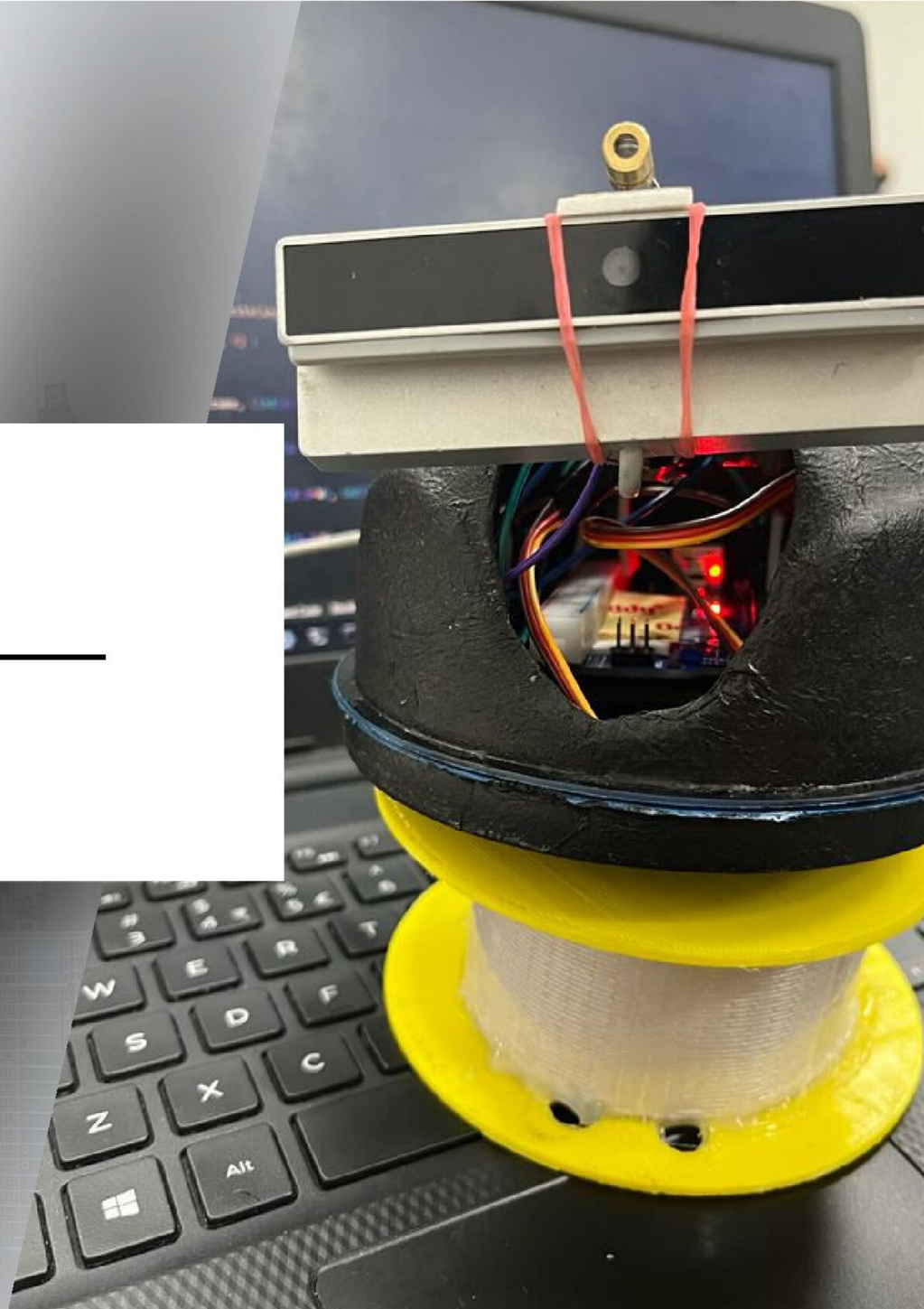
ARDUINO
TURRET



CONTENTS

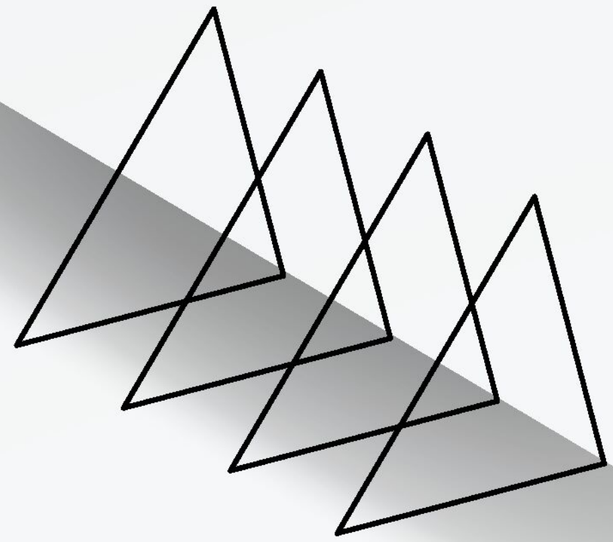
INTRODUCTION

In order to track a target , we have decided to design a “TURRET” . It is able to catch the movement of a living being.

IDEA

We decided to make a turret which first identifies an object, locks it as a target and then the laser follows the path of the target, providing an innovative touch to a simple turret.

COMPONENTS USED



- Arduino UNO
- WebCam
- 3-D printed discs
- Breadboard
- Laser module
- 2 Servo motors
- Jumper wires
- USB Cable
- Plastic dome

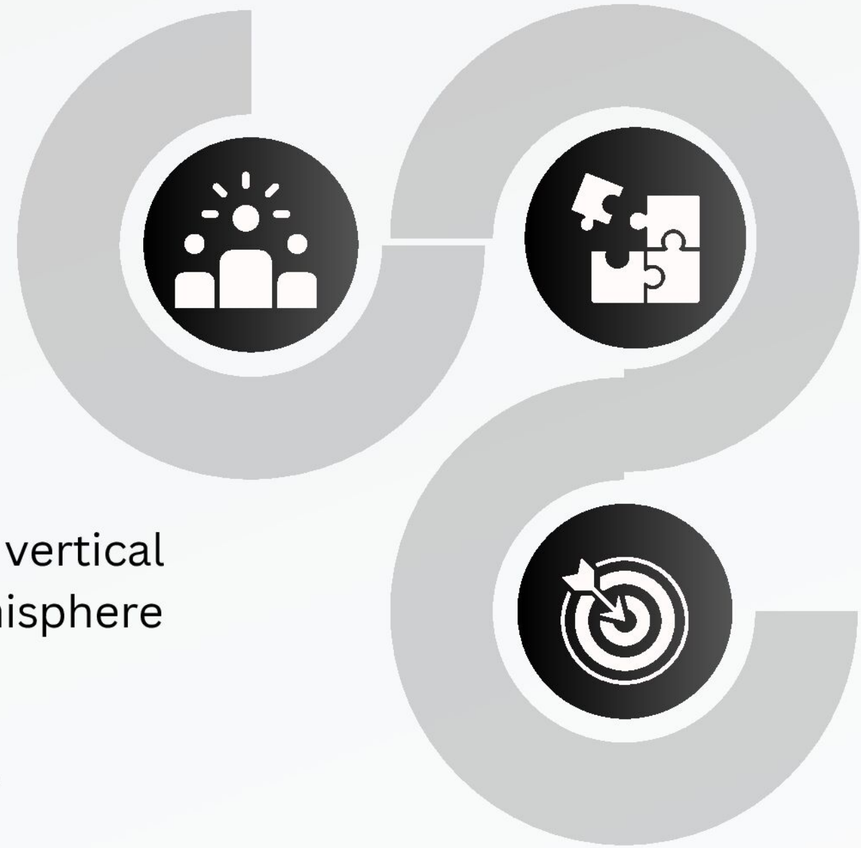
IMPLEMENTATION

01 We implemented the turret using a web cam and laser pointer which points as per ther input received through webcam

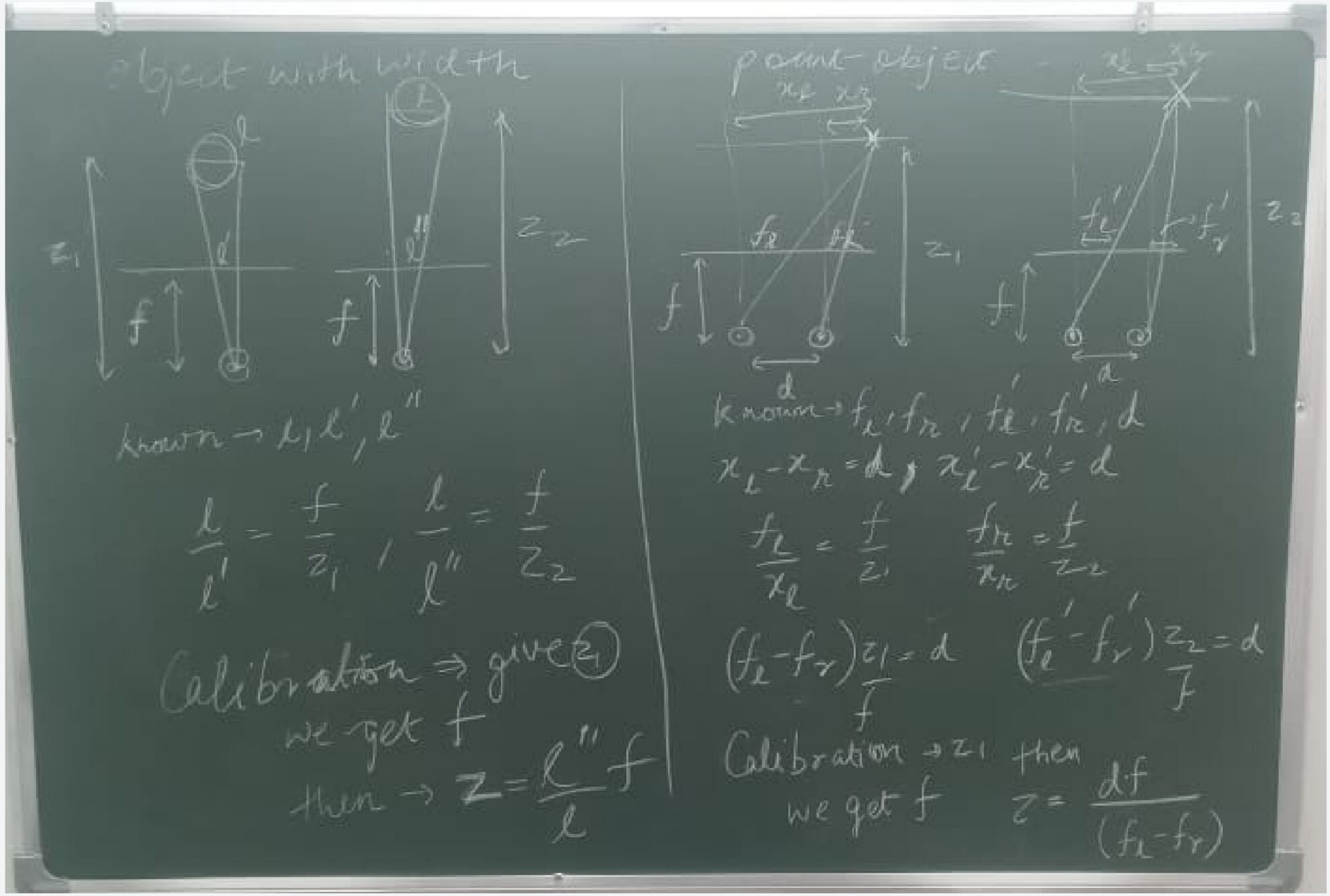
02 Arduino runs 2 servo motors. Lower servo's movement will be in horizontal plane.Upper servo's rotation will be in vertical plane.

03 The horizontal rotation covers 180 degrees angle and the vertical rotation covers a 90 degrees angle, hence covering a hemisphere area.

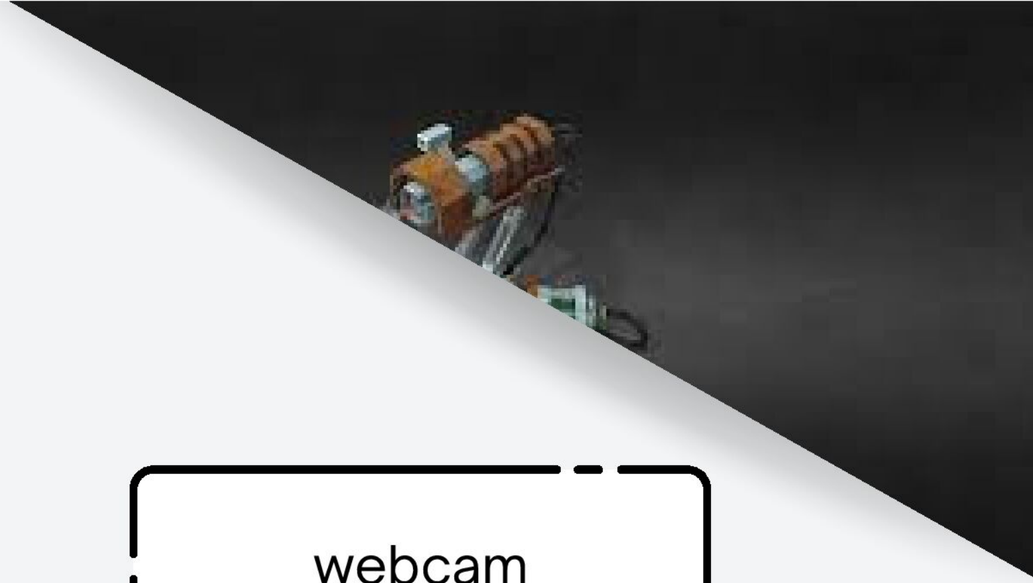
04 The web camera(video) -> laptop(instruction) -> servo-> rotation -> Laser pointer -> distance.



Formula used



Circuit Diagram



servo 1

laser

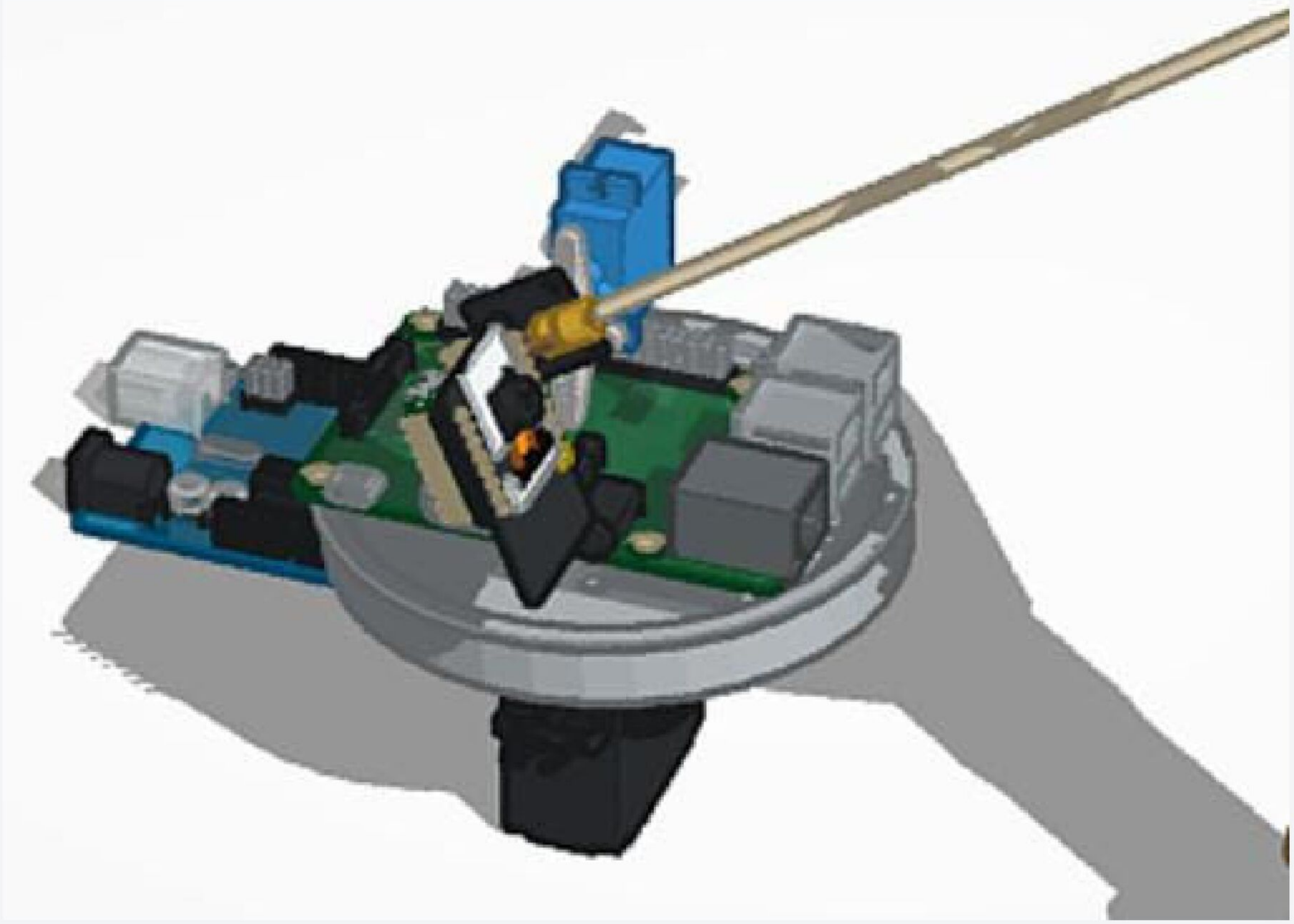
webcam

servo 2

arduino board

laptop

3-D Model



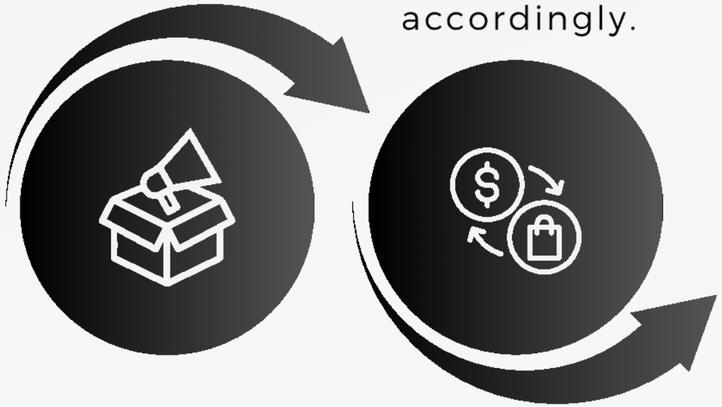
Weekly Progress

Week 1

We designed the basic structure of our turret.
Came up with two probable structures, one with 3-D Print and another with cardboard.
Formulated code to take video and lock the target.

Week 2

Checked the working of all components,
Made progress in code to make the servo move accordingly.

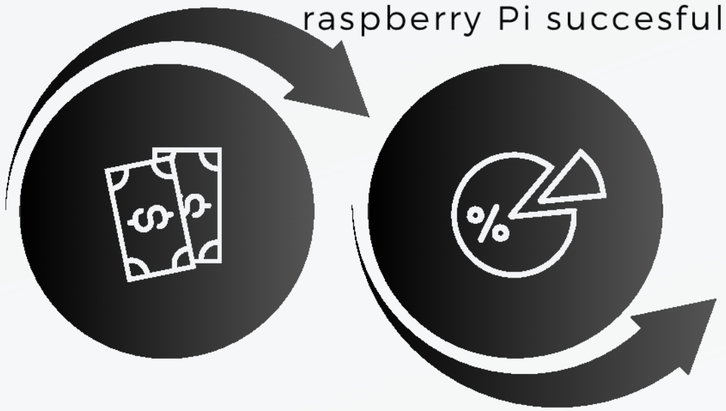


Week 3

Prepared the 3-D design of the project.
Tried to install the camera and it's working.
Made progress towards physical model.

Week 4

Had to shift to raspberry Pi , since camera didn't work.
Installed Pi OS.
Installed OpenCV in raspberry Pi succesfully .

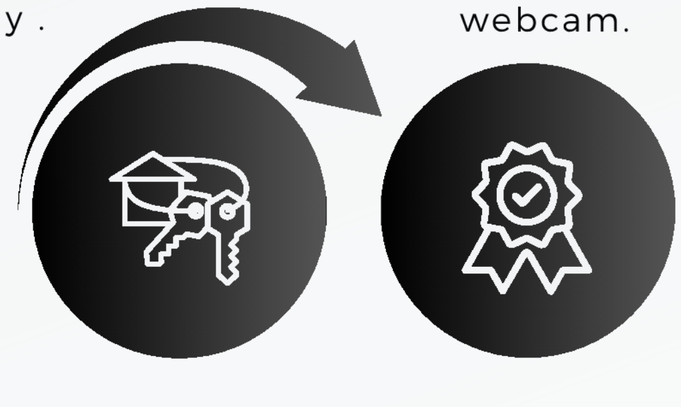


Week 5

There was lag in video through raspberry pi and many internal errors.
Moreover, there was SD Card failure.
Again, we had to shift to Arduino.

Week 6

Finally, completed our project with arduino.
Had to replace raspberry pip camera with an external webcam.



APPLICATIONS

Military

Some aircraft, particularly helicopters and gunships, use turrets to mount weapons or sensors that can be directed independently of the aircraft's movement.

Astronomy

Telescopes often use turrets to hold and position different optical instruments. Turrets enable astronomers to switch between various lenses, filters, or detectors without physically changing the instrument.

Gaming and Virtual Reality:

In gaming and virtual reality simulations, turrets are sometimes used as a user interface for controlling weapons or cameras in a dynamic environment.

Precision Agriculture:

Turrets with cameras, multispectral/hyperspectral sensors aid precision agriculture by providing detailed insights into crop health, nutrient levels, and overall field conditions, empowering farmers with valuable data for optimized decision-making

Surveillance and Security:

Turrets equipped with cameras, sensors, and sometimes weapons are used in surveillance systems to monitor and secure critical areas, such as borders, airports, and sensitive installations.

Research and Science:

Turrets are employed in laboratories and research settings for holding and positioning different scientific instruments, allowing researchers to easily switch between tools without manual intervention.

CHALLENGES

OpenCv

Open CV's installation took our 3 weeks, installation failed thrice at 99%.

Installation

After it got installed, the importing of libraries and all have consumed 1 week.

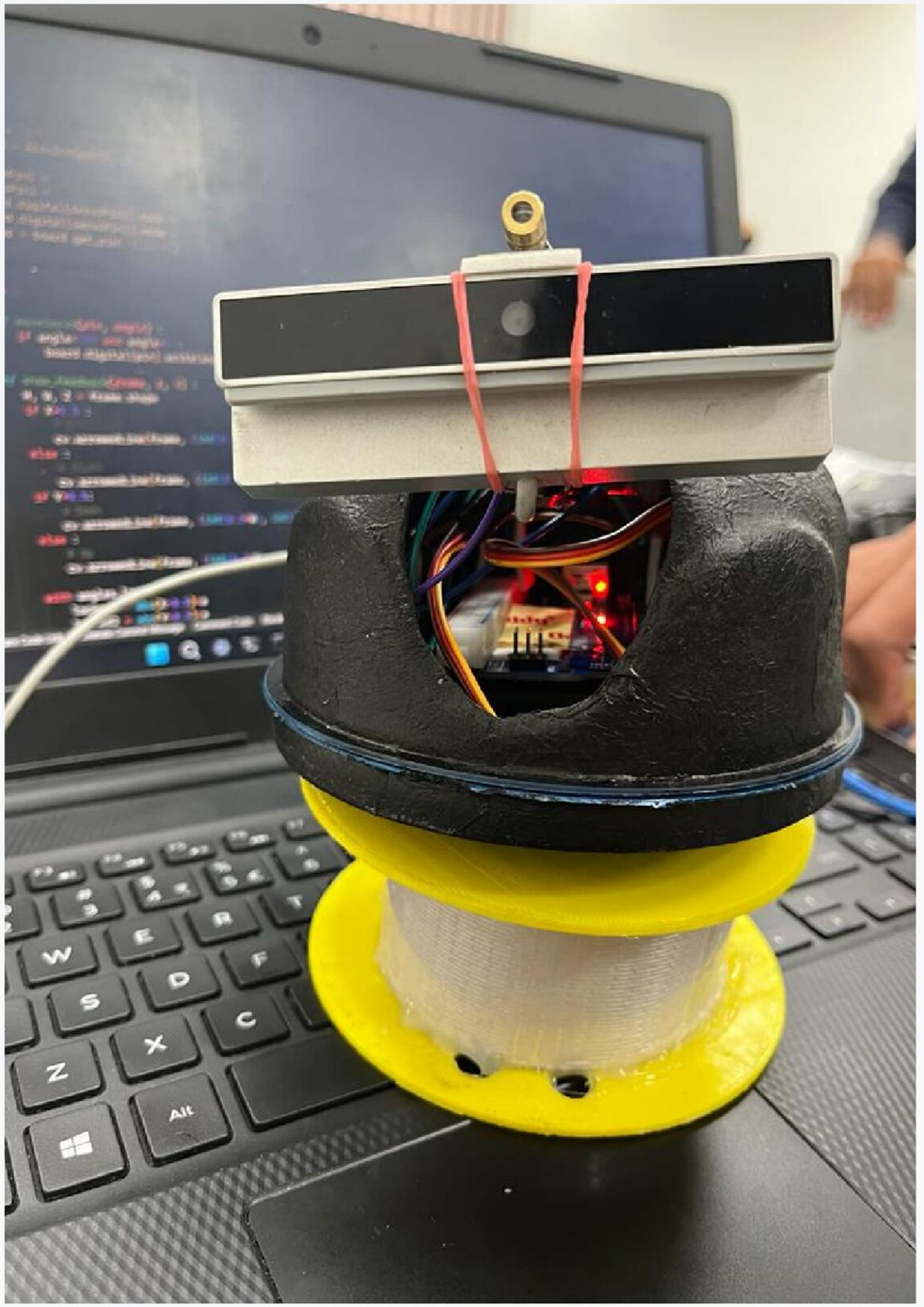
3 -D Print

3-D Printing was a highly time consuming task.

Code

In doing the threading in the code, for simultaneous use, preparing the formula for rotation of the servo,


RESULTS



In summary, the Arduino turret project successfully combines robotics and programming to create a responsive and adaptable system. Overcoming challenges, the turret accurately tracks and targets objects, demonstrating its potential for security systems and automation. This collaborative effort highlights the versatility of Arduino in the realm of innovative, practical applications.

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References and Regards

References :

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https://youtu.be/yAV5aZ0unag?si=eVTHD0k33l-2j9Ls

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thank you!