilize embedded systems. Some embedded systems include an operating system, but many are so specialized that the entire logic can be implemented as a single program. In terms of complexity embedded systems can range from very simple with a single microcontroller chip, to very complex with multiple units, peripherals and networks mounted inside a large chassis or enclosure.

## 2.2 Definition

Embedded system is defined as, for a particular/specific application implementing the software code to interact directly with that particular hardware what we built.

Software is used for providing features and flexibility, hardware = {Processors, ASICs, memory,..} is used for Performance (& sometimes security).There are many definitions of embedded system but all of these can be combined into a single concept. An embedded system is a special purpose computer system that is used for particular task.

## 2.3 Features

- Versatile
- Various applications
- Cost efficient
- Simple and understandable
- Can be used in extreme environmental conditions (high temperatures)
- Is good enough to implement necessary functions

## 2.4 The Characteristics

Embedded computing systems generally exhibit rich, complex functionality is usually the reason for introducing CPUs into the design. However, they also exhibit many non- functional requirements that make the task especially challenging:

- Real-time deadlines that will cause system failure if not met
- Low manufacturing cost, which often means limited code size

The need to juggle all these requirements makes embedded system programming very challenging and is the reason why embedded system designers need to understand computer architecture.

## 2.5 Types Of Embedded Systems

Based on functionality and performance embedded systems categorized as 4 types

1. Stand-alone embedded systems
2. Real time embedded systems
3. Networked information appliances
4. Mobile devices

## 2.6 An Overview

Every Embedded system consists of a custom-built hardware built around a central processing unit. This hardware also contains memory chips onto which the software is loaded. Fig. 2.1 depicts layers which are involved in a typical embedded system.

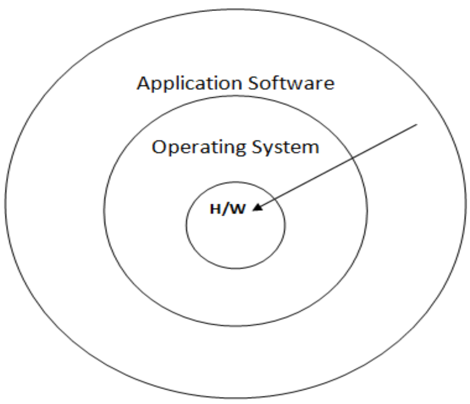


Fig. 2.1 Typical Embedded System

The operating system runs above the hardware and the application software runs above the operating system.

# 3. HARDWARE AND SOFTWARE REQUIREMENTS

## 3.1 Block Diagram

An ATMega328P microcontroller controls the system architecture with an Arduino Uno boot- loader. The Fig. 3.1 illustrates the architecture of the missile detection and alarming system, which depicts the various technologies and technological standards used.

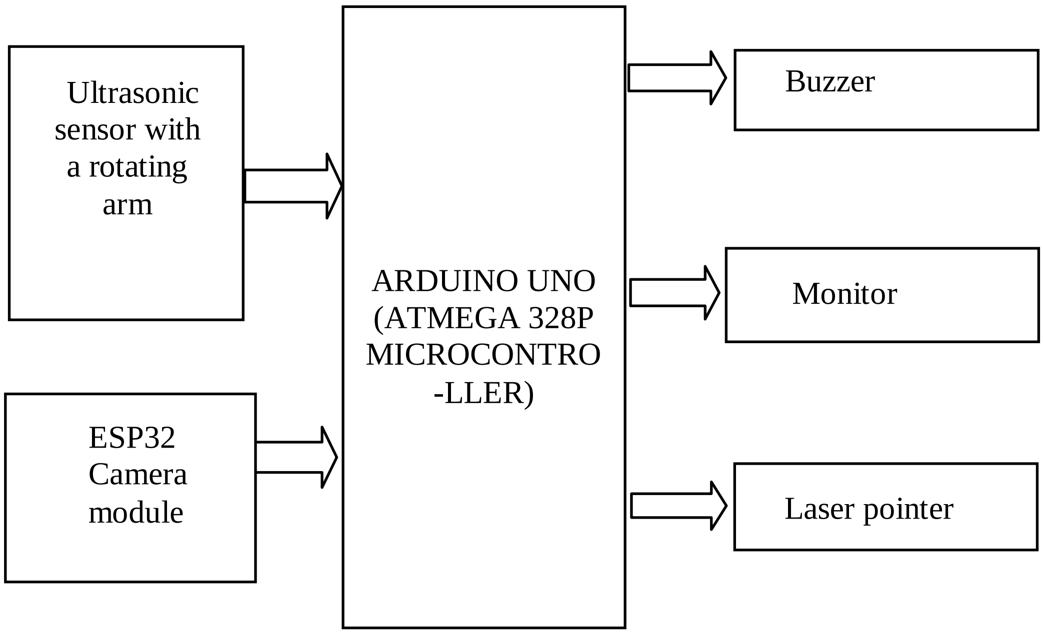


Fig. 3.1 Block Diagram

## 3.2 Hardware Requirements

- Power Supply
- Arduino
- Ultrasonic Sensor
- Laser Pointer
- ESP 32 Camera Module
- Buzzer

### 3.2.1 Power Supply

In mains-supplied electronic systems the AC input voltage must be converted into a DC voltage with the right value and degree of stabilization. In these basic configurations the peak voltage across the load is equal to the peak value of the AC voltage supplied by the transformer's secondary winding. For most applications the output ripple produced by these circuits is too high. However, for some applications - driving small motors or lamps, for example - they are satisfactory. If a filter capacitor is added after the rectifier diodes the output voltage waveform is improved considerably. The section b-c is a straight line. During this time it is the filter capacitor that supplies the load current.

The slope of this line increases as the current increases, bringing point c lower. Consequently the diode conduction time (c-d) increases, increasing ripple. With zero load current the DC output voltage is equal to the peak value of the rectified AC voltage. The value of the voltage ripple obtained is directly proportional to the load current and inversely proportional to the filter capacitor value. The below Fig. 3.2 shows the circuit diagram of the regulated power supply system.

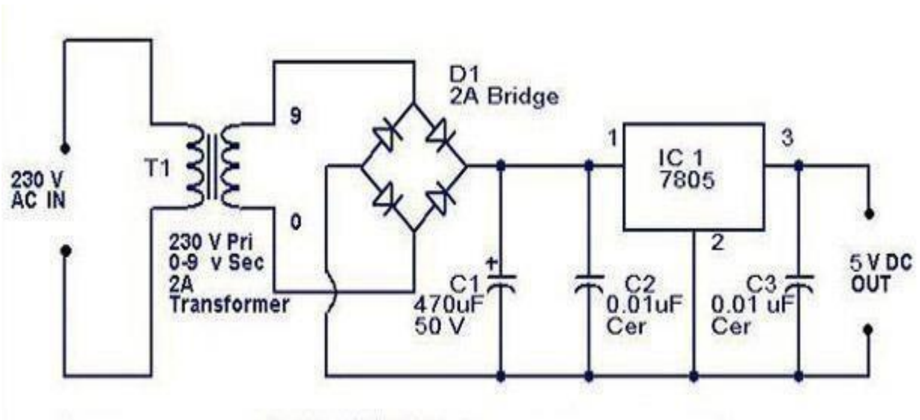


Fig. 3.2 Circuit diagram of regulated power supply section

### 3.2.2 Arduino

The Arduino is a family of microcontroller boards to simplify electronic design, prototyping and experimenting for artists, hackers, hobbyists, but also many professionals. People use it as brains for their robots, to build new digital music instruments, or to build a system that lets your house plants tweet you when they're dry. Arduinos (we use the standard Arduino Uno) are built around an ATmega328P microcontroller essentially a complete computer with CPU, RAM, Flash memory, and input/output pins, all on a single chip. Unlike, say, a Raspberry Pi, it's designed to attach all kinds of sensors, LEDs, small motors and speakers, servos, etc. directly to these pins, which can read in or output digital or Analog voltages between 0 and 5 volts. The Arduino connects to your computer via USB, where you program it in a simple language from inside the free Arduino IDE by uploading your compiled code to the board. Once programmed, the Arduino can run with the USB link back to your computer, or stand-alone without it no keyboard or screen needed, just power. The below figure 3.3 shows the internal structure of an Atmega 328p Arduino microcontroller.

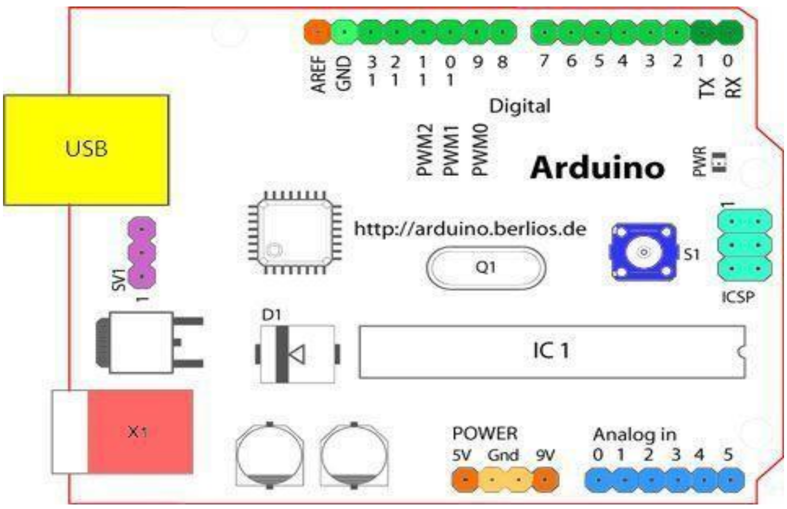


Fig. 3.3 Structure of Arduino Board

Looking at the board from the top down, this is an outline of what you will see (parts of the board you might interact with in the course of normal use are highlighted). The Fig. 3.4 shows a detailed labelled picture of every part of an Arduino board.

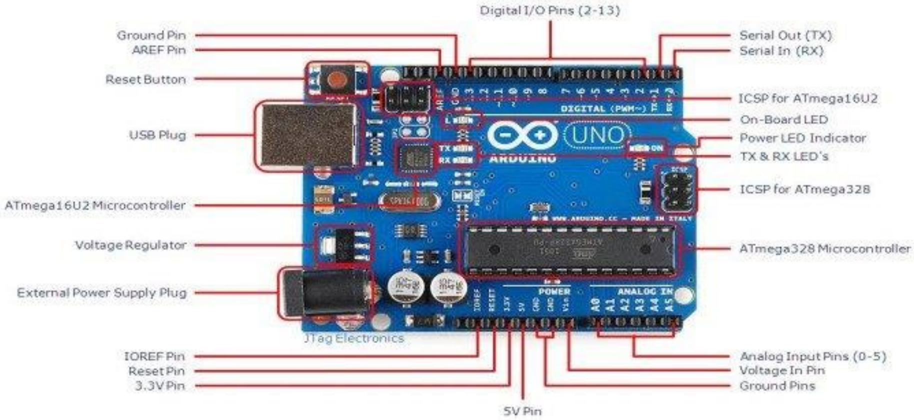


Fig. 3.4 Arduino Board

Starting clock-wise from the top:

- Analog Reference pin (orange)
- Digital Ground (light green)
- Digital Pins 2-13 (green)
- Digital Pins 0-1/Serial In/Out - TX/RX (dark green) - These pins cannot be used for digital i/o (DigitalRead and DigitalWrite) if you are also using serial communication (e.g., Serial.begin).

- Reset Button - S1 (dark blue)
- In-circuit Serial Programmer (blue-green)
- Analog In Pins 0-5 (light blue)
- Power and Ground Pins (power: orange, grounds: light orange)
- External Power Supply In (9-12VDC) - X1 (pink)

Serial : 0 (RX) and 1 (TX). Used to receive (RX) and transmit (TX) TTL serial data. On the Arduino these pins are connected to the corresponding pins of the FTDI USB-to-TTL Serial chip. On the Arduino BT, they are connected to the corresponding pins of the WT11Bluetooth module. On the Arduino Mini and Lily Pad Arduino, they are intended for use with an external TTL serial module (e.g. the Mini-USB Adapter).

Digital Pins : In addition to the specific functions listed below, the digital pins on an Arduino board can be used for general purpose input and output via the pin Mode(),Digital Read(),and Digital Write()commands. Each pin has an internal pull-up resistor which can be turned on and off using digital Write() (w/ a value of HIGH or LOW, respectively) when the pin is configured as an input. The maximum current per pin is 40mA.

- External Interrupts: 2 and 3. These pins can be configured to trigger an interrupt on a low value, arising or falling edge, or a change in value. See the attach Interrupt()function for details.

- PWM: 3, 5, 6, 9, 10, and 11 Provide 8-bit PWM output with the Analog Write() function. On boards with an ATmega8, PWM output is available only on pins 9, 10, and 11.

- SPI: 10 (SS), 11 (MOSI), 12 (MISO), 13 (SCK). These pins support SPI communication, which, although provided by the underlying hardware, is not currently included in the Arduino language.

- LED: 13. On the Diecimila and LilyPad, there is a built-in LED connected to digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it's off.

Analog Pins : In addition to the specific functions listed below, the analog input pins support 10- bit analog-to-digital conversion (ADC) using the analog Read()function.

- VIN (sometimes labeled "9V"): The input voltage to the Arduino board when it's using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin. Also note that the Lily Pad has no VIN pin and accepts only a regulated input.5V: The regulated power supply used to power the microcontroller and other components on the board.

- 3V3 (Diecimila-only) :A 3.3 volt supply generated by the on-board FTDI chip.

- GND:Ground pins.

### 3.2.3 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. High-frequency sound waves reflect from boundaries to produce distinct echo patterns. Fig. 3.5 is the ultrasonic sensor module used in our project.

Fig. 3.5 Ultrasonic Sensor

## Laws of physics for sound waves

Sound waves are having specific frequencies or number of oscillations per second. Humans can detect sounds in a frequency range from about 20Hz to 20 KHz. However the frequency range normally employed in ultrasonic detection is 100 KHz to 50MHz. The velocity of ultrasound at a particular time and temperature is constant in a medium.

## Transducers for Wave Propagation and particle detection

The commonly used transducers are contact transducers, angle beam transducers, delay line transducers, immersion transducers, and dual element transducers. Contact transducers are typically used for locating voids and cracks to the outside surface of a part as well as measuring thickness. Angle beam transducers use the principle of reflection and mode conversion to produce refracted shear or longitudinal waves in the test material. Delay line transducers are single element longitudinal wave transducers used in conjunction with a replaceable delay line. One of the reasons for choosing delay line transducer is that near surface resolution can be improved.

## How Ultrasonic Sensors Work?

Ultrasonic sound vibrates at a frequency above the range of human hearing. Transducers are the microphones used to receive and send the ultrasonic sound. Our ultrasonic sensors, like many others, use a single transducer to send a pulse and to receive the echo. The sensor determines the distance to a target by measuring time lapses between the sending and receiving of the ultrasonic pulse. The below figure 3.6 depicts the working of an ultrasonic sensor.

**Why use an ultrasonic sensor?**

Ultrasound is reliable in any lighting environment and can be used inside or outside. Ultrasonic sensors can handle collision avoidance for a robot, and being moved often, as long as it isn't too fast. Ultrasonics are so widely used, they can be reliably implemented in grain bin sensing applications, water level sensing, drone applications and sensing cars at your local drive-thru restaurant or bank.

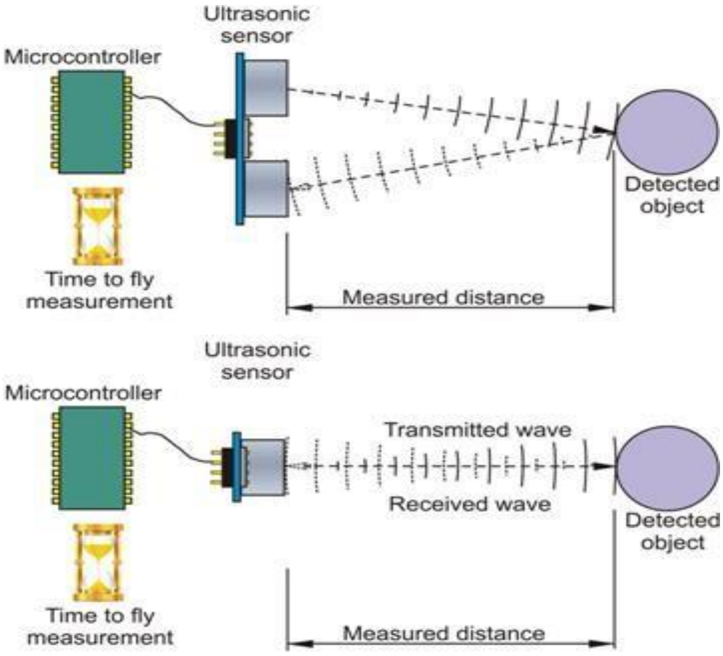


Fig. 3.6 Working of an Ultrasonic sensor

Ultrasonic Sensors are best used in:

- Presence
- Level
- Position
- Distance

### 3.2.4 Laser Pointer

A laser pointer or laser pen is a small hand-held device with a power source (usually a battery) and a laser diode emitting a very narrow coherent low-powered laser beam of visible light, intended to be used to highlight something of interest by illuminating it with a small bright spot of colored light. The small width of the beam and low power of typical laser pointers make the beam itself invisible in a clean atmosphere, only showing a point of light when striking an opaque surface. Laser pointers can project a visible beam via scattering from dust particles or water droplets along the beam path.

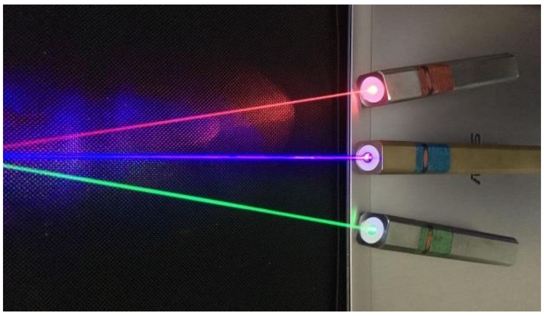

Fig. 3.7 Laser Pointer

There are significant safety concerns with the use of laser pointers. Most jurisdictions have restrictions on lasers above 5 mW. If aimed at a person's eyes, laser pointers can cause temporary visual disturbances or even severe damage to vision. Early laser pointers were helium–neon (HeNe) gas lasers and generated laser radiation at 633 nanometers (nm), usually designed to produce a laser beam with an output power under 1 milliwatt (mW). The least expensive laser pointers use a deep-red laser diode near the 650 nm wavelength. Slightly more expensive ones use a red-orange 635 nm diode, more easily visible because of the greater sensitivity of the human eye at 635 nm. Other colors are possible too, with the 532 nm green laser being the most common alternative. Yellow-orange laser pointers, at 593.5 nm, later became available. In September 2005 handheld blue laser pointers at 473 nm became available.

The apparent brightness of a spot from a laser beam depends on the optical power of the laser, the reflectivity of the surface, and the chromatic response of the human eye. For the same optical power,green laser light will seem brighter than other colors because the human eye is most sensitive at low light levels in the green region of the spectrum (wavelength 520–570 nm). Sensitivity decreases for longer (redder) and shorter (bluer) wavelengths.

| Color | Wavelength(s) |
|---|---|
| Red | 638 nm, 650 nm, 670 nm |
| Orange | 593 nm |
| Yellow | 589 nm, 593 nm |
| Green | 532 nm, 515/520 nm |
| Blue | 450 nm, 473nm, 488 nm |
| Violet | 405 nm |

Table 3.1 Colours and wavelengths

### 3.2.5 ESP32 Camera module

The ESP32 CAM WiFi Module Bluetooth with OV2640 Camera Module 2MP for face recognization has a very competitive small-size camera module that can operate independently as a minimum system with a footprint of only 40 x 27 mm; a deep sleep current of up to 6mA and is widely used in various IoT applications.

It is suitable for home smart devices, industrial wireless control, wireless monitoring, and other IoT applications. This module adopts a DIP package and can be directly inserted into the backplane to realize rapid production of products, providing customers with high-reliability connection mode, which is convenient for application in various IoT hardware terminals.

ESP integrates WiFi, traditional Bluetooth, and BLE Beacon, with 2 high-performance 32-bit LX6 CPUs, 7-stage pipeline architecture. It has the main frequency adjustment range of 80MHz to 240MHz, on-chip sensor, Hall sensor, temperature sensor, etc. The below figure shows a typical ESP32 Camera module.


Fig. 3.8 ESP32 Camera module

The ESP32-CAM module has fewer I/O pins than the previous ESP-32 module we looked at. Many of the GPIO pins are used internally for the camera and the microSD card port.Another thing missing from the ESP32-CAM module is a USB port. One thing to note about this module is that it has components on both sides of the printed circuit board. The “top” of the board has the connector for the camera module, as well as the microSD (sometimes called “TF”) card socket. The underside of the circuit board has the ESP32-S module. It also has a connector for an external antenna, as well as an internal antenna that is etched onto the circuit board.

### 3.2.6 Buzzer

A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric. Typical uses of buzzers and beepers include alarm devices, timers and confirmation of user input such as a mouse click or keystroke.

Fig 3.10 is a buzzer. Buzzer is an integrated structure of electronic transducers, DC power supply, widely used in computers, printers, copiers, alarms, electronic toys, automotive electronic equipment, telephones, timers and other electronic products for sound devices. Active buzzer 5V Rated power can be directly connected to a continuous sound, this section dedicated sensor expansion module and the board in combination, can complete a simple circuit design, to "plug and play."

Fig. 3.9 Buzzer

**Specifications**

• On-board passive buzzer

• On-board 8550 triode drive

• Can control with single-chip microcontroller IO directly

• Working voltage: 5V

• Board size: 22 (mm) x12 (mm)

**Pin Configuration**

1. VCC

2. Input

3. Ground

**How to test**

1. Connect your Arduino microcontroller to the computer.

2. Connect the VCC pin of your module to the to the 5V pin of your Arduino.

3. Connect the GND pin of your module to the GND pin of your Arduino.

4. Connect the Input pin of your module to the pin 13 of your Arduino.

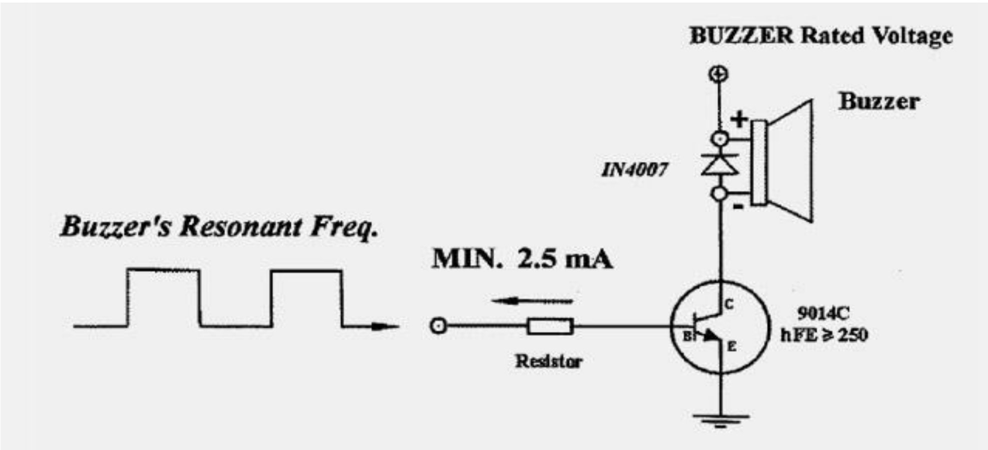


Fig. 3.10 Buzzer Pin Configuration

5. Enter this program to your Arduino Integrated Development Environment (IDE): int buzzer = 13;

```
void setup()
{
pinMode(buzzer, OUTPUT);
}
void loop()
{
digitalWrite(buzzer, HIGH);
delay
(100)
;
}
```

6. Lastly, click the Upload Button.

**Schematic Diagram**

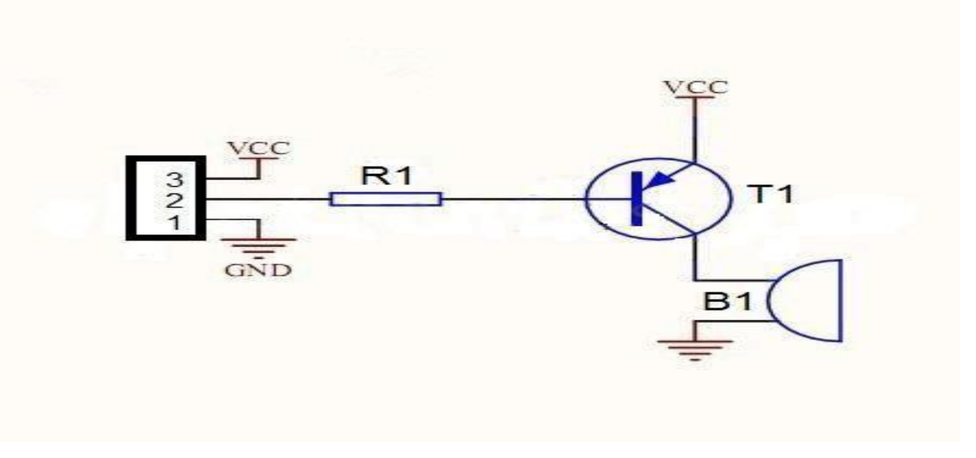


Fig. 3.11 Diagram

**Frequency Response**

How efficiently a buzzer produces sound at a given frequency.

**Sound Pressure Level (Unit: dB Pa)**

Sound pressure level, SPL, is the deviation from atmospheric pressure caused by the soundwave expressed in decibel Pascals. It is generally proportional to input voltage and decays by 6 dB's when doubling the distance from the buzzer.

**Resonant Frequency (Unit: F0 Hz)**

All things have a specific frequency at which they tend to vibrate. This frequency is called the resonant frequency. For buzzers, the resonant frequency is the frequency at which they will be the loudest.

**Impedance (Unit: ohm)**

Electrical impedance is the ratio of applied voltage to current. The electrical impedance varies with frequency.As mentioned earlier in the presentation, piezo and magnetic indicators have the driving circuitry built into the design, creating a "plug and play" solution. Because of this, engineers do not need to worry about building a complex circuit to drive the buzzer. The disadvantage, however, is that indicators operate on a fixed frequency, reducing the flexibility offered to achieve an alternate frequency as application requirements change

Transducers, on the other hand, do not have the driving circuit built-in, so engineers are offered a greater range of flexibility when designing their circuit. The downside comes in the fact that transducers do require an external driving signal to operate properly, potentially adding complexity and time to the design cycle. Buzzers are typically used for identification and alarm purposes across many major industries. The major application categories that utilize buzzers for indication or alert purposes include: home appliances, automotive electronics, medical, safety and security, industrial, and office automation.

## 3.3Software Requirements

### 3.3.1 Download Arduino Software

You'll need to download the Arduino Software package for your operating system from the Arduino download page.When you've downloaded and opened the application you should see something like this:

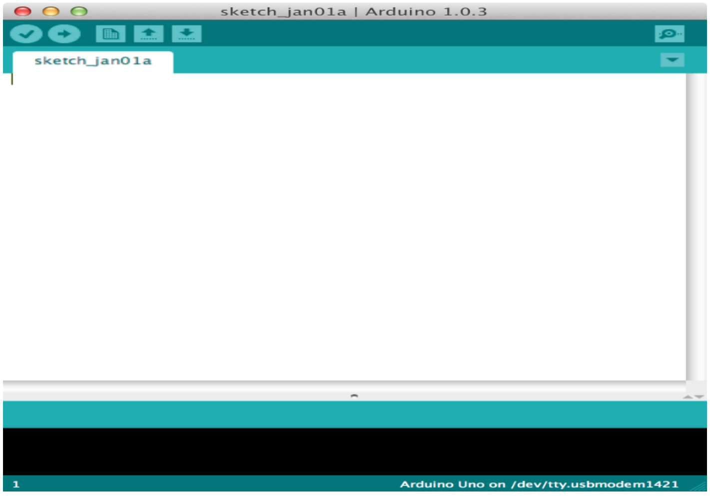


Fig. 3.12 Arduino IDE

This is where you type the code you want to compile and send to the Arduino board.

**The Initial Setup**

We need to setup the environment to **Tools** menu and **select Board.**

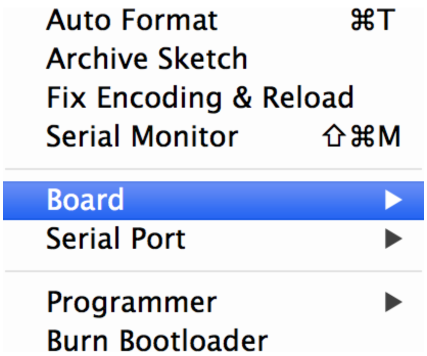


Fig. 3.13 Selecting Board from Tools menu

Then select the type of Arduino you want to program, in our case it's the **Arduino Uno**.

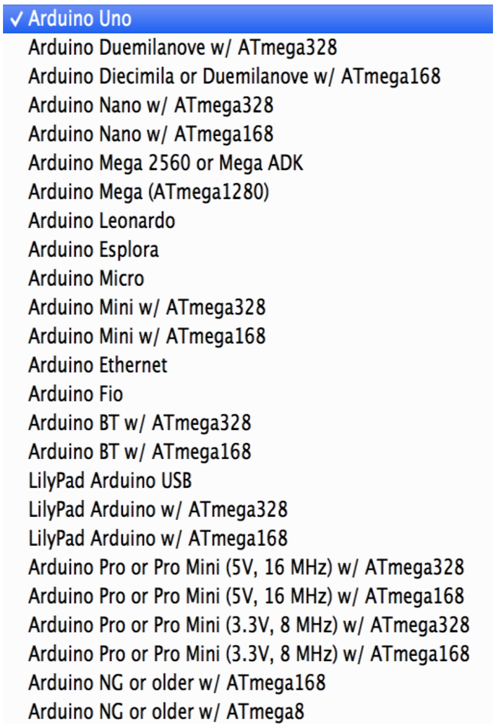


Fig. 3.14 Selecting type of Board as Arduino

### 3.3.2 The Code

The code you write for your Arduino are known as sketches.

Every sketch needs two *void type functions,* setup() and loop(). A void type function doesn't return any value.

The setup() method is ran once at the just after the Arduino is powered up and the loop() method is ran continuously afterwards. The setup()) is where you want to do any initialisation steps, and in loop() you want to run the code you want to run over and over again.

So, your basic sketch or program should look like this:

```
void setup() {
  // put your setup code here, to run once:

}

void loop() {
  // put your main code here, to run repeatedly:

}
```

Fig.3.15 Basic Program

If you notice on the top edge of the board there's two black rectangles with several squares in. These are called headers. Headers make it easy to connect components to the Arduino. The pin numbers are listed next to the headers on the board in white. The onboard LED we want to control is on pin 13. In our code above the setup() method let's create a variable called ledPin In C++ we need to state why type our variable is before hand, in this case it's an integer, so it's of type int.

```
int ledPin = 13;
void setup()
{
}

void loop()
{
}
```

Fig.3.16 Code Setup

Each line is ended with a semicolon (;)

In the setup() method we want to set the ledPin to the output mode. We do this by calling a special function called pinMode() which takes two variables, the first the pin number, and second, whether it's an input or output pin. Since we're dealing with an output we need to set it to a constant called OUTPUT(). If you were working with a sensor or input it would be INPUT.

```
int ledPin = 13;
void setup()
{
  pinMode(ledPin, OUTPUT);
}
void loop()
{
}
```

Fig. 3.17 Setting pinMode

**Compiling the Code**

If this is your first time you've ever compiled code to your Arduino before plugging it in to the computer go to the **Tools** menu, then **Serial Port** and take note of what appears there.

Here's what mine looks like before plugging in the Arduino UNO:

```
/dev/tty.Bluetooth-PDA-Sync
/dev/cu.Bluetooth-PDA-Sync
/dev/tty.Bluetooth-Modem
/dev/cu.Bluetooth-Modem
```

Fig. 3.18 Before plugging in Arduino

Plug your Arduino UNO board in the USB cable and into your computer. Now go back to the Tools > Serial Portmenu and you should see at least 1 new option. On my Mac 2 new serial ports appear.

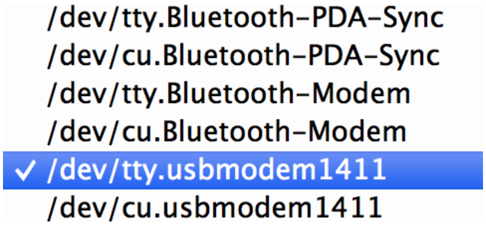


Fig. 3.19 Selecting tty.usbmodem after plugging

They *tty* and *cu* are two ways that computers can talk over a serial port. Both seem to work with the Arduino software so I selected the tty.* one. On Windows you should see COM followed by a number. Select the new one that appears. Once you have selected your serial or COM port you can then press the button with the arrow pointing to the right.

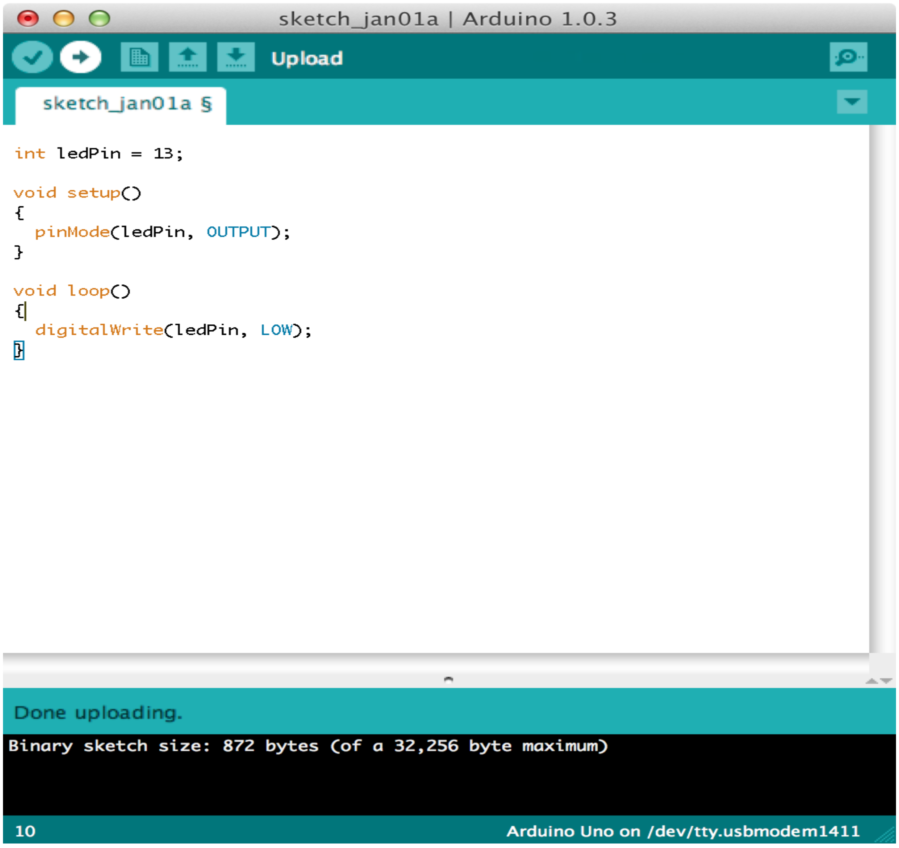


Fig. 3.20 Arduino Software

# 4. RESULTS AND DISCUSSION

**PHASE - I**

The below Fig. 4.1 shows the project setup connected to the external power suppy (Laptop)

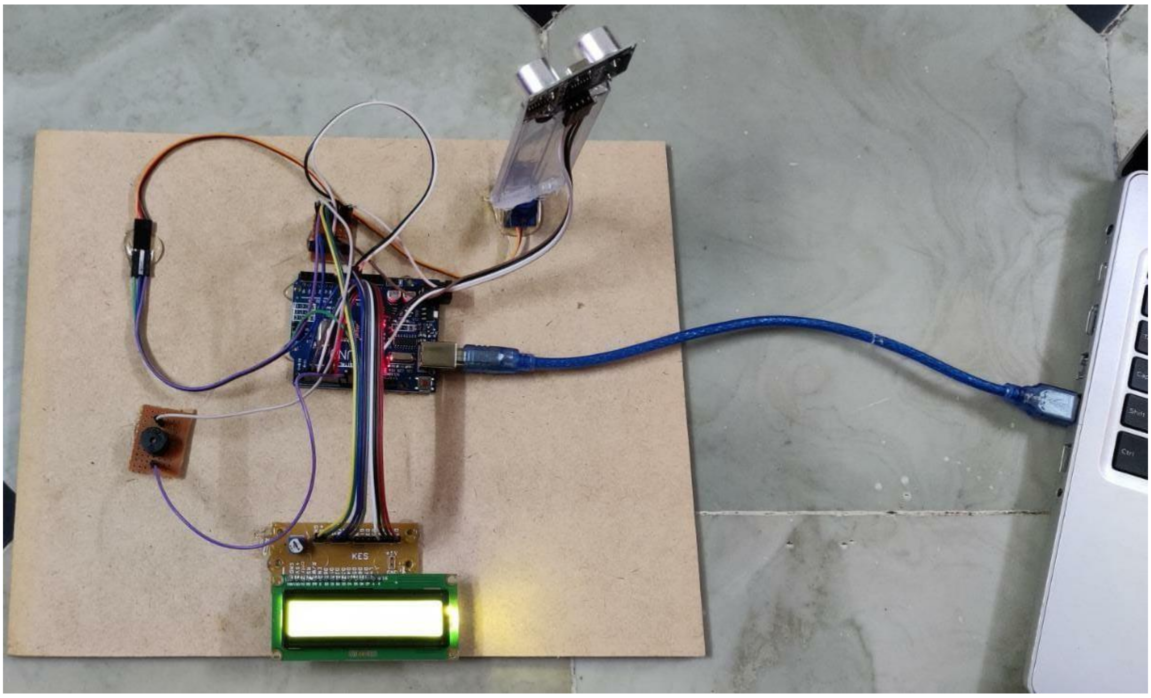

Fig. 4.1 The setup

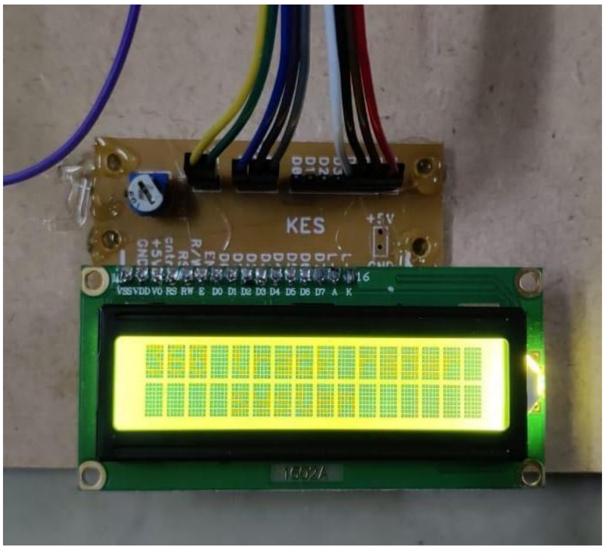


Fig. 4.2 The LCD display

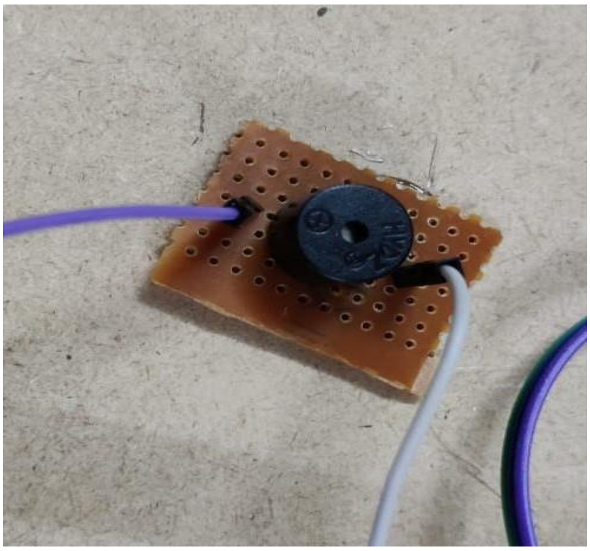

Fig. 4.3 The buzzer

Fig. 4.2 and 4.3 depict 16*2 LCD displaying output and a buzzer which produces alarm when target is detected.


Fig. 4.4 The ultrasonic sensor

Fig. 4.4 shows an ultrasonic sensor mounted on a rotating arm which has a range 0-180°

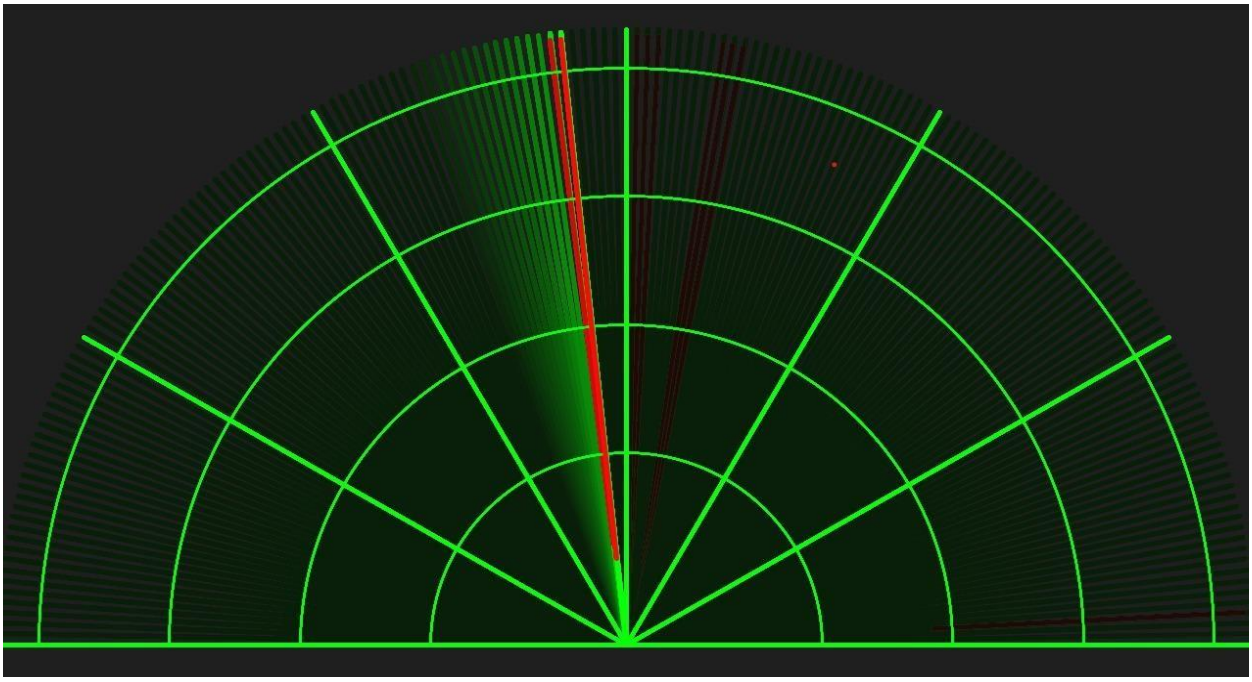

Fig. 4.5 Output when obstacle is very near

The above output is displayed on the Processing 4 software when the obstacle is very near (5-10cm) to the sensor unit.

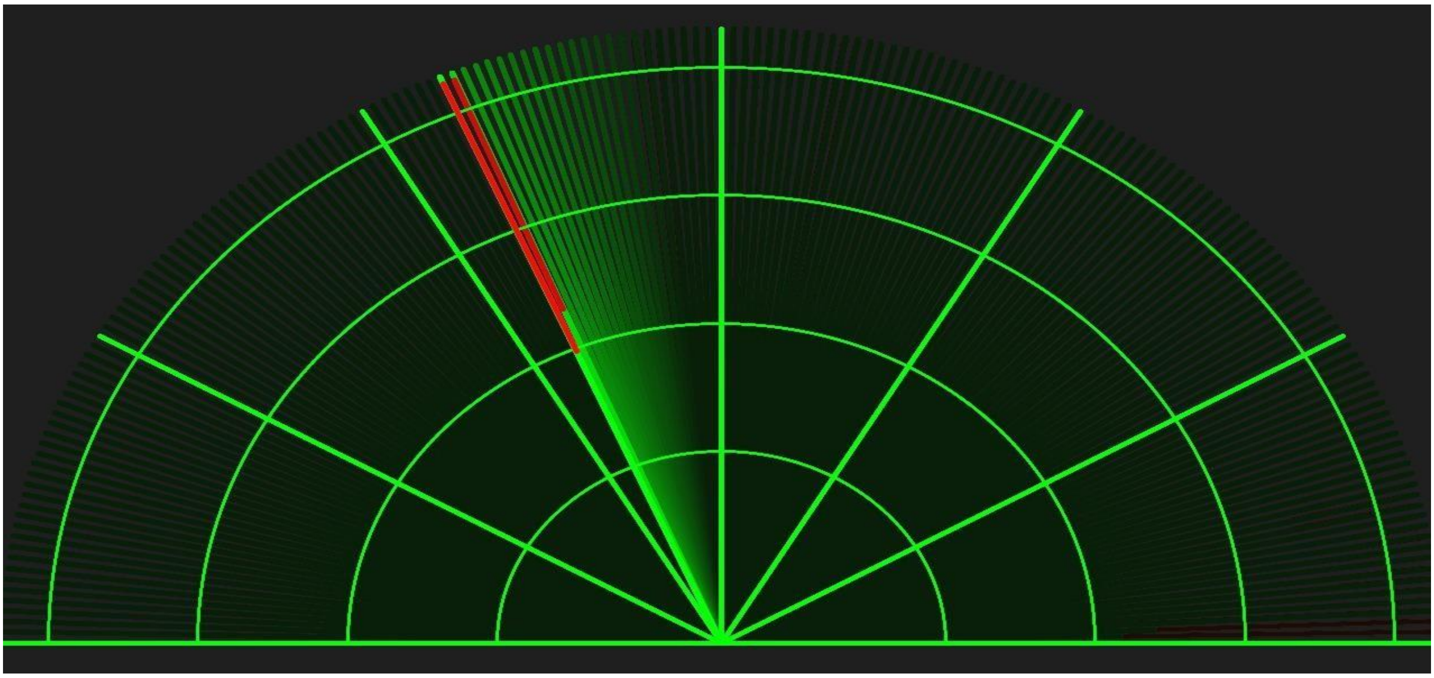

Fig. 4.6 Output when obstacle is near

The above output is displayed on the Processing 4 software when the obstacle is near (20cm) to the sensor unit.

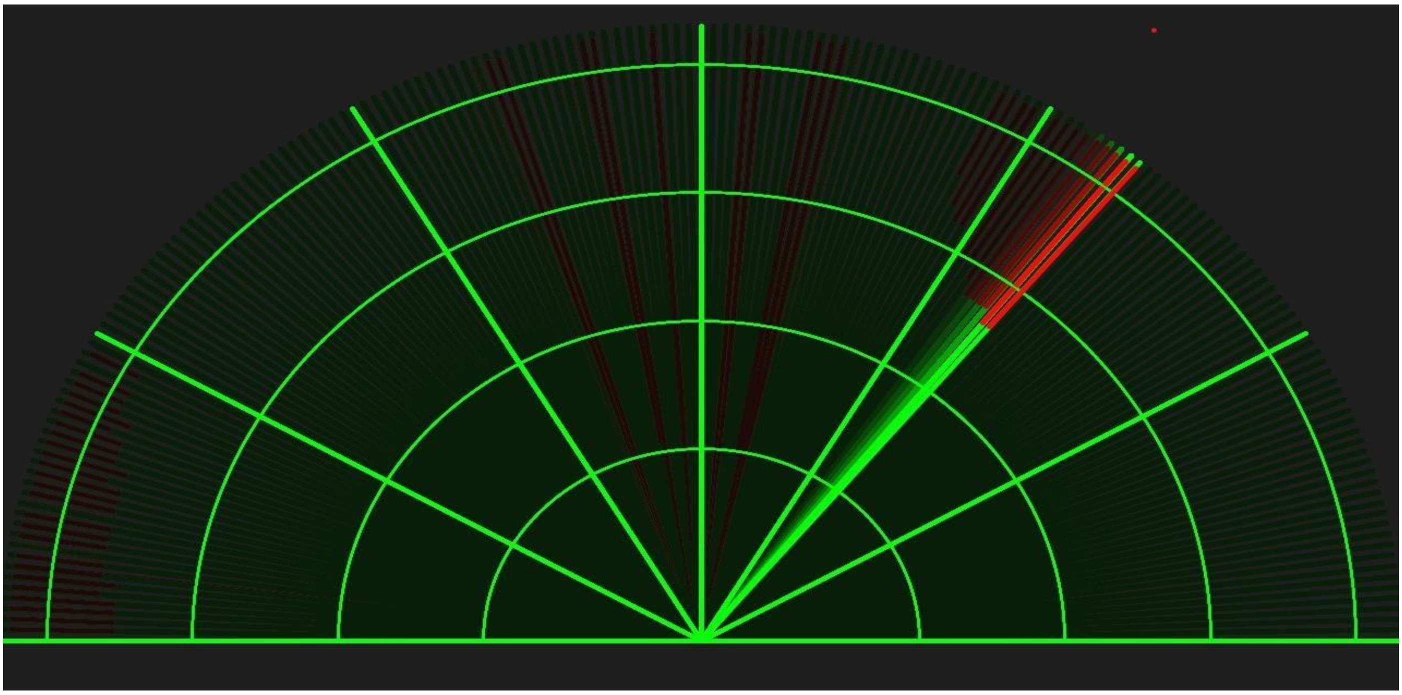

Fig. 4.7 Output when obstacle is at a distance

The above output is displayed on the Processing 4 software when the obstacle is at moderate distance(30cm) to the sensor unit.

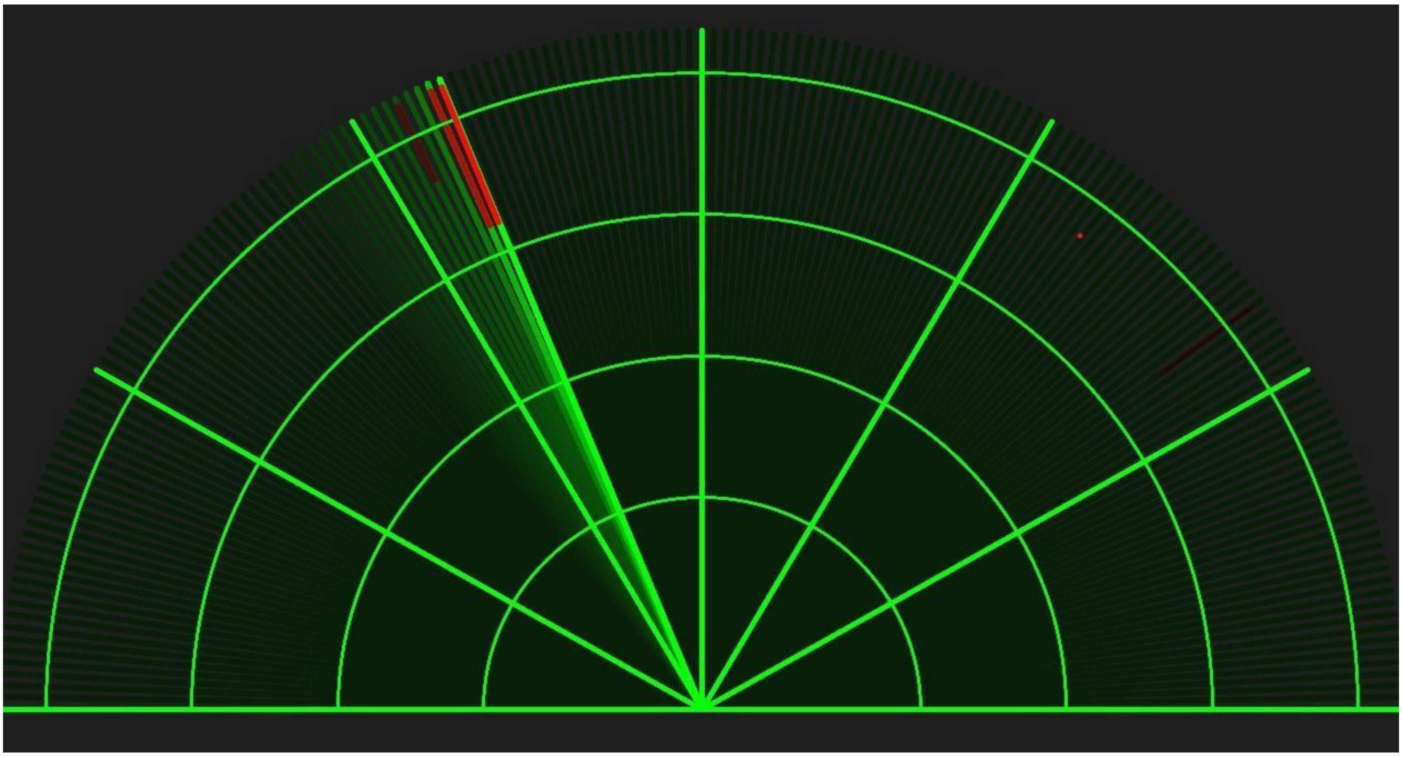

Fig. 4.8 Output when obstacle is far

The above output is displayed on the Processing 4 software when the obstacle is far (>30cm) from the sensor unit.

**PHASE - II**

The below Fig. 4.9 shows the whole project setup connected to the external power suppy (Laptop)

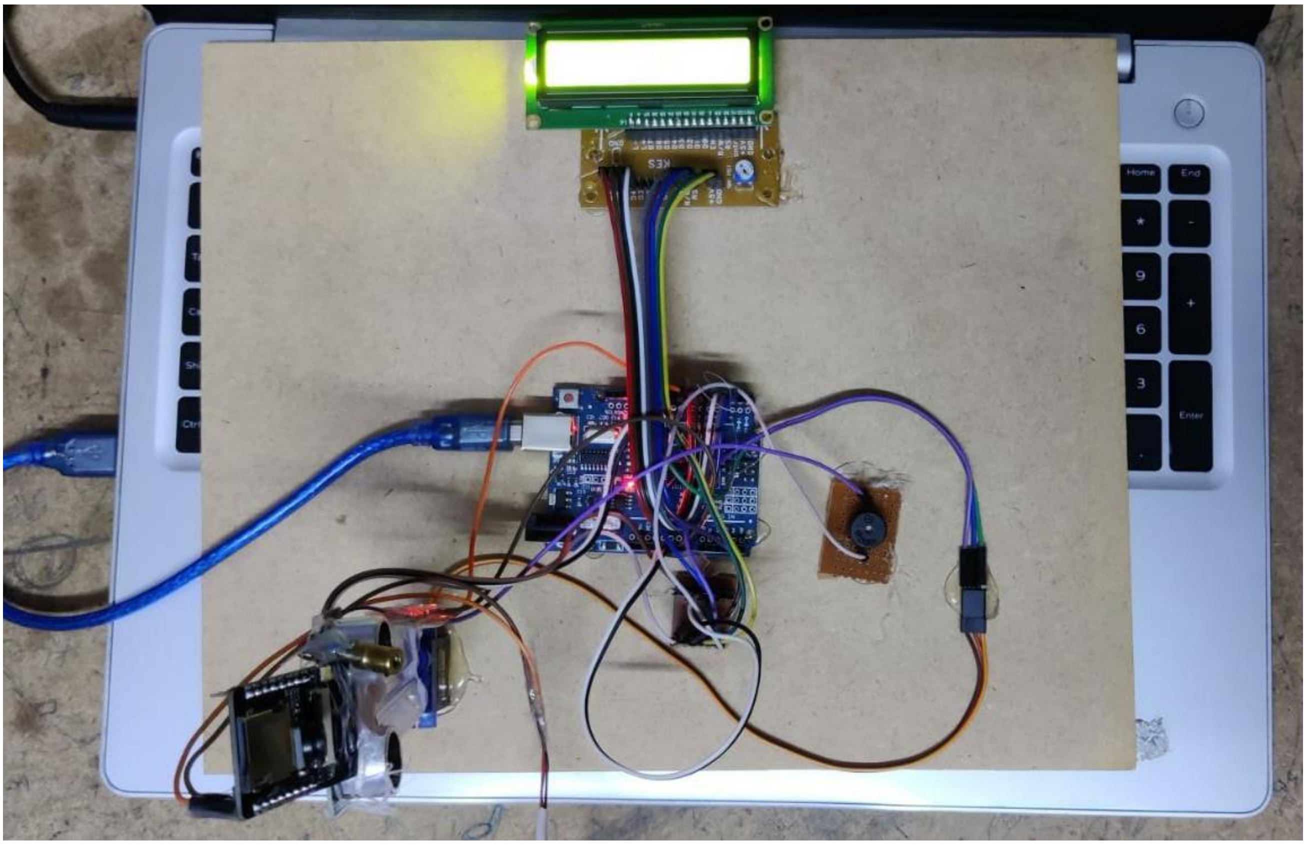

Fig. 4.9 Complete setup

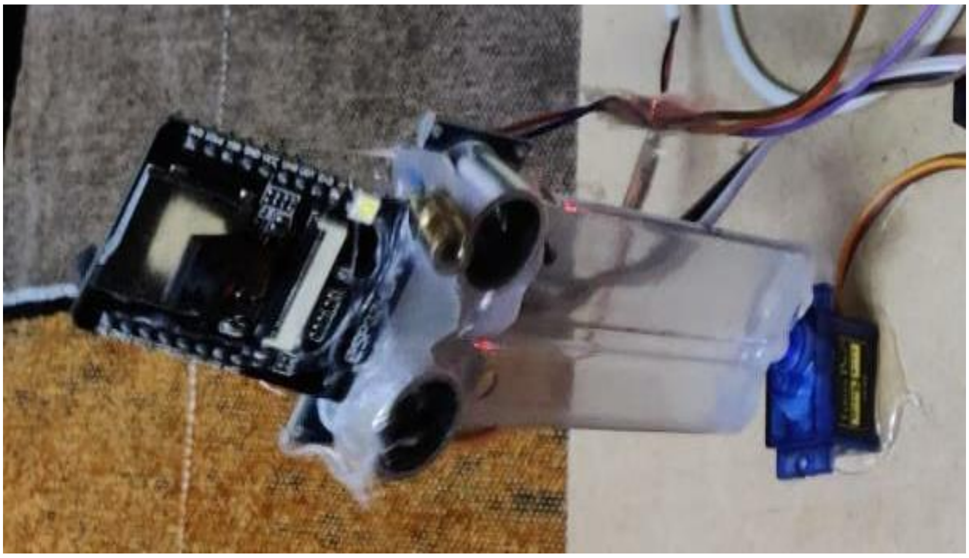

Fig. 4.10 Additionally added ESP32 Camera module and Laser Pointer

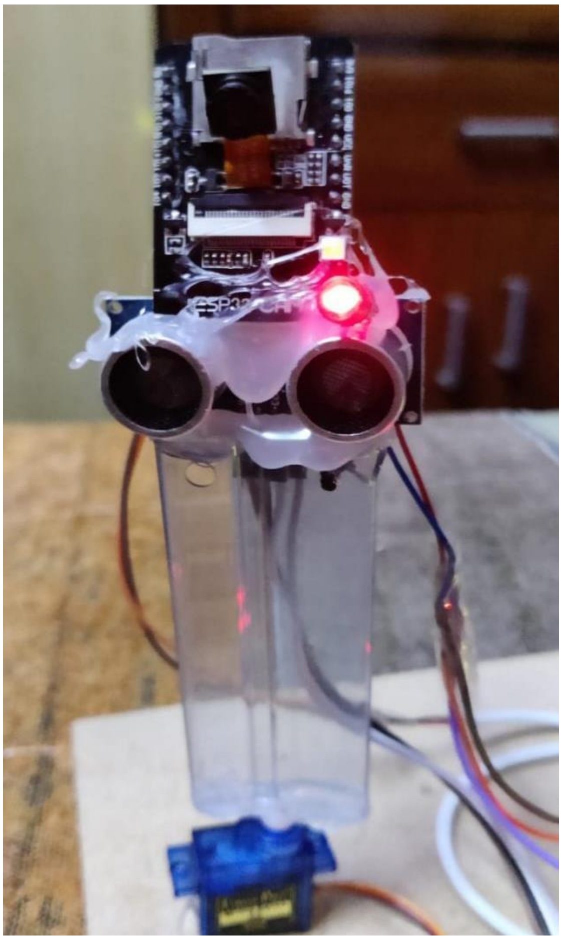

Fig. 4.11 Laser shooting beam in the direction of missile

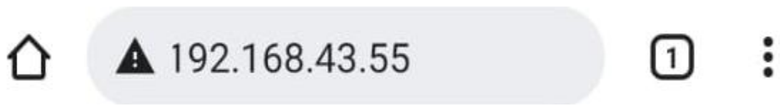


Fig. 4.12 IP Address of ESP32 Camera

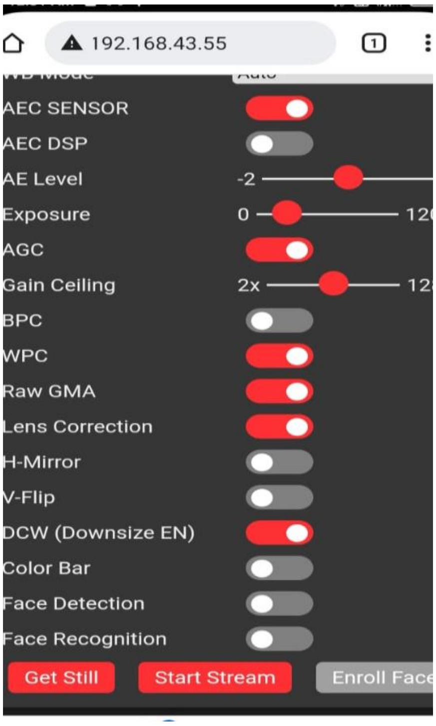


Fig. 4.13 web results when Camera IP Address is given

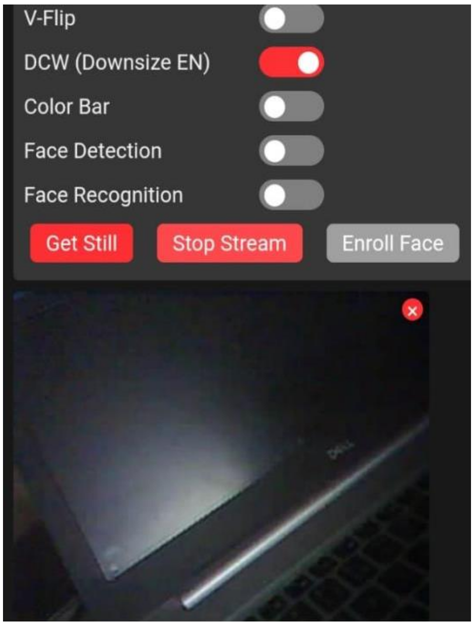


Fig. 4.14 Live visuals

# 5.CONCLUSION AND FUTURE SCOPE

## Conclusion

Most of the similar products available today in the market are made and controlled using a remote- control with Bluetooth and Wi-Fi as the medium of communication. But Wi- Fi and Bluetooth seem a very unreliable source to transfer informati. Therefore, we have built a completely automatic model as this has fewer chances of failing compared to Wi-Fi and Bluetooth. This paper reviewed the missile detection and alarming device which is used for military applications. Firstly, various systems and devices available are defined. Basic missile detection and alarming device comprises of an Arduino or any other microcontroller, buzzer button, lcd display and ultrasonic sensor. Ultrasonic sensor is the component which detects the obstacle. The sensor is fitted on a movable unit and is rotated through 0° to 180°.

## Future scope

In the future, this model can be developed further that it can shoot in any direction while the missile moves in various directions. There is another scope that the device can be made movable using wheels and motors.

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Gmail **mudrakola mansi rao <mansimudrakola@gmail.com>**

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