

FOR THE WEEK ENDING

Sunday..... 01..... 05..... 2022.....

TRAINING LOCATION

L.E. Robotics (Pvt) Ltd.

DAY	DATE	BRIEF DESCRIPTION OF THE WORK CARRIED OUT	
Monday	04/25	* solved a problem with object classification model which led to misclassify some objects. * Add new methods to the application in order to visualize the objects which are already in the database.	
Tuesday	04/26	* Identified that the object classification, entirely depending on the shape of the contour do not give satisfactory results. * started looking for alternatives.	
Wednesday	04/27	* Initialized implementation of a new classification model which is based on "Bag of visual words" and "Support vector machines". * Designed basic layout of the application to facilitate for the new changes.	
Thursday	04/28	* Implemented a sophisticated method to save training images to suit them to be used in training the classifier.	
Friday	04/29	* Investigated efficient feature detection methods used in computer vision, that can be used inside an embedded system. * Started implementing " <u>ORB</u> " feature detector.	
Saturday	04/30	} - weekend -	
Sunday	05/01		

DETAILS AND NOTES OF WORK CARRIED OUT, PROBLEMS ENCOUNTERED AND HOW SOLVED ETC., DIMENSIONS AND SKETCHES TO BE GIVEN WHEREVER POSSIBLE

Primary work carried out in the week:

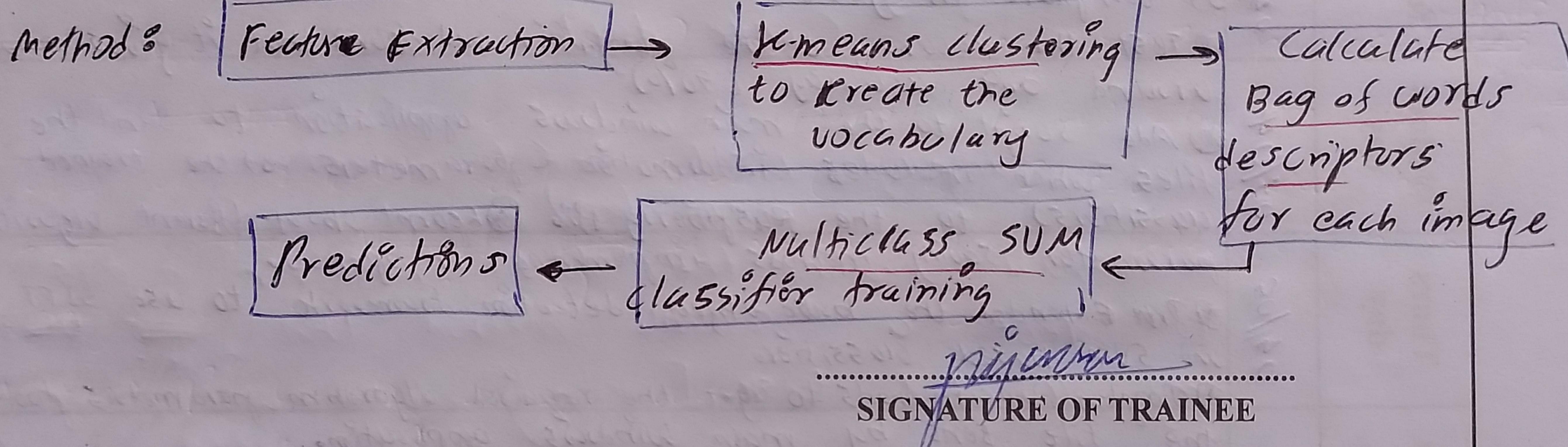
① Identified weaknesses of classifying objects, depending entirely on the shape of the contour of an object.

② Therefore, investigated alternative methods for object classification.

Solution (proposed) :- Image classification based on SIFT and SVM.

SIFT :- Scale-Invariant Feature Transform :- a computer vision algorithm to detect and describe recognizable, distinctive features from an ~~image~~ images (wikipedia)

SVM :- In Machine Learning "Support Vector Machines" are "supervised learning" models with associated learning algorithms that analyze data for classification. (wikipedia)



REMARKS AND CERTIFICATION BY THE ENGINEER /T.O

When using certain Method / Technique specific terminology try to explain those terms for clarity of the reader.

L.E. ROBOTICS (PVT.) LTD.

Jakni

Engineer - In - Charge

DATE : 03/05/2022

DESIGNATION AND SIGNATURE

FOR THE WEEK ENDING

TRAINING LOCATION

Sunday.....08.05.2022.....

L.E. Robotics (Pvt) Ltd.

DAY	DATE	BRIEF DESCRIPTION OF THE WORK CARRIED OUT
Monday	05/02	<ul style="list-style-type: none"> ① Initialized implementing an object classifier based on SIFT (Scale Invariant Feature Transform) and Support Vector Machines. ② Debugged an error given by the Support Vector Machine. ③ Changed feature detection method to SIFT, as ORB (oriented FAST and Rotated BRIEF) descriptor found to be not working properly. ④ Train the SVM (Support Vector Machine) classifier using a set of template images. ⑤ Test the accuracy of the classifier and found that it gives around 0.9 accuracy (90%).
Tuesday	05/03	<ul style="list-style-type: none"> ⑥ Add script to the main windows application to send the files which includes information (parameters of the trained classifiers) to the Raspberry Pi. Learned about different algorithm parameter saving methods implemented in opencv. ⑦ Extended the base object detection framework to use SIFT and SVM based classifiers. ⑧ Implemented methods to get the required algorithm parameters from the file sent by main windows application. * Handled an exception given by raised by the SVM classifier when a new image is passed for prediction. * Demonstrated the performance of the system to the supervisor.
Wednesday	05/04	<ul style="list-style-type: none"> * Cleared the code by removing unnecessary code snippets (unwanted comments / unwanted debugger methods). * Started a literature survey on "grasping methods" when
Thursday	05/05	<ul style="list-style-type: none"> * Picking an objects by a robot arm.
Friday	05/06	<ul style="list-style-type: none"> - Weekend -
Saturday	05/07	
Sunday	05/08	

DETAILS AND NOTES OF WORK CARRIED OUT, PROBLEMS ENCOUNTERED AND HOW SOLVED ETC., DIMENSIONS AND SKETCHES TO BE GIVEN WHEREVER POSSIBLE

Primary work carried out in the week:

* Extended the basic object detection framework to use SIFT and SVM based image classification.

* Implemented a new windows application to train the new classifier.

Image classification
method used in object
detection framework.

Object's contour based
previous classification method with low
accuracy.

New : SIFT features based classifier
which uses several support vector machines
in one-vs-all approach.
(Has around 90% classification accuracy).

Problems Encountered Method of saving and retrieving algorithm
parameters ~~when~~ of the trained classifier.

Training Phase of the
classifier happens in the
Windows application

However

?

Actual object detection model
runs on the remotely located
Raspberry Pi.

So we have to send the data related to trained classifier to the
Raspberry Pi, in an OpenCV (open source computer vision library)
compatible way.

Solⁿ Use OpenCV's "FileStorage" class! This class handles files in the way
we need ?

REMARKS AND CERTIFICATION BY THE ENGINEER /T.O

Satisfactory

Avoid exclamation ~~points~~^{mark} in technical writing, ~~and~~
unless it's a warning, caution or specific scientific
notation

L.E. ROBOTICS (PVT.) LTD.

Jaknui
Engineer - In - Charge

DATE : 10/05/2022

DESIGNATION AND SIGNATURE

FOR THE WEEK ENDING

TRAINING LOCATION

Sunday....15....1.05....1....2022....

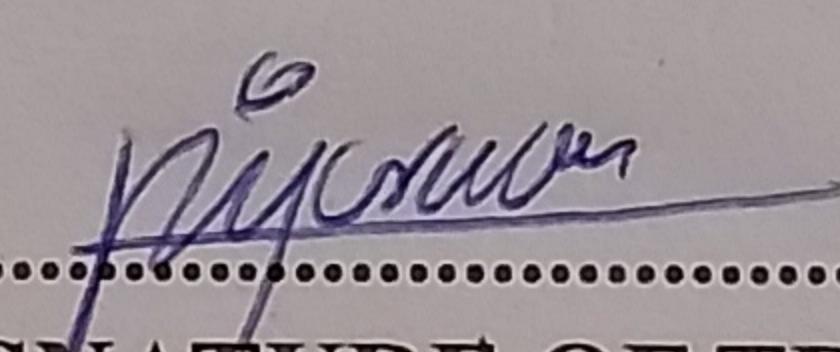
...LE Robotics (Pvt) Ltd...

DAY	DATE	BRIEF DESCRIPTION OF THE WORK CARRIED OUT
Monday	05/09	* Carried out a literature survey on "object grasping position detection" methods. * Read several research papers on the mentioned topic to select an algorithm to implement. - Company closed due to curfew - (whole day)
Wednesday	05/10	- Company closed due to curfew - (whole day)
Thursday	05/11	* Continued reading the found research papers to select a suitable method that suits the fits my allocated task. [Company closed at 12-30pm due to curfew]
Friday	05/12	- Casual Leave - [Compensated by working on the Saturday 7th of May] (last week)
Saturday	05/13	- { weekend } -
Sunday	05/14	
	05/15	

DETAILS AND NOTES OF WORK CARRIED OUT, PROBLEMS ENCOUNTERED AND HOW SOLVED ETC., DIMENSIONS AND SKETCHES TO BE GIVEN WHEREVER POSSIBLE

Primary work carried out in the week, } : Conduct a literature survey on object grasping position identification without using deep learning.

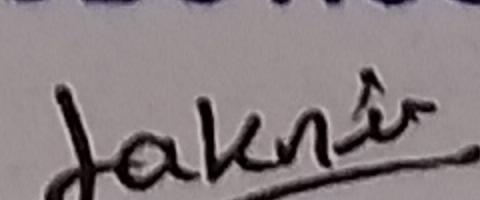
- * In computer vision literature there are many methods to identify the "grasping position of an object" using various deep learning techniques.
- * However, my allocated task was to develop a vision system that does not use deep learning for any of its functionalities.
- * Therefore finding a suitable algorithm / method was quite challenging due to a lot of constraints like time & resource usage.


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SIGNATURE OF TRAINEE

REMARKS AND CERTIFICATION BY THE ENGINEER /T.O

Satisfactory

L.E. ROBOTICS (PVT.) LTD.


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Engineer - In - Charge

DATE : 17/05/2022

DESIGNATION AND SIGNATURE

FOR THE WEEK ENDING

Sunday.....22.05.2022.....

TRAINING LOCATION

L.E. Robotics (Pvt) Ltd.....

DAY	DATE	BRIEF DESCRIPTION OF THE WORK CARRIED OUT
Monday	05/16	- Public, Bank and Mercantile Holiday— (Day following week full moon Poya Day)
Tuesday	05/17	* Initialized implementing a method to identify grasping location of an object using SIFT (Scale Invariant Feature Transform) features and perspective transformation. * Added functions to get mouse clicked points from the user on a given image.
Wednesday	05/18	* Added scripts to calculate Homography Transformation matrix between two given images using the matching key points extracted by SIFT algorithm.
Thursday	05/19	* Benchmarked the performance of the algorithm on achieving achieving the mentioned task. * Observed that algorithms, produces unreliable outputs
Friday	05/20	and therefore not suitable for an industrial level application. * Carried out a literature survey on methods to improve the performance of the mentioned algorithms.
Saturday	05/21	* Found a method named as improved RANSAC (Random Sample Consensus) to improve the algorithm's performance. * However, that also failed to give the expected results and therefore had to terminate further development of the task "grasping location detection".
Sunday	05/22	

DETAILS AND NOTES OF WORK CARRIED OUT, PROBLEMS ENCOUNTERED AND HOW SOLVED ETC., DIMENSIONS AND SKETCHES TO BE GIVEN WHEREVER POSSIBLE

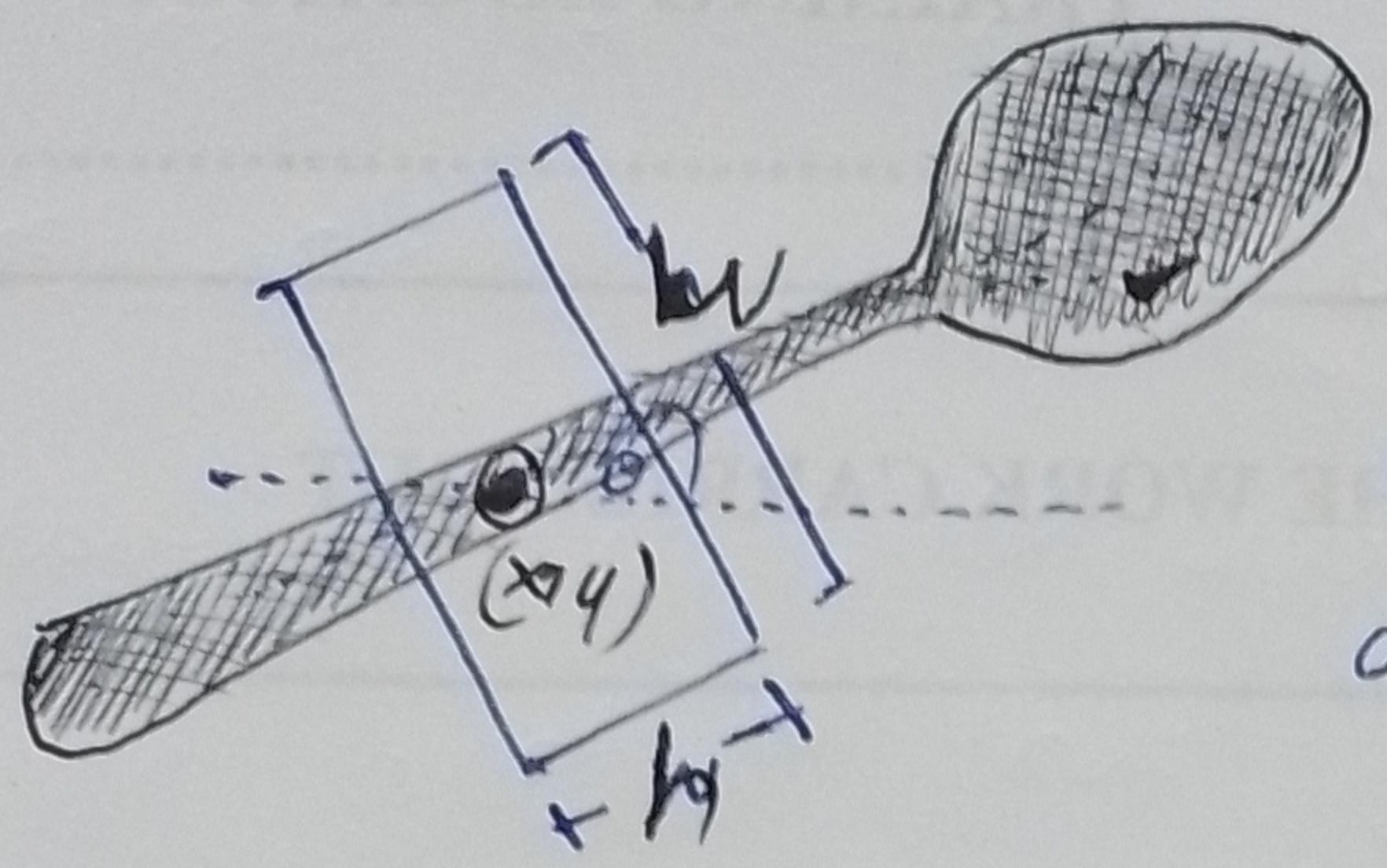
Primary work carried out in the week:

L.E. ROBOTICS

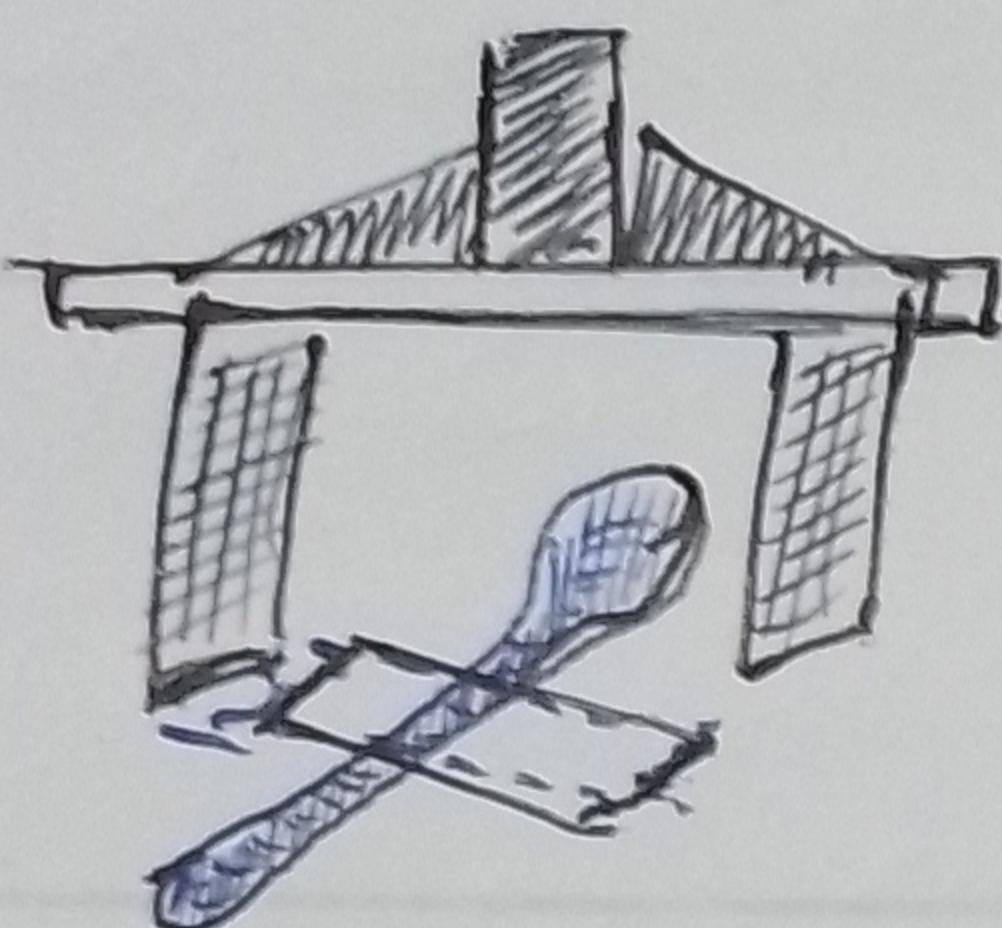
Engineering - II - Classmate

Implementing an algorithm to determine grasping configurations for a detected object in order to grab it successfully by a pick and place robot.

Grasp configuration of an object. $h = (x_1y, w, h, \theta)$



In order to grab an object on an a conveyor we need few details about the object.



- ① A location to grasp (x_1y)
- ② Width of the opening of a parallel plate gripper. (w) (End effector of a robot)
- ③ orientation of the object with respect to a given known axis on the conveyor. (θ)

- * Once we know these parameters of an object we can successfully grab the object using a pick and place Machine.
- * There are deep learning based and traditional computer vision approaches to solve this problem.
and here I used a traditional method due to no hardware resource constraints.

SIGNATURE OF TRAINEE

Jignesh

REMARKS AND CERTIFICATION BY THE ENGINEER /T.O

Satisfactory

L.E. ROBOTICS (PVT.) LTD.

Jignesh

Engineer - In - Charge

DATE : 24/05/2022

DESIGNATION AND SIGNATURE