



ACADEMY OF TECHNOLOGY

Department: ECE

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Final Year Project Progression Report

OBJECT IDENTIFICATION & MOTION DETECTION USING DEEP LEARNING

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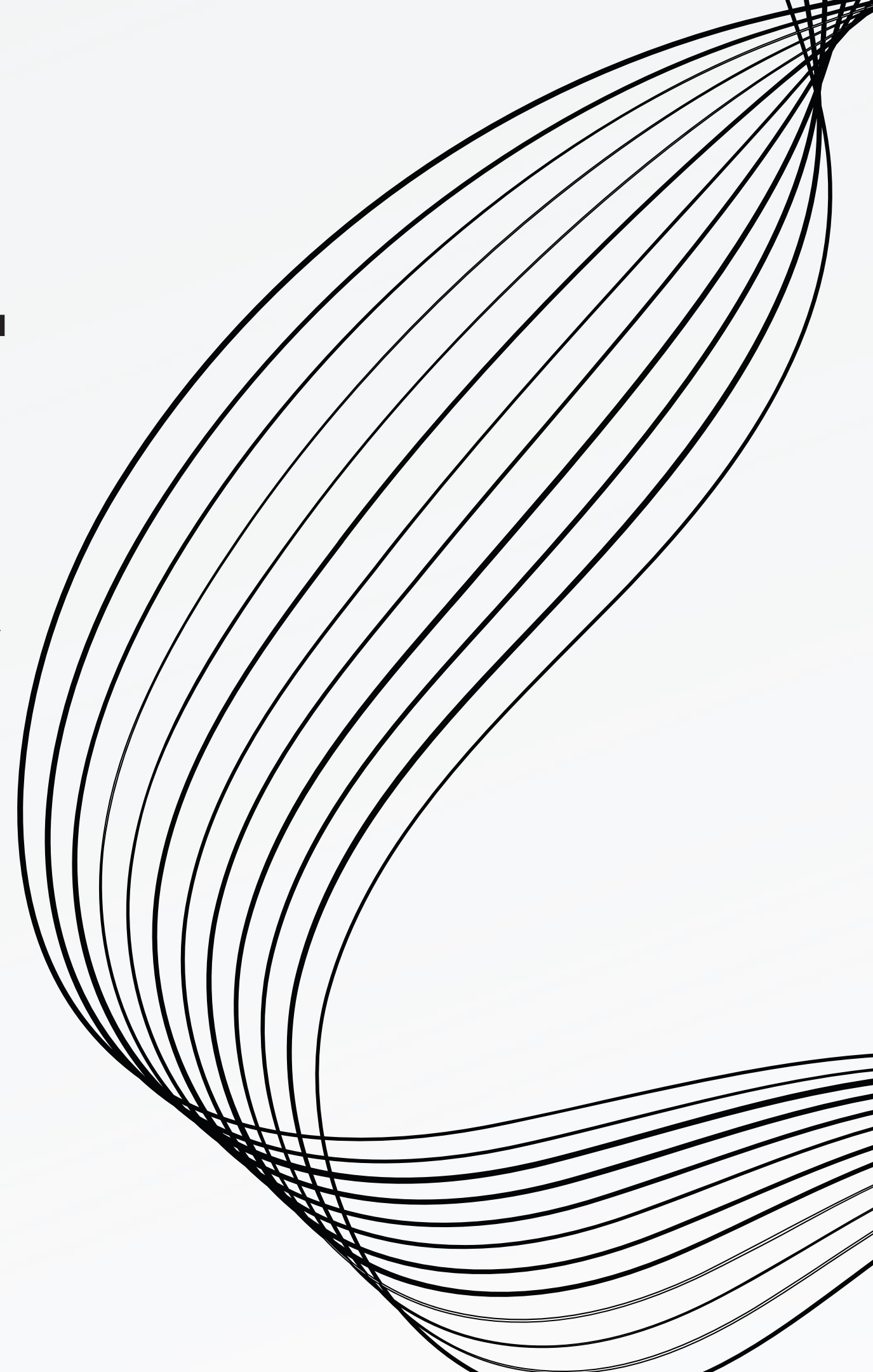
MENTOR:

PROF. BASAB CHATTERJEE

ACKNOWLEDGEMENT

We extend our heartfelt gratitude to our mentor, **Prof. Basab Kumar Chatterjee**, for his unwavering support and invaluable guidance throughout the course of this project. His ability to simplify complex concepts and convey them in a lucid manner has been instrumental in our understanding and progress.

ECE Department
Academy of Technology





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PROGRESSION MAP

1 UNDERSTAND

The increasing demand of the security lead us to select this topic. At first we read how the things work from different site , take help from a course form COURSERA. Then sum up the things to build our plan

2 DEFINE

We have noticed that only Motion detection will not make us different from the others. So we planned to add Object Identification part too. And our main motto was to provide this things at reasonable price.

3 IDEATE

We have divided our team into 3 segment & each part of our team working on the different portion of the project

4 COMPLETION OF SOFTWARE PART

Till now we have done the coding part for the motion detection part & working on the object detection part. Later on we will be exporting all these into hardware for testing the same

5 TESTING & FUTURE PLAN

Importing all our code in the hardware, we will be testing it in real-life scenario to achieve better observation & result. Later we will think to scale up this project in future

ABSTRACT



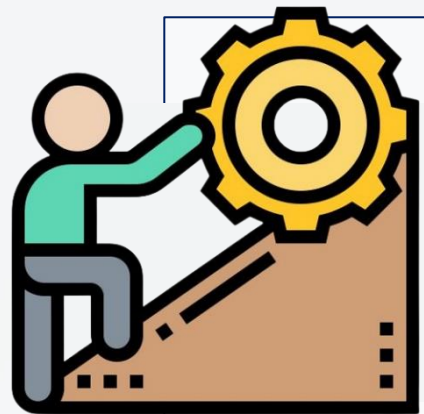
IMPORTANCE

Object identification and motion detection are vital in computer vision for applications like security, traffic management, and self-driving cars.



FOCUS

Develop a robust and accurate method for object detection and tracking.



CHALLENGES

Detecting and tracking moving objects amidst dynamic scenes with variable backgrounds and lighting poses a significant challenge.



METHODOLOGY

Utilize advanced techniques such as deep learning and neural networks to enhance accuracy and adaptability to changing conditions.



OBJECTIVE

Propose an AI-based approach leveraging deep learning and neural networks.



APPLICATIONS

The proposed approach has implications across various sectors including security, transportation, and autonomous vehicles.





LITERATURE SURVEY

Deep learning-based object identification

Deep learning algorithms have been shown to be very effective for object identification tasks. Deep learning-based object identification algorithms are able to learn complex patterns in data, which allows them to identify objects even in challenging environments.

<https://www.mdpi.com/2076-3417/10/9/3280>

3D object identification

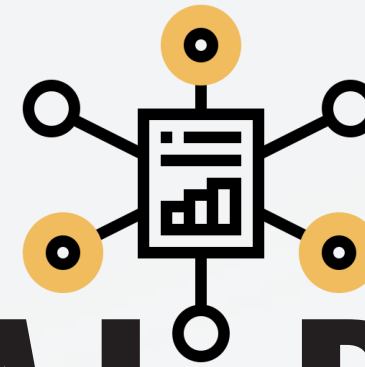
3D object identification is a challenging problem, but there has been significant progress in recent years. 3D object identification algorithms can now be used to identify objects in real-time from video sequences.

<https://www.sciencedirect.com/topics/computer-science/3d-object-detection>

Motion sensing with low-cost sensors

Researchers have developed new motion sensing algorithms that can be used with low-cost sensors such as cameras and ultrasonic sensors. This has made it possible to develop affordable motion sensing systems for a wide range of applications.

<https://www.mdpi.com/1424-8220/20/23/6819>



THEORETICAL BACKGROUND

Key Technologies of Computer Vision: Object Identification & Motion Detection are two key technologies of Computer Vision

Motion Detection Algorithm: Optical flow algorithm are a subfield of computer vision that quantify the motion of objects between consecutive frames captured by a camera. They capture the apparent motion of brightness patterns in an image and calculate a velocity for points within it. .

Theoretical Background

Detection of Object Type Causing the Motion: The object which is responsible to creating the motion depending on which response will be provided to user

Object identification Algorithm: The YOLO(You Look Only Once) algorithm divides the input image into a grid of cells, and for each cell, it predicts the probability of the presence of an object and the bounding box coordinates of the object..



REQUIREMENTS

Hardware Requirements

USB cable: Features two sets of wires. One set carries the current, other transfers the data signals.

Jumper wires (female to female): used to connect any development board, have connector pins at each end, allow them to connect two points to each other.

ESP32 cam Module: A single 2.4 GHz Wi-Fi-and-Bluetooth combo chip. low-power technology

OV2640 Camera: 2MP Mini CCM Compact Camera Modules Compatible with ESP32 Development Board

FTDI: implement the USB protocol stack, which allows them to tell the computer what they are so that the computer can load the correct driver, also manage data transactions with the computer.

Software Requirements

Python: High-level programming language known for its simplicity, readability. Python modules used in this project are: OpenCV, YOLO, Supervision, MIME etc.

Arduino UNO: User-friendly integrated development environment (IDE) tailored for programming Arduino microcontroller boards.

PyCharm: A popular integrated development environment (IDE) for Python programming

DESIGNING PROCESS

Step-1

Hardware Setup



Connect ESP32 to FTDI and then to a laptop/desktop using a USB cable. This step establishes the physical connection between your ESP32 and your development environment.

Step-2

Controller Configuration



Write the script in the Arduino IDE for programming the Controller Board (ESP32) and to obtain its IPV4 address in URL form.

Step-3

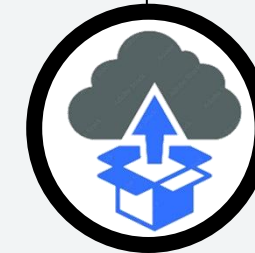
Software Development



Develop a Python script in any IDE (like PyCharm, VS code etc.) for object identification and motion detection which will use that URL obtained from the Arduino IDE to communicate with ESP32.

Step-4

Project Deployment



Deploy and test the system in a real-world environment where you want to monitor for movement.

Step-5

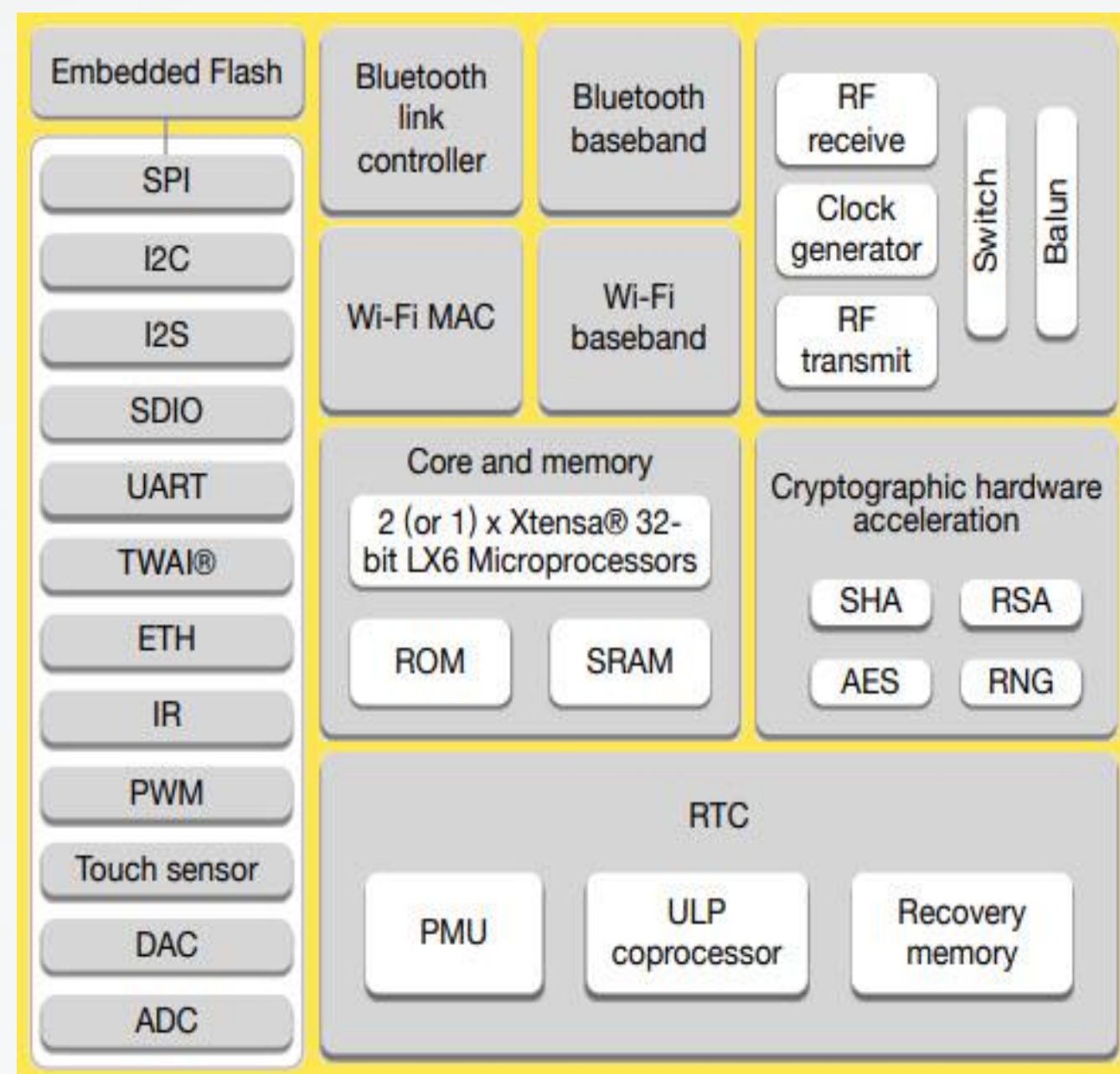
Alert System



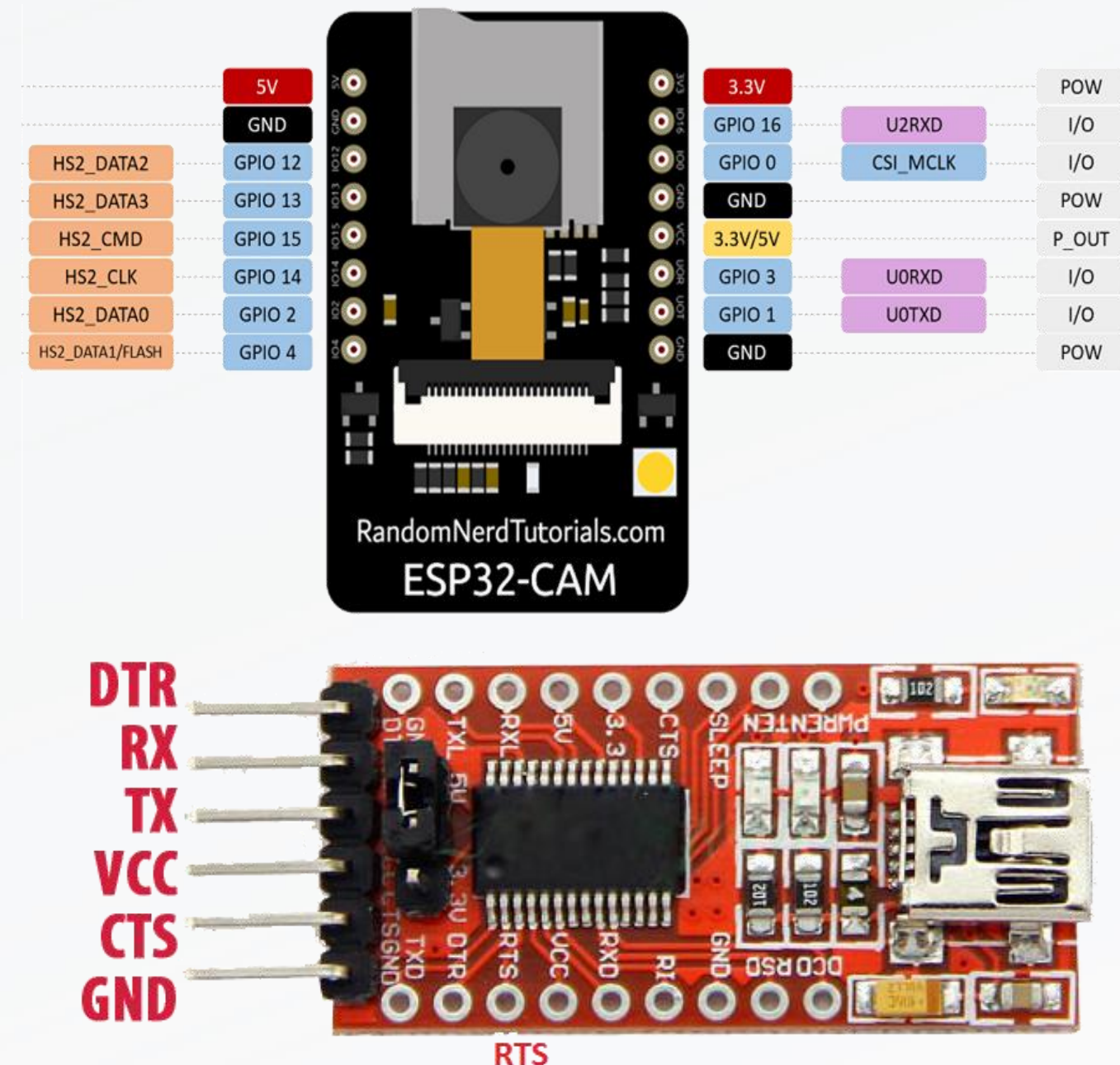
Implement an alert system in your Python script to send an email notification whenever motion is detected. The email includes the name of detected object that creating the movement.

FUNCTIONAL DIAGRAM

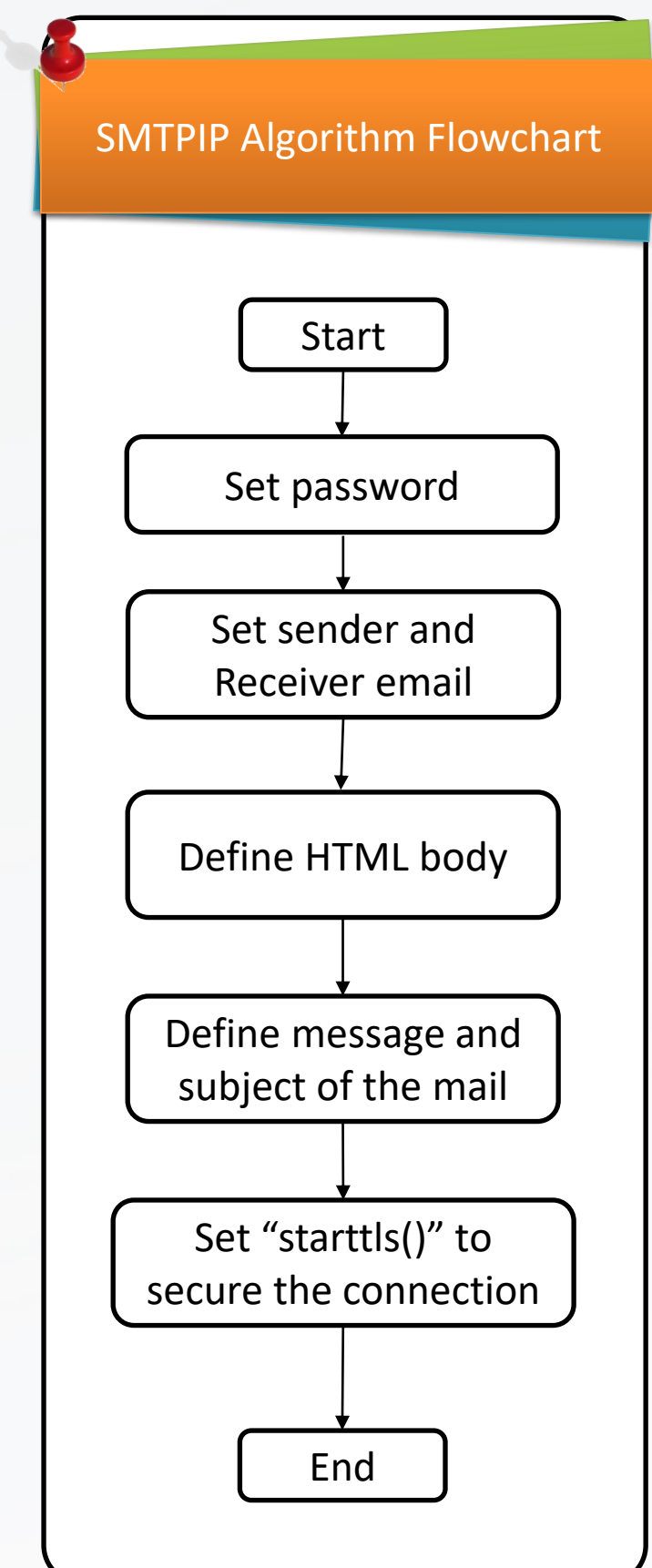
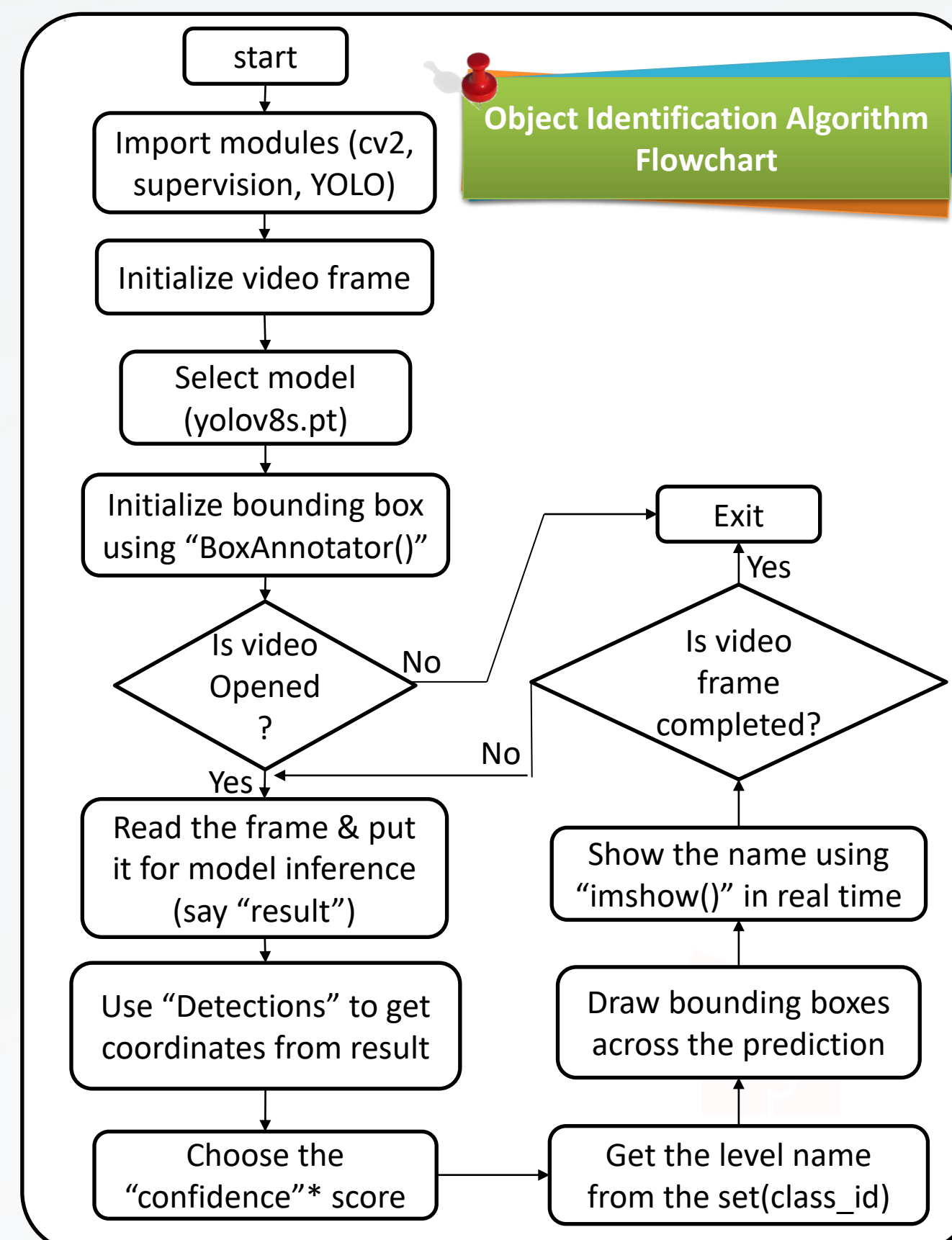
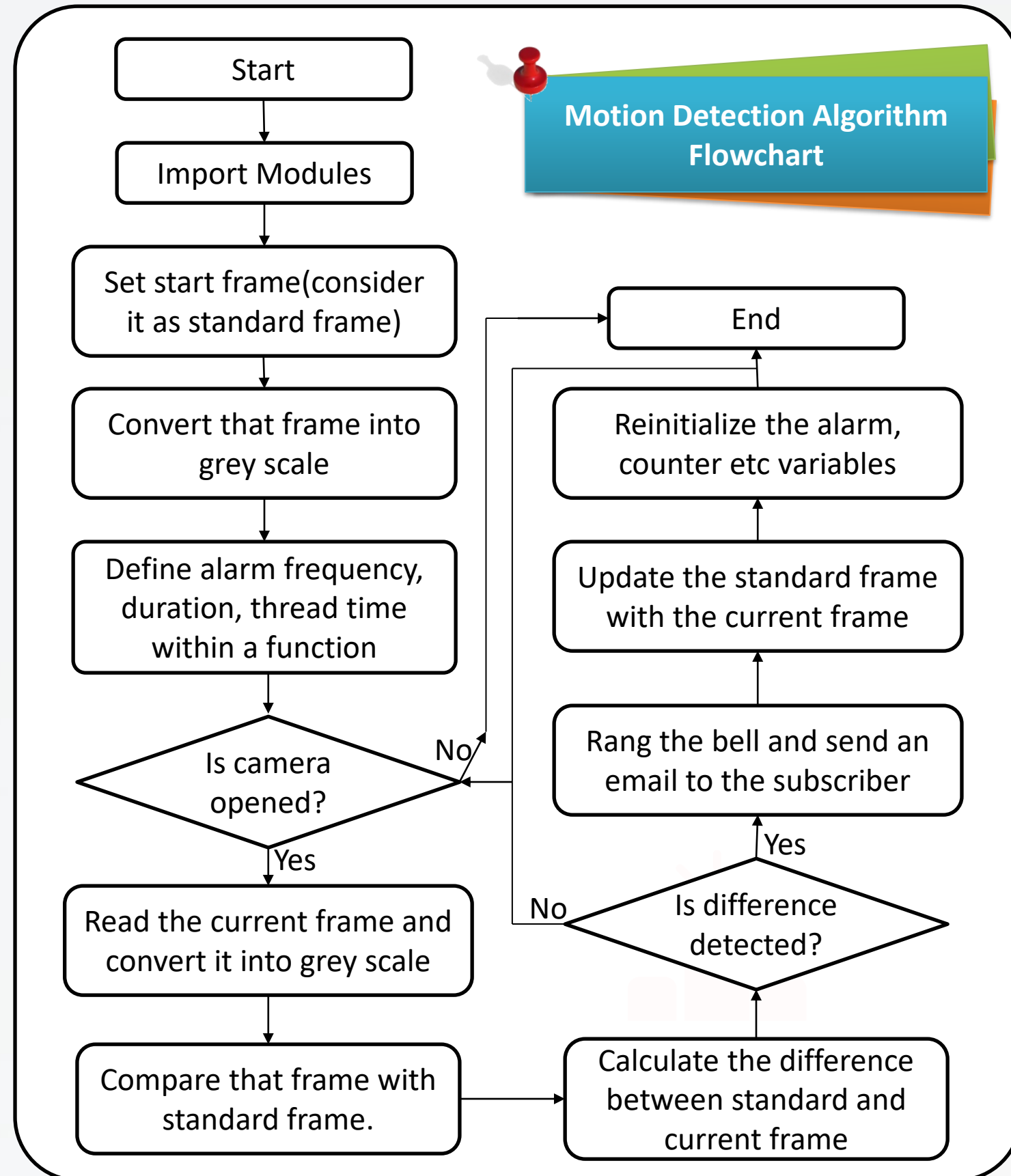
BLOCK DIAGRAM



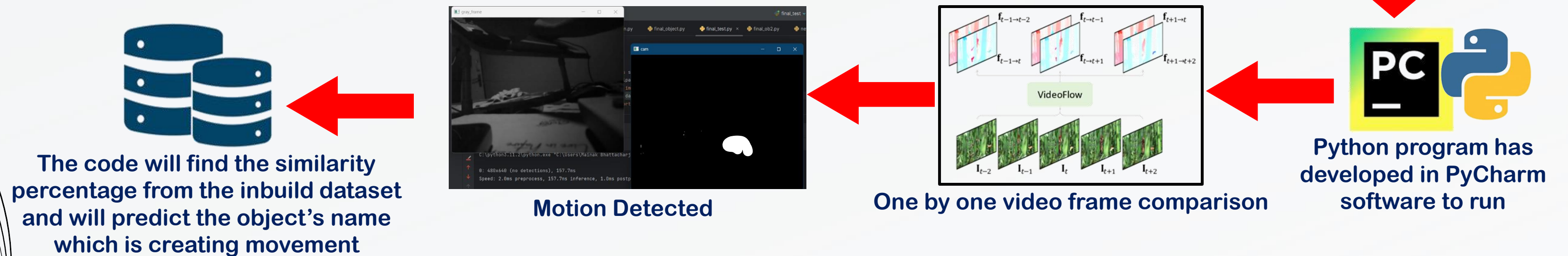
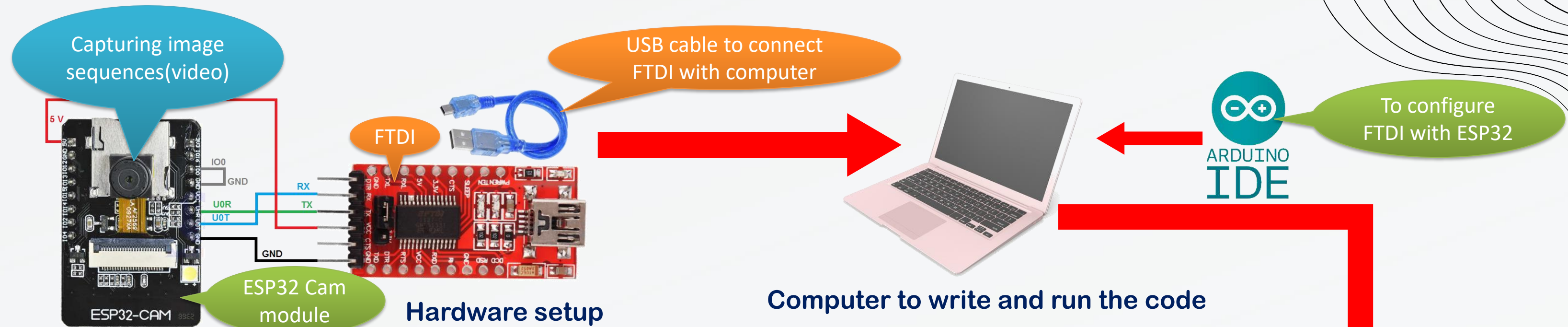
PIN DIAGRAM



FLOWCHART

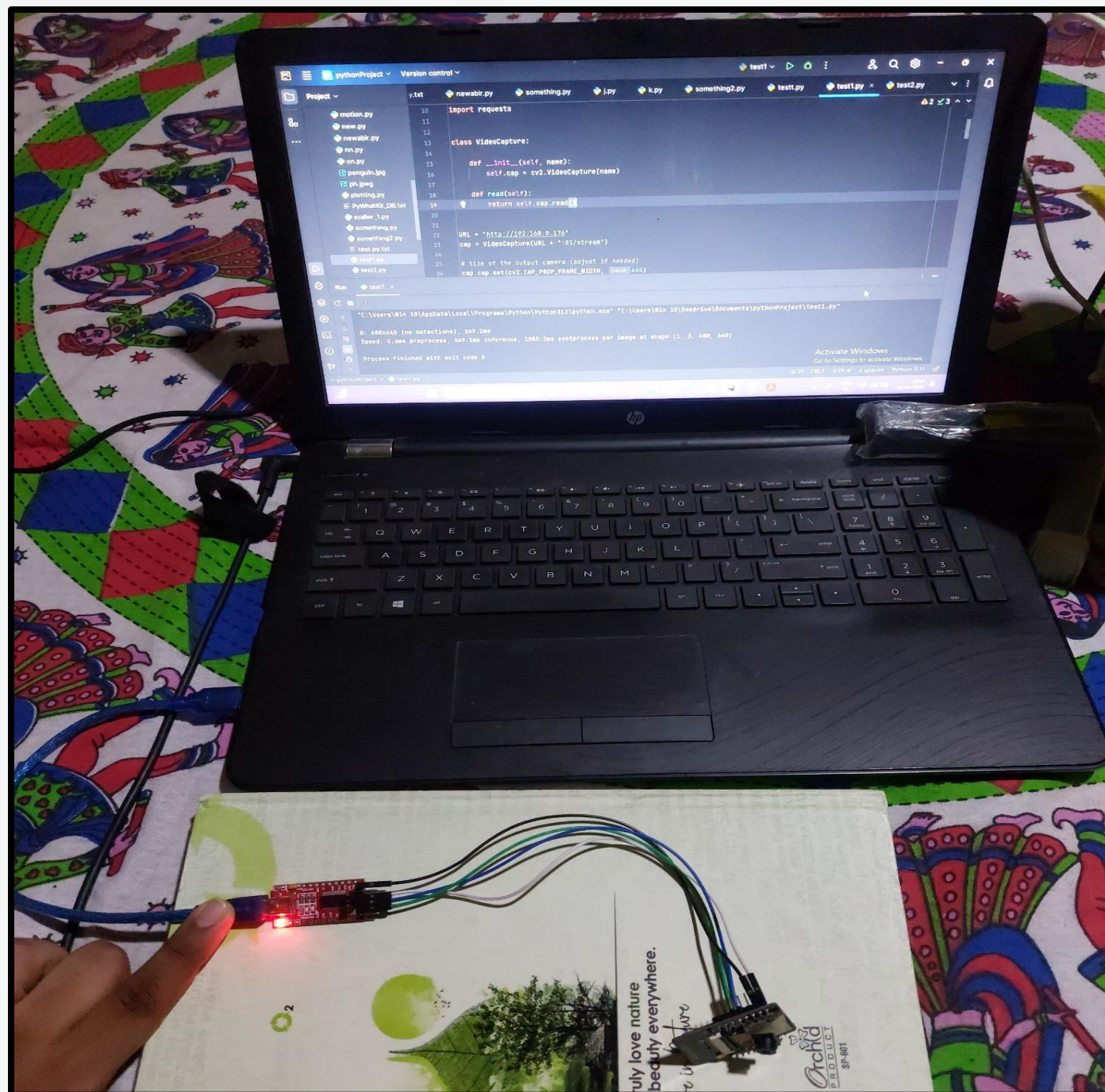


HOW IT WORKS

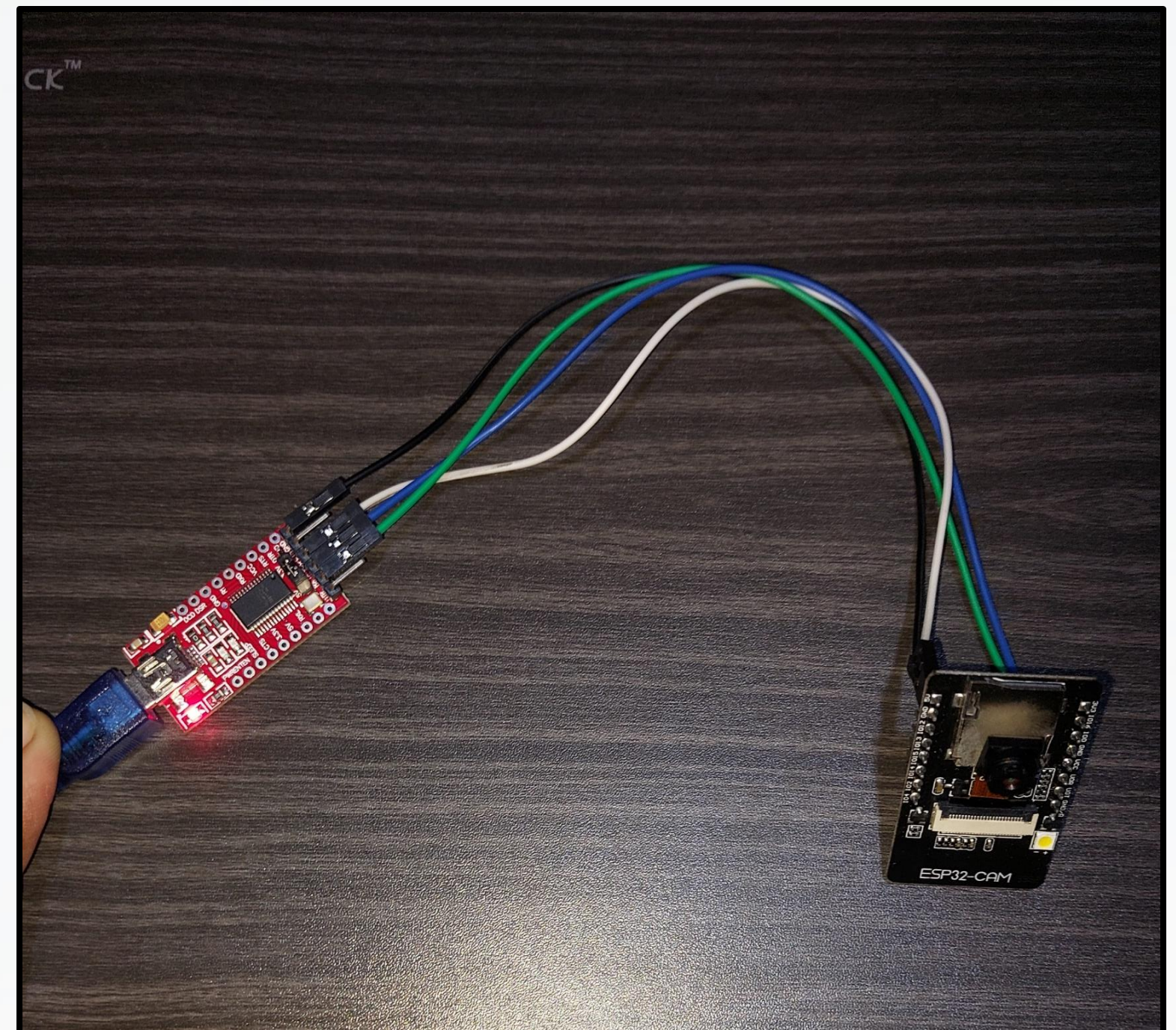


CONNECTIONS

1. Connection of ESP32 with FTDI & Laptop



2. Connection of ESP32 with FTDI





RESULT

1. Connecting FTDI with ESP32 CAM

2. Getting IPV4 address from Arduino IDE

3. Initializing the camera, converting the frame in grey scale

4. Tracking of white spot by comparing (i.e. the motion)

5. Getting output as the name of moving object

6. Sending Alert Mail to the subscriber

RESULT

PRICE COMPARISON

Already available product

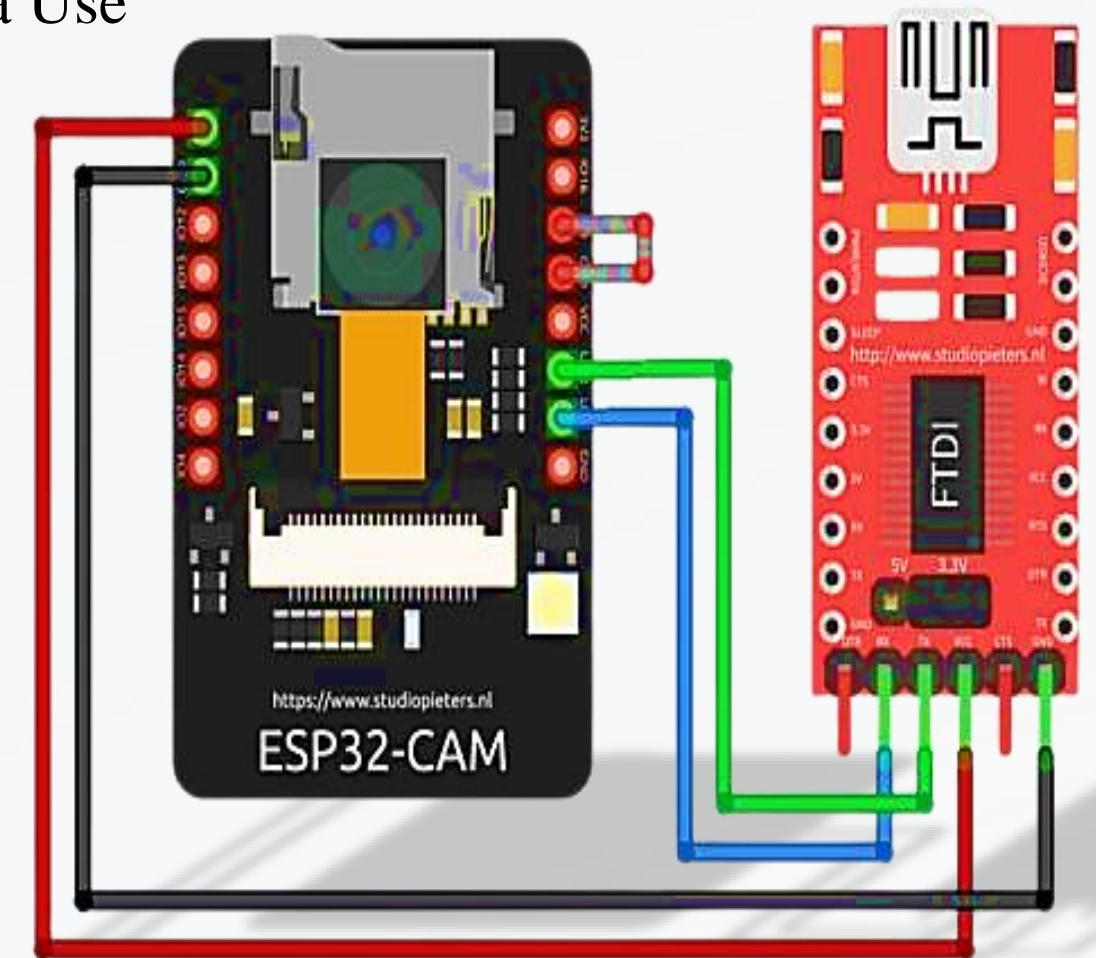


- ✓ For Indoor Security Camera Use
- ✓ Night Vision Feature
- ✓ Smart Motion Detection
- ✓ SD Card Capacity: 128 GB
- ✓ HD Quality Video
- ✓ Smartphone Viewing
- ✓ Supports Onvif

Regular Price: ₹2,399.00
Sale Price: ₹1,699.00

Our Product

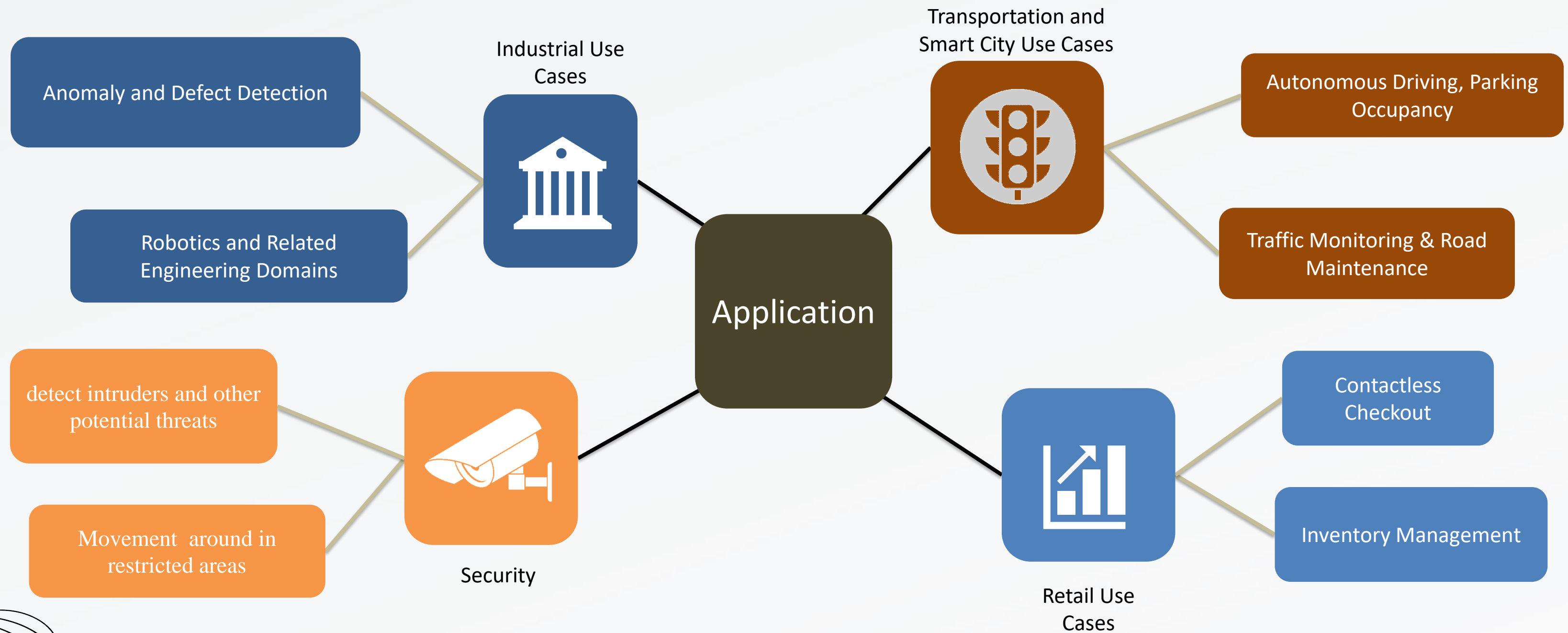
- ✓ For Indoor Security Camera Use
- ✓ Night Vision Feature
- ✓ Motion Detection
- ✓ Object Identification
- ✓ Storage Enhancement
- ✓ Less power consumption
- ✓ Instant mail alert



Estimated Price				
ESP32	FTDI	USB Micro-B Cable	Jumper Wire	Total
₹329.00	₹287	₹149.00	₹119.00	₹884.00



APPLICATION



ADVANTAGES OVER MARKET PRODUCT

- Provides instant email notification.
- Identifies object causing the result.
- Utilizes predefined dataset for object identification.

TECHNOLOGIES USED

Deep Learning Algorithms, Optical Flow (for motion detection), YOLO v8 (for object identification).



CHALLENGES & SOLUTIONS

- Upgrade hardware for better performance (e.g., Arduino).
- Adapt to challenging environments.

CONCLUSION

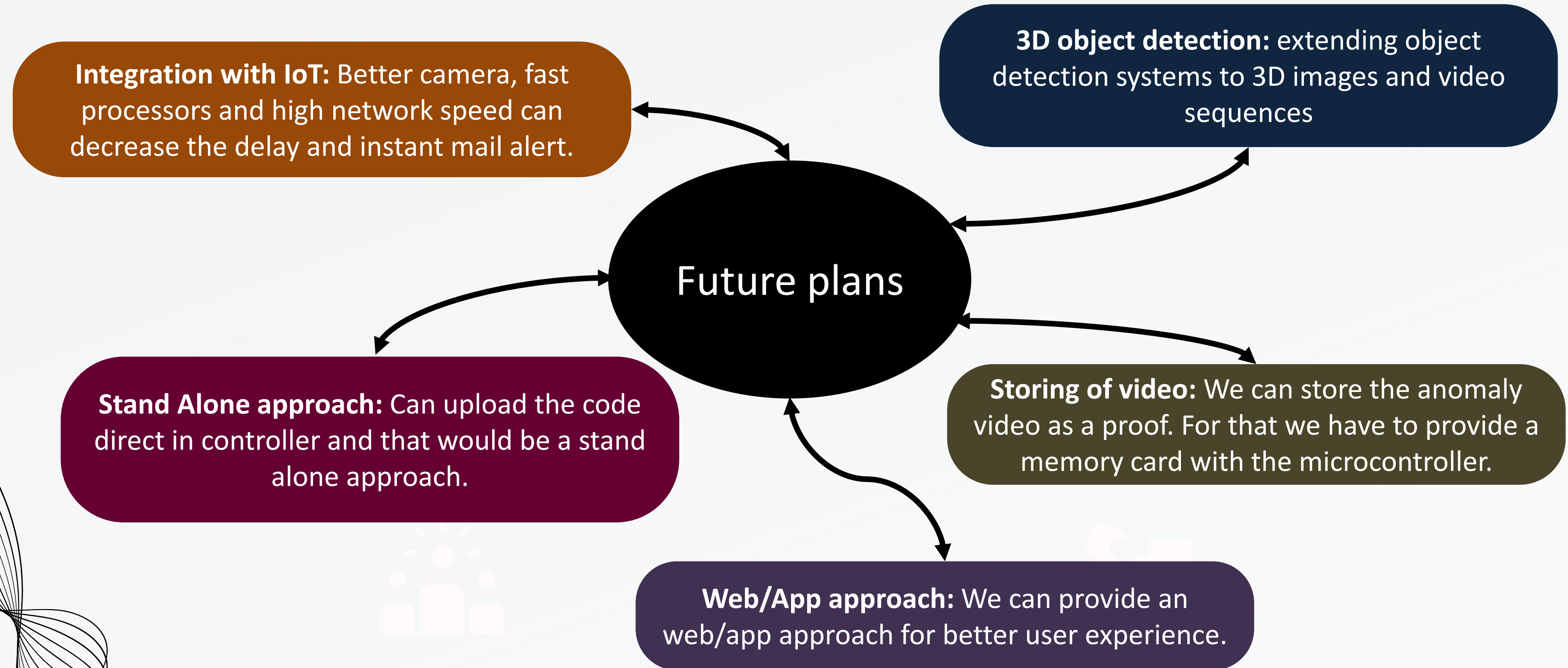
FUTURE DIRECTIONS

- Advanced hardware integration.
- Evolving technology adoption.

HARDWARE USED

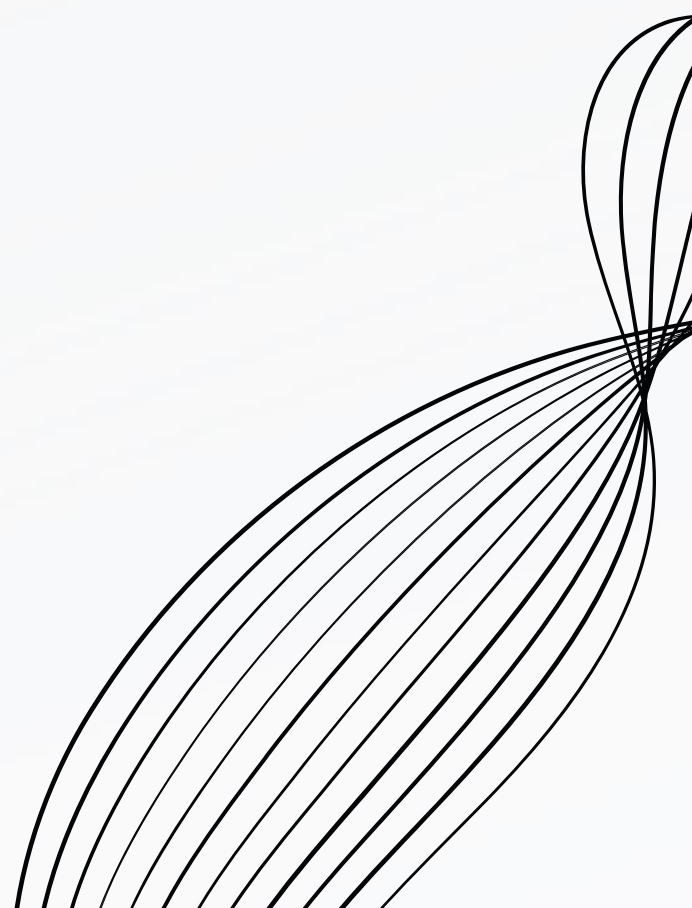
ESP32-CAM
(2 MP camera).

FUTURE PLANS





REFERENCES

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 2. https://issuu.com/ijraset/docs/a_literature_review_of_object_detection_using_yolo/s/21496887
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THANK YOU

