

WEEK NO:01.....

FOR THE WEEK ENDING

Sunday 09/01/2022

TRAINING LOCATION

LE Robotics (Pvt) Ltd.

DAY		DATE		BRIEF DESCRIPTION OF THE WORK CARRIED OUT
Monday	Tuesday	Wednesday	Thursday	
		01/03	01/04	* A brief introduction about the company, including history, progress and current status was given. * Observed the machines used in industrial robot arm manufacturing (Lathe/milling /computer numerical control [CNC])
		01/05	01/06	* Responsibilities and Tasks were assigned to each trainee. * Initiated the feasibility study of the task "Machine vision based Real time trajectory Generation". * Learnt the basics of robot arm motion planning.
		01/07	01/08	* Investigated the tradeoffs between, traditional and Deep Learning based Machine Vision algorithms in resource constrained environment. * Referred several research and conference papers.
		01/09		* A discussion was carried out about Non-Disclosure Agreements (NDA) and Intellectual Property (IP) of a company * Review a source code written in "C" programming language to identify best practices in codebase maintenance.

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

The task that was assigned : Machine vision based Real time Trajectory Generation for an industrial articulated / SCARA robot arm.

Primary task carried out in the week : Feasibility study of the different algorithms to achieve the object detection portion of the above task.

- * During the feasibility study two main approaches for object detection was identified.
 1. Traditional machine vision algorithms.
 2. Deep Learning based machine vision algorithms
- * The inevitable tradeoff between accuracy and the speed was identified as the primary concern when choosing an algorithm for the object detection, when it comes to resource constrained embedded systems.
- * Therefore, it was decided to incorporate a traditional machine vision approach to address the object detection problem, as those algorithms are optimized for performance and minimum computing resource when it is compared with deep learning based algorithms.
- * A documentation was initiated to document the feasibility study and the progress.

Prayagam
SIGNATURE OF TRAINEE

REMARKS AND CERTIFICATION BY THE ENGINEER /T.O

Satisfactory.

L.E. ROBOTICS (PVT.) LTD.

Lakshmi

Engineer - In - Charge

DATE : 12/01/2022

DESIGNATION AND SIGNATURE

FOR THE WEEK ENDING

Sunday..... 15 / 01 / 2022

TRAINING LOCATION

LF Robotics (Pvt) Ltd.....

DAY	DATE	BRIEF DESCRIPTION OF THE WORK CARRIED OUT
Monday	01 / 10	* A discussion was carried out about commercialisation of a product which involves Intellectual Property (IP) of a company * * Feasibility study was continued and finalized one algorithm.
Tuesday	01 / 11	* A presentation about "Non-Disclosure agreements" was prepared to present in front of the trainees of LF Robotics. * Further documentation of the selected object detection algorithm was added.
Wednesday	01 / 12	* Learnt about, how to choose a suitable hardware platform for a given embedded system. * A discussion was carried out about optimising designing optimal hardware architecture for a given algorithm.
Thursday	01 / 13	* Initiated implementing an algorithm for a research paper named as "Topological Structural Analysis of Digitized binary Images by border following" from
Friday	01 / 14	— Tamil Thai Pongal Day. —
Saturday	01 / 15	—
Sunday	01 / 16	—

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

Primary Task carried out } = Learned about how to select a proper hardware platform (processor) which is suitable and optimal for a given algorithm. optimal in the sense - with minimum execution time and minimum cost.

Detailed description of the steps to follow:

- ① Select an algorithm which is suitable for the given task.
- ② Investigate the modules and the most fundamental functions that the algorithm composed of.
- ③ Findout the types of most basic operations that are used inside those modules / functions. (addition / multiplication / floating point operation)
- ④ Compute the time complexity according to those basic operations.
- ⑤ Select a processor which has a sufficient "clock rate" to run the algorithm within the desired time duration (real time.)

Problems encountered: Finding related research papers of functions inside "opencv" python library

* Solved the problem by finding the signature of trainee
tracing the function descriptions in opencv documentations!

REMARKS AND CERTIFICATION BY THE ENGINEER / T.O

Satisfactory, focus on proper grammatical usage

L.E. ROBOTICS (PVT.) LTD.

J. Akne

Engineer - In - Charge

DATE: 18/01/2022

DESIGNATION AND SIGNATURE

WEEK NO:Q3.....

FOR THE WEEK ENDING

Sunday 23 / 01 / 2022

TRAINING LOCATION

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

DAY	BRIEF DESCRIPTION OF THE WORK CARRIED OUT					
	Monday	Tuesday	Wednesday	Thursday	Friday	DATE
					- Duruthu Full moon Poya Day -	01 / 17
					* continued the implementation of contour finding algorithm described in the paper "Topological structural analysis of digitized binary images by border following."	01 / 18
					- study leave for semester 5 end of Semester - exams	01 / 19
					- study leave for semester 5 end of Semester - exams.	01 / 20
					* Implemented and debugged linked List data structure using C language which is required for further implementation of the algorithm(mentioned above).	01 / 21
Sunday	01 / 22					
Saturday	01 / 23					

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

Primary task carried out in 3 days
the week

Continued the implementation of algorithm from the paper mentioned above.

Problems encountered: struggled to solve debug a C program which involved pointers.

Problems encountered: struggled to solve a bug which involved manipulation of pointers in C language

Later it was realized that ~~life time~~ the bug was due to the lack of knowledge of a life time of a variable ~~existing~~ within different scopes.

The bug was solved using pointers of pointers!

- * The concepts of pass by value, pass by reference were deeply studied in regard to function calls in C language.

Jignesh
SIGNATURE OF TRAINEE

REMARKS AND CERTIFICATION BY THE ENGINEER /T.O

Satisfactory

L.E. ROBOTICS (PVT.) LTD.

Jahnvi

Engineer - In - Charge

DESIGNATION AND SIGNATURE

DATE : 01/02/2022

WEEK NO: 04

FOR THE WEEK ENDING

Sunday..... 30...../.....01...../....2022.....

TRAINING LOCATION

LF Robotics (Pvt) Ltd.

DAY	DATE	BRIEF DESCRIPTION OF THE WORK CARRIED OUT
Sunday	01/24	- Study leave for Semester 5 end of semester - exams
Saturday	01/25	* Implemented the a part of the algorithm mentioned in previous week, in order to find the first nonzero pixel of a Moore neighbourhood of a given pixel. * Implemented & optimized the same using enumerators in C language.
Friday	01/26	* Implemented border following algorithm part of the main algorithm and debugged it. For the border traversing concepts of Moore neighborhood was used.
Thursday	01/27	* The algorithm from the paper "Topological Structural Analysis of digitized binary images" was completed to a satisfactory level. + Debugged the algorithm using test images.
Saturday	01/28	* Carried out timing comparisons of the algorithm using different algorithms (C language ("C" and "Python"))
Sunday	01/29	* Observed how efficient the "opencv" python library functions with respect to the algorithm developed by me.
	01/30	—

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

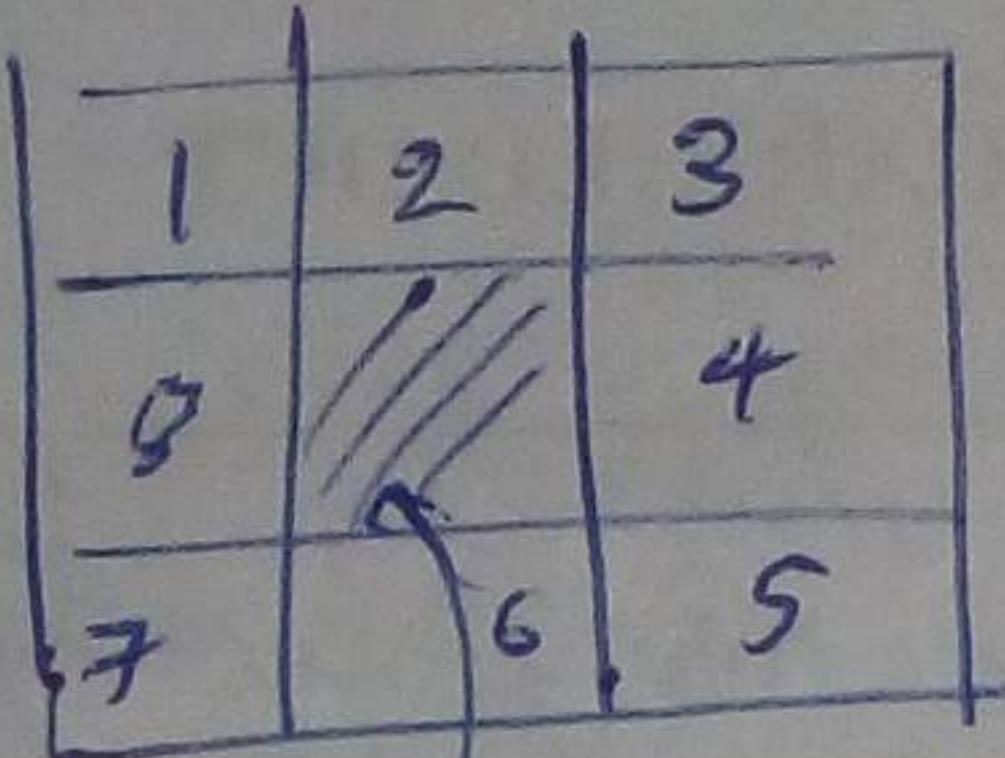
Primary work carried out : in the week

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Completion of the main algorithm of the paper "Topological Structural Analysis of a digitized binary images by border following", by adding the border following algorithm to the main algorithm.

* The concept of Moore neighbourhood of a pixel was used when implementing the "border following" part of the main algorithm. The pixels indexed

1, 2, 3, 4, 5, 6, 7, and 8



Moore Neighbourhood of pixels indexed.

from 1 - 8 are known as

the Moore neighbourhood

of a pixel. This concept

has variety of applications in the computer vision literature.

calculating time it takes to execute a function call in python. This time can not be accurately calculated if we use only a single function call to measure it. As the reason for that frequent shifts between processes of an operating system can be shown.

Solution: Run the function call for Python around (100-1000) times and get an average time of execution. That was found to be consistent over time.

REMARKS AND CERTIFICATION BY THE ENGINEER /T.O

satisfactory, good approach towards summarizing the work done & problems encountered.

L.E. ROBOTICS (PVT.) LTD

Jainie

Engineer - In - Charge

DATE : 01/02/2022

DESIGNATION AND SIGNATURE