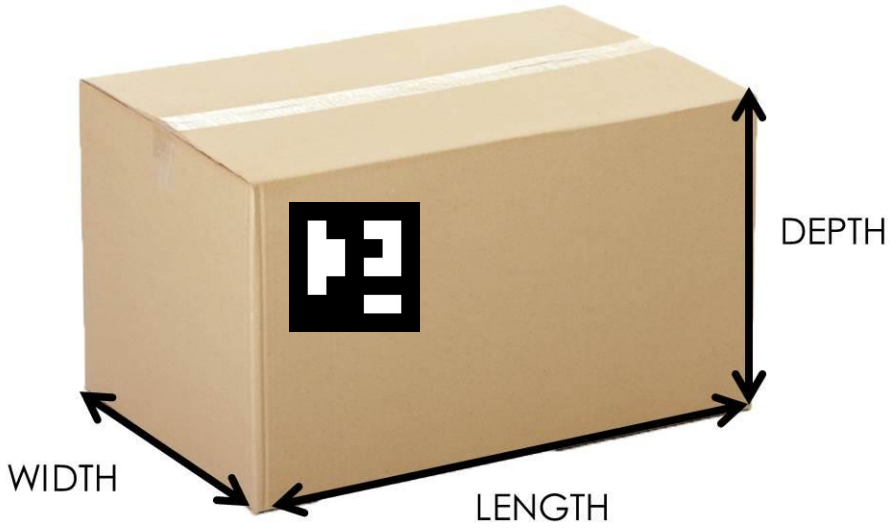
Savitribai Phule Pune University

Faculty of Information Technology

AISSMS
INSTITUTE OF INFORMATION TECHNOLOGY
ADDING VALUE TO ENGINEERING

Department of Information Technology

Box Volume Measurement System



Ishwar Gujjarwar
Adnan Tamboli

Amir Khan
Aditya Khaparde

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Group Id: 15	(Academic Year :2022-23)			Date: 08/09/2022
Project Title:	Box Volume measurement System			
Sr. No.	**Roll No.**	**Student Name**	**Contact Details**	**Internal / External Guide Details (Name, Email Id & Mobile No)**
1	30	Ishwar Gujjarwar	9130832881	Mrs. Meenakshi Thalor
2	78	Adnan Tamboli	9822399437	
3	43	Amir Khan	7506657032	
4	45	Aditya Khaparde	7499304113	

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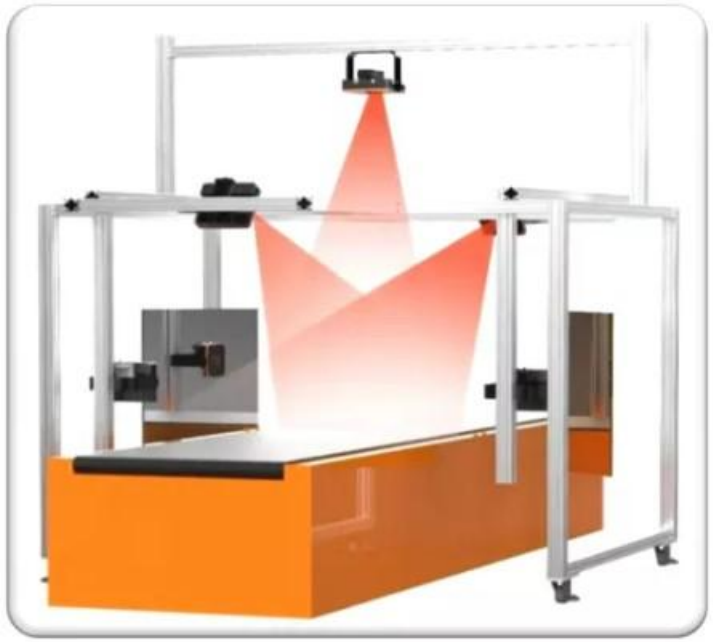
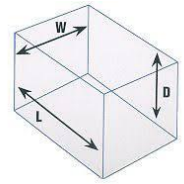
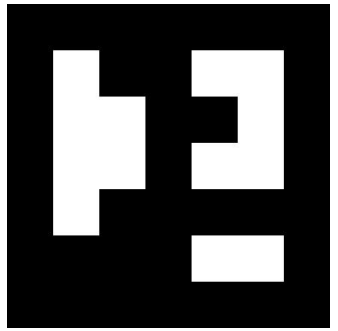
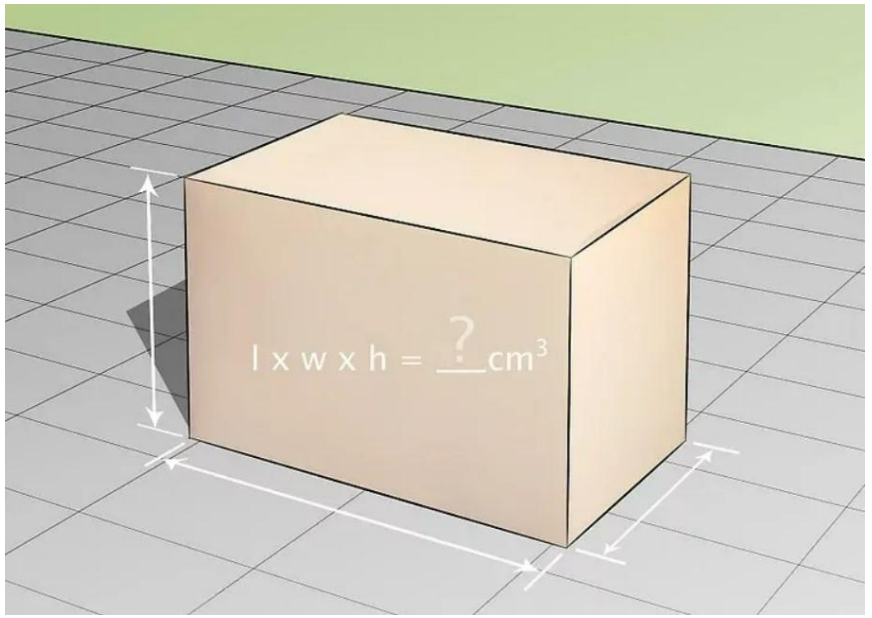


Introduction



- Box Volume measurement using Mobile camera and Aruco Marker.
- Implementing Computer Vision in Python.
- A System that can help detect dimensions and volume of a box with High accuracy and extremly low cost.





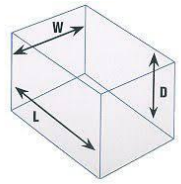
Problem statement

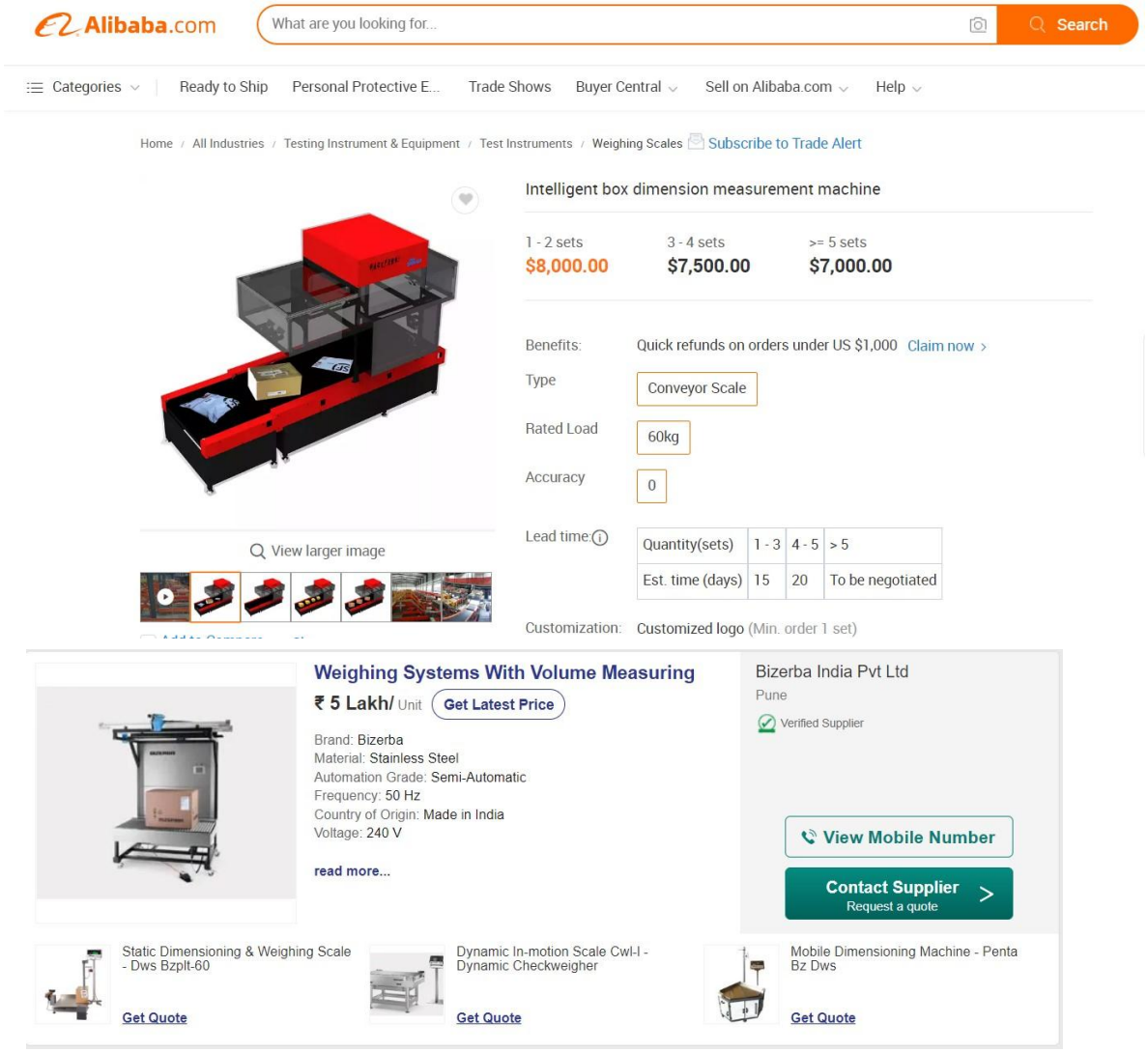
Warehouse companies need robust system for volume measurement.

Spending high time and cost on measurements.

Developing a cost effective and mobile system for measurement.

Motivation





Existing Systems

- Very High Cost
- Hard to Install and calibrate
- Space consumption
- Many points of failure
- Hard to learn and use

Motivation

Automated System

Time Efficient

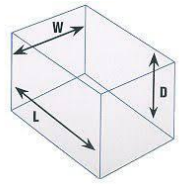
OUR SYSTEM

Mobile (easy to move)

Less Real Estate

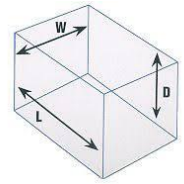
Low Cost

Scope



- This system will be highly accurate for square, rectangular.
- System not yet efficient for other polygonal shaped objects.
- Threshold for height and width for an object to be measured.
- Currently does not support or weigh the weight of object.
- Available for android OS and Windows OS.

Flow Application (High Level)



START

Image Input

Image Preprocessing

Object Detection (Detect Edges)

ArUco Marker Detection

Unit Conversion (Pixels to cm)

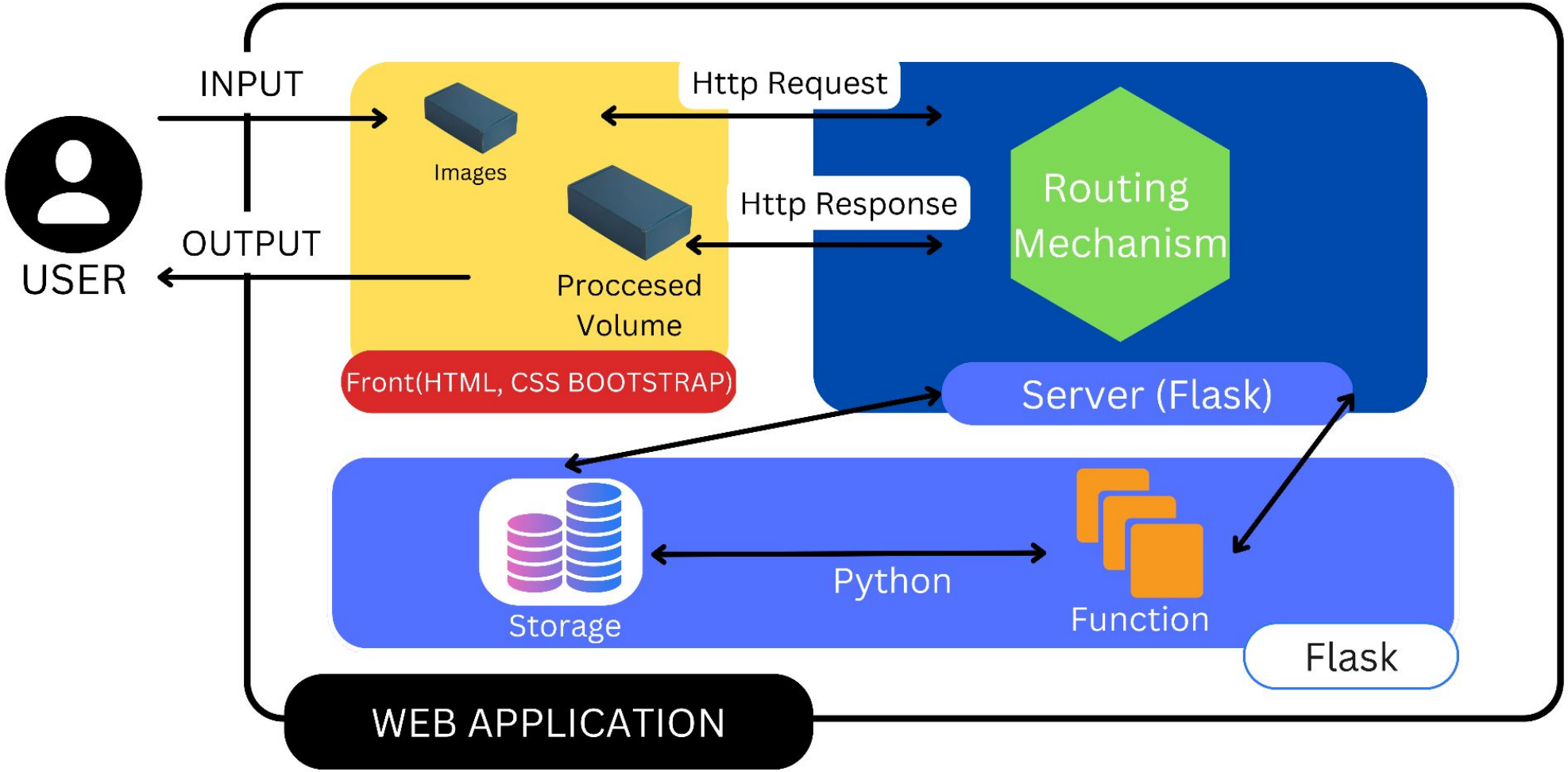
Detecting approx. dimensions of the box

Forward the dimensions for Volume calculation

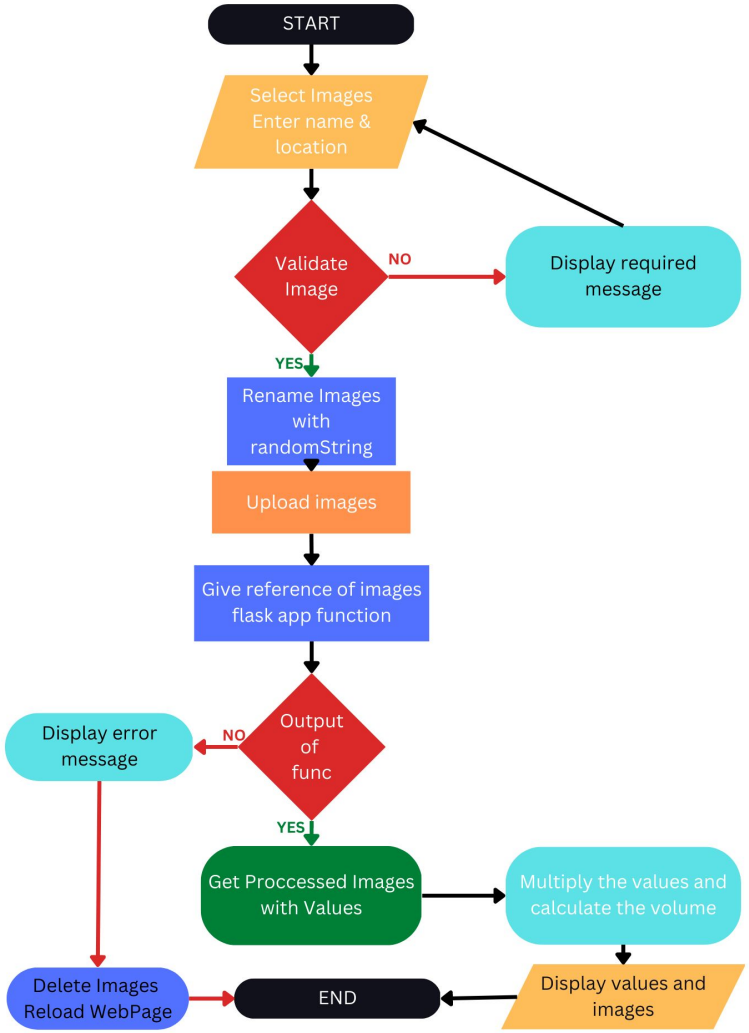
Calculate Volume & Display the Volume

END

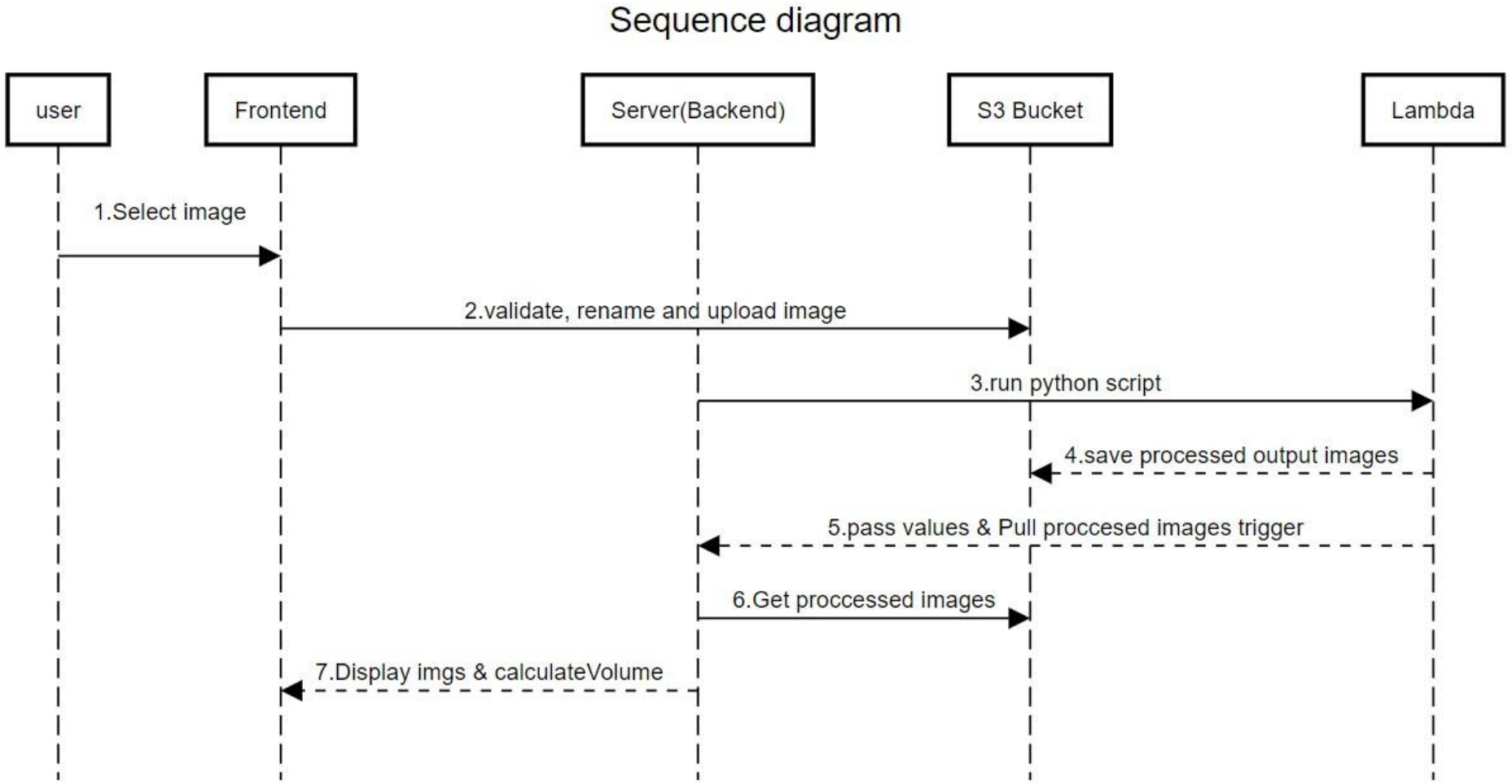
System Architecture



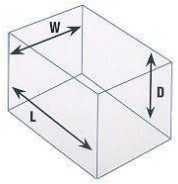
Flow chart


START
Select Images
Enter name &
location
Validate
Image
NO
Display required
message
YES
Rename Images
with
randomString
Upload images
Give reference of images
flask app function
Output
of
func
NO
Display error
message
YES
Get Proccessed Images
with Values
Multiply the values and
calculate the volume
Delete Images
Reload WebPage
END
Display values and
images

Sequence


Sequence diagram
user
Frontend
Server(Backend)
S3 Bucket
Lambda
1.Select image
2.validate, rename and upload image
3.run python script
4.save processed output images
5.pass values & Pull proccesed images trigger
6.Get proccessed images
7.Display imgs & calculateVolume

Planning

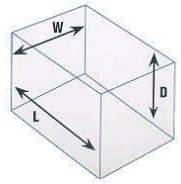


Project Planning

Phase 1 → Phase 2 → Phase 3 → Phase 4

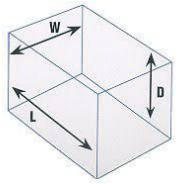
Activities	Phase 1 (August - September)	Phase 2 (September - November)	Phase 3 (November - December)	Phase 4 (December - February)
	List of activities	List of activities	List of activities	List of activities
	Topic Selection	Synopsis Submission	Developing of Front-End, Back-End	Testing using sample images
	Base Paper Reasearch	Understanding of OpenCV, working of Aruco markers	Creating S3 bucket on AWS and establishing connection	Improving the efficiency (if required)
	Understanding Project Requirements	Study of existing system	Writing codes in python for object detection	Testing with real life objects
	Planning	Implementation Planning	Designing of Flow chart, System Architecture	Infrastructure planning/implementation
		Project Review 1	Project Review 2	

Planning



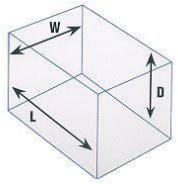
	Phase 1 (August - September)	Phase 2 (September - November)	Phase 3 (November - December)	Phase 4 (December - February)
Outcomes	List of Outcomes	List of Outcomes	List of Outcomes	List of Outcomes
	Topic selection done	Synopsis submission done	Developed fully Front-End and partial back-end	
	Collected several base papers related to topic	Understood Aruco markers	Created S3 Bucket successfully	
	Have a clear understanding of requirements	Studied the existing systems	Python code done	
	Planned things with deadlines	Project Review done on 01/09/2022	Flow Chart, Sytem architecture design done	

Literature Survey



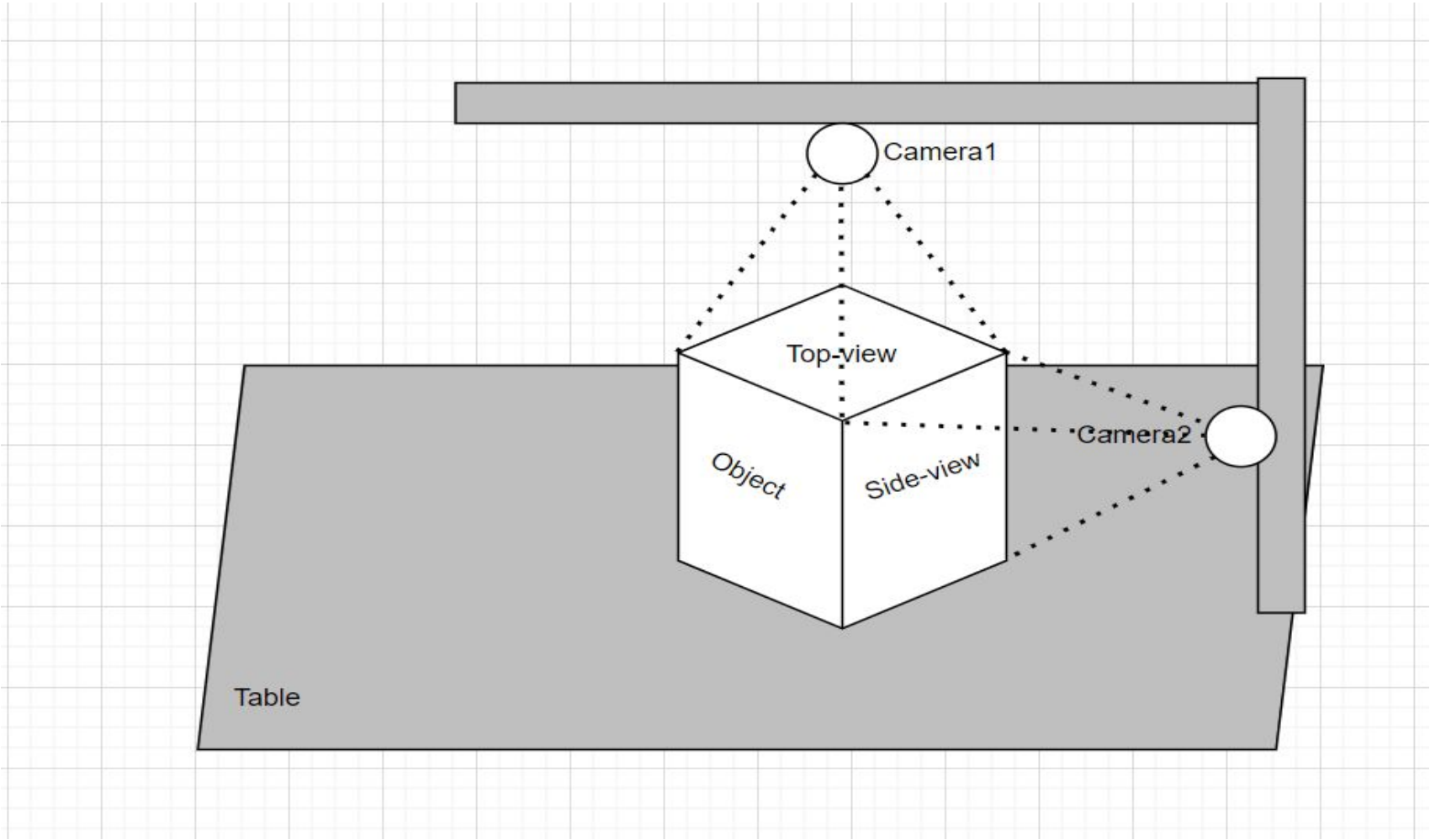
Sr. No.	Title of Paper	Description	Conclusion
1	A Practical Framework for the Development of Augmented Reality Applications by using ArUco Markers	In this multitude of remarkable studies and applications, our simple contribute is to provide a practical and manageable framework for the development of non-immersive AR applications through which target objects are enriched with multimedia information. When the RGB sensor of the device (e.g., smartphone) recognizes the ArUco marker placed on an object, then an image, a video, or the home page of a Web site is projected on the marker. If the marker has an unfavourable position or size, the multimedia information can be also projected elsewhere (near the marker).	Moreover, their recognition is very fast with a low level of ambiguity in indoor environments. As for the previous libraries, the recognition of the ArUco markers in outdoor environments is a hard task. This last aspect is crucial for this kind of systems. Finally, the ArUco library is free for research purposes and it has been recently included within the last stable version of OpenCV 3.0

Literature Survey

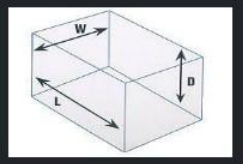


Sr. No.	Title of Paper	Description	Conclusion
2	OBJECT DETECTION AND DIMENSIONING USING OPENCV	In these days of the 4th industrial revolution, real-time object detection and dimensioning is an important aspect from an industrial point of view. These are requisite topics of computer vision problems. This study presents an augmented technique for detecting objects and computing their real-time measurements from an IoT video device such as a webcam. We have suggested an object measurement technique in real-time using AI and IoT technologies like OpenCV libraries and webcam respectively. OpenCV includes many libraries and algorithms that are used. And we are using Algorithms like canny edge detection algorithm[2] and mobile/ web camera capture video in this paper.	Because of this framework, numerous enhancements can be made to the modern area[8]. The task effectively gauges the elements of the article progressively. Consequently the PC vision (webcam gadget and code) is utilized to gauge the aspects progressively. It catches the picture from the real-time video casing and afterward shows its aspects. A Canny edge locator is effectively used to identify the aspects[2]. This procedure works quick and enjoys many benefits and remarkable highlights that can be carried out in reality.

Hardware Design



Live Demo Example (web App) *input*

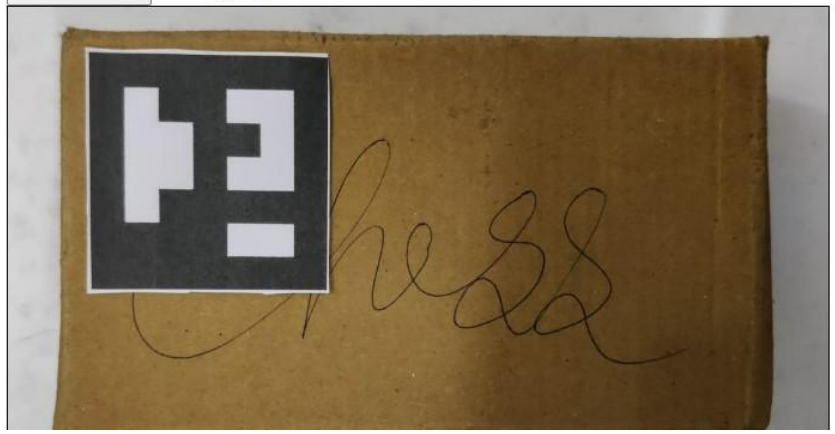


Measure the Volume of Your package in Seconds...

Just Upload Images and see the magic

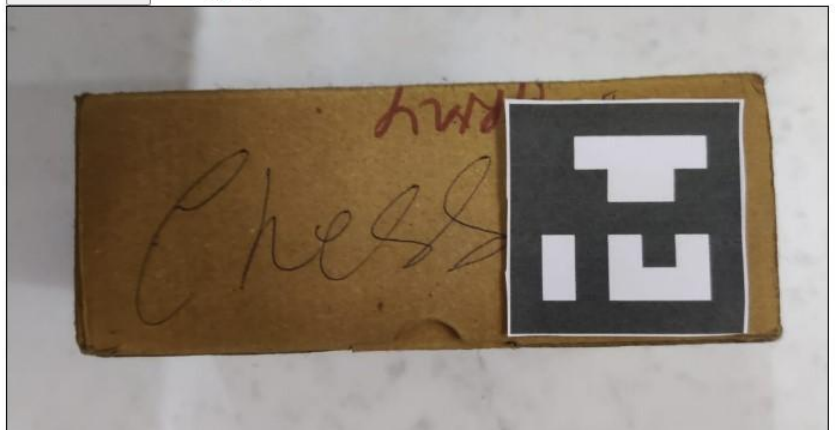
Upload Top View Image

Choose File boxM.jpeg

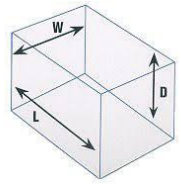


Upload Side View Image

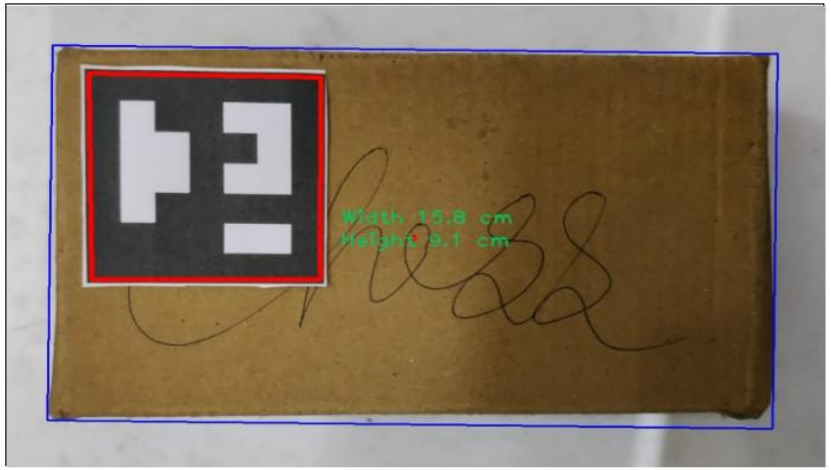
Choose File boxS.jpeg



Live Demo Example (web App) *output*

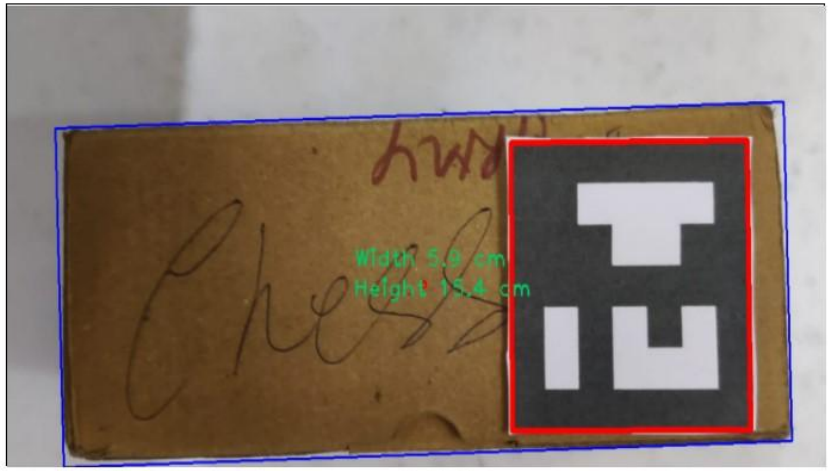


Details of IMG 1



Height : 15.8cm, width : 9.1cm

Details of IMG 2



Height : 15.4cm, width : 5.9cm

15.6 x 9.1 x 5.9

Calculated Volume is 837.5

Sample Outputs

Drawback

- Cannot detect object when the background black.

Conclusion

- Background should be white.

Sample Outputs

Original Dimensions

1. Length = 15 cm
2. Breadth = 7.5 cm

Calculated Dimensions

1. Length = 14.9 cm
2. Breadth = 7.1 cm

Accuracy

1. Length = 99.33%
2. Breadth = 94.60%

Sample Outputs

Original Dimensions

1. Length = 16.8 cm
2. Breadth = 8.5 cm

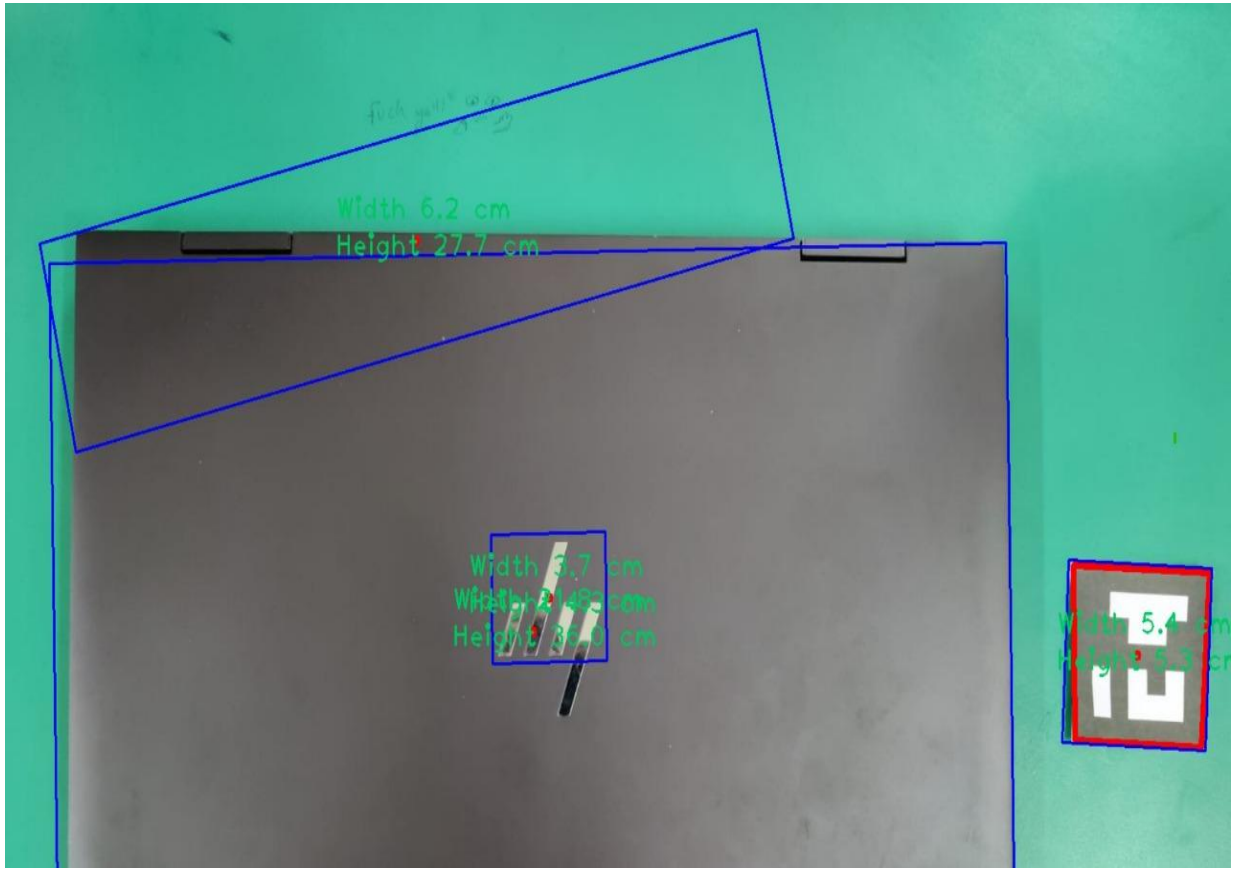
Calculated Dimensions

1. Length = 16.6 cm
2. Breadth = 8.4 cm

Accuracy

1. Length = 98.81%
2. Breadth = 98.82%

Sample Outputs



FALSE DETECTION

- Object detection is failing in some scenarios.
- Black Background doesnt work
- Multiple Objects in a frame will not give accurate results