

## Sentry Gun

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**Abstract :** In classical guard system we may need to have more than one person to guard important places in order to increase the scope of the guard, and keeper cannot continuously monitor the important places which were guarded endure some effects such as drowsiness and fatigue which affect the accuracy of gun shooting. The main objective of this project is to build an automatic guard system by using control of gun and camera performs tracking depending on that servo motors move and points the gun towards the person using Arduino controller.

**Keywords** - Arduino Uno, Servo Motor, Sentry Gun, Trigger Motor, Webcam

### I. INTRODUCTION

It is a gun that is automatically aimed and fired at targets that are detected by sensors. The earlier military sentry guns were the close-in weapon systems point-defense weapons for detecting and destroying short range incoming missiles and enemy aircraft first, used exclusively on naval assets, and now also as land-based defences. [1]

This gun is extremely important when it comes to defending bases as they can be fitted with the same variety of weapons that can be used by the players, that range from pistols to high caliber rifles, which makes it a very versatile defense tool, with the disadvantage of constantly needing manual ammunition reloads.

The motivation behind our project stems from the ever increasing budgets in both the government and private military sectors. The sentry gun has many applications in security, military combat and unmanned vehicles. Sentry gun features a perfect blend of software and hardware to complement the team's computer and software engineers. By incorporating hardware components such as micro controllers, motors and motion tracking and the onboard control center through Image processing. [1]

The prototype will be lightweight and low cost and will demonstrate the need and functionality of a real world sentry gun. The system will have intuitive controls and interface so that anyone can operate and monitor the gun. In order to demonstrate the need for such a gun the system must be accurate, reliable, and have quick response times; any lapse in functionality will result in massive risk to the zone sentry gun is covering. [1]



Fig 1. Sentry Gun

### II. THE HARDWARE SYSTEM

#### 2.1 ARDUINO UNO

It is a microcontroller board based on the 8-bit Atmel AVR microcontroller, or a 32-bit Atmel ARM. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button.[1]

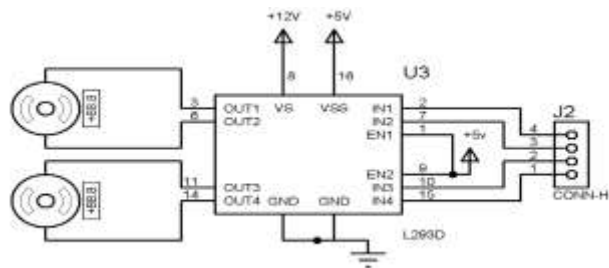


**Fig 2.** Arduino UNO - ATMEGA 328 Pinout

## 2.2 L293D Motor Driver

As the current provided by microcontroller is insufficient to drive the motors, so there arises a need for some type of amplifier (Transistors, MOSFET etc.) which can accept a small current, amplify it and generate a larger current, which further drives a motor. This entire process is done by what is known as a motor driver.

L293D is a Motor Driver IC which drives DC motor in either direction. It is a 16-pin IC which is capable to control a set of two DC motors simultaneously in any direction. Thus this IC can control two DC motors with a single L293D IC, Dual H-bridge Motor Driver integrated circuit (IC). This IC can drive small and quiet big motors as well.[1]



**Fig 3.** L293D Pinout

## 2.3 MOTOR

The operation of electric motor is based on electromagnetism. A current-carrying conductor generates a magnetic field; when it is placed in an external magnetic field, it will experience a force proportional to the current in the conductor, and to the strength of the external magnetic field. The internal configuration of a DC motor is designed to generate rotational motion.[3]



**Fig 4.** Schematic of motor

**Fig 5.** Interfacing table for motor and Arduino

High Left	High Right	Low Left	Low Right	Description
On	Off	Off	On	Motor runs clockwise
Off	On	On	Off	Motor runs anti-clockwise
On	On	Off	Off	Motor stops or decelerates
Off	Off	On	On	Motor stops or decelerates

## 2.4 USB TO TTL

This cable is easiest way to connect microcontroller to computer. The USB plug consist of a USB<->Serial conversion chip and four wires - red power, black ground, white RX into USB port, and green TX out of the USB port. The power pin of USB port provides 5V and 500mA, the RX/TX pins are 3.3V level which are used for interfacing with 3.3V logic level chipsets.[2]

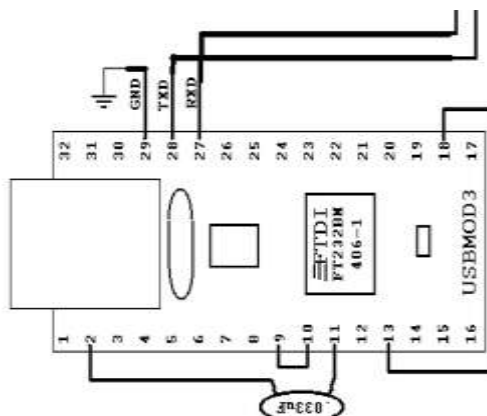


Fig 6. USB to TTL pinout

## 2.5 WEBCAM

It is a video camera that feeds its image in real time to or through a computer to computer network. When the stream is captured by the computer it can be saved and also viewed.

The purpose of a webcam is, not to broadcast video on the Web. Webcams are small cameras that can either be attached to a user's monitor or sit on a desk. Most webcams connect to the computer via USB.

A webcam is used to view the real time images on a computer, it can also be used to track the objects using a software on a computer. It is a small camera which can be either attached to a monitor.[1]



Fig 7. Webcam

## III. Block diagram

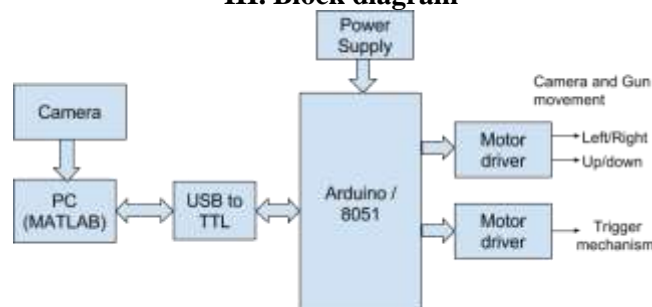


Fig 8. Block Diagram

This project is divided into 2 parts, one is microcontroller and Image processing. Microcontroller is used for triggering mechanism and movements of gun and camera using DC motor. Camera will be mounted on the gun to capture the object. Camera will give live images to MATLAB to recognise the object location.

MATLAB will capture one frame, in that we have to select the object points. After that matlab will perform color based thresholding and recognize the object. Using Blob detection it will find the area of object and it will start tracking that object. As we move object, the blob will also move this is a tracking process using image processing. Wherever matlab will find that object, it will send that location in terms of some character to microcontroller. According to the data received from matlab, microcontroller will control the dc motor for gun

movement. After gun is pointing to the object , trigger mechanism will take place using DC motor and gun will shoot to object.

#### IV. Software Used

Matlab software is used to capture and process images.

Arduino IDE software is used for coding.

UC flash software is used to burn the code in to Arduino IC.

#### V. Algorithm

1. Start
2. Camera determines the location of target
3. If the gun points towards the target.
4. Then Arduino turns on the trigger motor to fire towards the target.
5. Stop

#### VI. Working

When the system is running, the camera sense and determine location of target "person" which is found front it. Then camera sends the signal detected to Arduino. Interfacing between the camera and Arduino done by the processing package. When Arduino receiving a signal from the camera it perform by command to the servo motors to move as follows:

- Pan servo motor keeps track of horizontal movement of the person "goal" depend on the signal coming from the camera.
- Tilt servo motor keeps track of vertical movement of the person "goal" depend on the signal coming from the camera.
- Trigger servo motor perform by pressing the trigger of the pistol to shoot the target or person and that when the gun sight towards the target or person.

Moving of the gun and orientation towards the target or person's location is done by pan and tilt servo motors and shooting the person or the target is done by trigger servo motor.

#### VII. CONCLUSION

All results of hardware and software are approximately similar to results in reality. The Sentry Gun System has been controlled automatically through microcontroller by building a system of two separated parts, the flexible part depends on high level languages (microcontroller coding). The solid part depends on electronic and mechanical parts. And then connect the solid part with computer via USB to TTL to show the status of DC motors which changed due to Object tracking done using MATLAB.

##### 7.1 Advantages

- 1.Sentries have much better" reaction times" and can detect and shoot enemies much more quickly.
- 2.The sentry gun can be used to great effect to defend check points.
- 3.The advantage of sentry gun is that it can itself act as a shield officer.
- 4.Sentries,when operating automatically,cannot accidentally shoot their enemies.
- 5.It is more accurate than a player.
- 6.Sentry gun,being armed and ready in less than 3 seconds and when deployed after hauling,it will be armed in 1.5 seconds.

##### 7.2 Limitations

It has a shorter range

It does not have night vision capabilities

##### 7.3 Applications

- 1.This gun can be used for security purpose , high security places , military , homes.
- 2.It can also be used for gaming purposes such as paintball.

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