



THALAGALA B.P.
180631J
NO.326/2, KANDAHENA,
DEDIGAMUWA,
HOMAGAMA.



Valid until - Dec. 2022

Holder's Signature
NIC No: 980832826V



Report Number ① [W1 - 4]

Annex. E

FOUR WEEKLY EXPECTED OUTCOMES FOLLOW-UP REPORT

Structured Training Program Items					Activity Carried Out Under <i>(You may generate a list of activities carried out and the list number can be mentioned here. A single activity can be considered for more than one learning outcome achievement)</i>
1	P01	LO2	H	Feasibility Study on "Real time trajectory generation, using machine vision."	<ul style="list-style-type: none"> >Selecting a suitable hardware platform for system development. >Analyzing time complexity of various algorithms. Finding reliable data/information resources for system design.
			L	Discussion on importance of respecting Intellectual Properties of a company. (Rules & Regulations)	<ul style="list-style-type: none"> Went through the Non-Disclosure Agreement of the company; Discussed about commercializing a product that involves intellectual property.
			L	Implementation of a research paper's algorithm using "C" programming language.	<ul style="list-style-type: none"> Read and Understand a research paper related to computer vision. Implemented the its algorithm to work on "ATMega" microcontroller.
2	P02	LO1	L	Identifying fundamental components of the main problem "Real time trajectory generation".	<ul style="list-style-type: none"> * Broke down the problem into set of sub problems which can be solved easily (Divide & conquer approach). * Broke down the object detection framework for implementation.
			L	Discussion on interfacing multiple sub systems together to form one single entity.	<ul style="list-style-type: none"> * Identified the importance of compatibility of interfaces of different sub systems to work as a single system. * Heard about importance of having understanding of work allocation among team members.
3	P03	LO4	L	Design components of the mentioned task (problem) to work in Real Time.	<ul style="list-style-type: none"> * Investigated algorithms (image processing) that can give real time behavior in operation. * Analysed drawbacks / advantages of Traditional & Deep Learning based algorithms.
4	P05	LO2	H	use industry level software development related tools for algorithm implementation.	<ul style="list-style-type: none"> * learnt how to use "Visual Studio 2019" for "C" language based algorithm implementation. * learnt "Git version controlling" to maintain/control versions of software.
5	P06	LO3	H	feasibility study on "Real time trajectory generation using machine vision."	<ul style="list-style-type: none"> * Selecting a suitable hardware platform for system development. * Time complexity analyzing of the algorithms to be used in the system.
			M	Familiarization session on the machineries used in industrial robot implementation.	<ul style="list-style-type: none"> * Learnt about machines used in industrial robot implementation. * Got to know about safety precautions to be followed when using them.
		LO5	H	Investigation on hardware platforms that should match the allocated budget.	<ul style="list-style-type: none"> * Investigated about the cost of using different hardware platforms to be used inside the system.

6	P07	LO5	L	Discussion on requirements that should be satisfied by a hardware development platform.	* Realized the importance of taking the "supporting period of a hardware platform" into a consideration when selecting a platform. Because production may go on for another ~5 years. * Gave a presentation on Non-Disclosure Agreement / Intellectual Property / Commercialization of a product with an IP.
7	P08	LO3	M	Discussion on Non-Disclosure Agreement / Intellectual Property / Commercialization of a product with an IP.	* Gave a presentation on Non-Disclosure Agreement of the company. * Learned about Business Linkage Cell of University of Moratuwa and its services.
		LO4	L	Discussion on importance of dedication towards the allocated tasks.	* Learned about importance of working as a team and importance of doing what is assigned to you with maximum efficiency to achieve final goals of the project.
8	P09	LO4	H	Discussion on the relevance of each trainee's assigned task to others' tasks.	* Identified importance of compatibility of interfaces as the components of a system to achieve the final goal. * Understood the importance of regular communication with teammates.
9	P10	LO1	L	Compiling a feasibility report prior to get into system implementation.	* Investigated different Machine Vision approaches to solve the given problem in real time. * Carried out and documented about timing requirements of algorithms.
		LO4	M	Timing analysis of various algorithms in order to choose a proper development platform.	* Benchmarked implementations of an algorithm using different programming languages. (By computing their time complexities.)
		LO5	H	Discussion on the importance of taking the "cost" of a product into account.	* Discussed about the impact of cost of a product depending on the target market. * Investigated on low cost solutions for subproblems encountered.
10	P11	LO1	L	Compiling a feasibility report prior to get into system implementation.	* Investigated different Machine Vision approaches to solve the given problem in real time. * Carried out and documented about timing requirement of algorithms.
		LO4	M	Timing analysis of various algorithms in order to choose a proper development platform.	* Benchmarked implementation of an algorithm using different programming languages. (By computing their time complexities.)
		LO5	L	Discussion on the importance of taking the "cost" of a product into account.	* Discussed about the impact of cost of a product depending on the target market. * Investigated on low cost solutions for encountered subproblems.

11	P12	LO1	M	Discussion on the difference between an undergraduate level project and an industrial project.	* Learnt what a consumer expect from a product and importance of giving seeing the end product from the point of view of a consumer.
		LO3	M	Self study about maintaining a readable source code as a member of a team.	* Went through a code written by another employee of the company to understand the various practices of maintaining and writing a computer program.
		LO4	H	Session on the rules and regulations that should be followed by an employee.	* learnt about procedures related to applying for leave as an employee.
		LO5	H	Investigation on hardware platforms that should match the allocated budget.	* Investigated about the cost of using different hardware platforms for the development and choosing an appropriate platform for an industrial level product.

Undergraduate				Supervisor	
Name	THALAGALA Bo P.			Name	J. A. L. Jayasinghe
Student ID	180631J	Field	EN	Position	L.E. ROBOTICS (PVT.) LTD.
Signature	<u>piyumi</u>			SignatureJohn..... Engineer - In - Charge
Date	01/02/2022			Date	03/05/2022

FOUR WEEKLY EXPECTED OUTCOMES FOLLOW-UP REPORT

#	PO Ref	LO Ref		Structured Training Program Items	Activity Carried Out Under <i>(You may generate a list of activities carried out and the list number can be mentioned here. A single activity can be considered for more than one learning outcome achievement)</i>
		No.	Scale (H,L,M or N/A)		
1	P01	LO2	H	Implementation of an algorithm which relates to preprocessing stage of object detection.	* In order to carry out object detection, images must be preprocessed. An algorithm required for a sub stage of that was implemented using "C" programming language. to work in a microcontroller
		LO3	L	Discussion on how to choose a proper hardware platform for an industrial product development.	* Investigated about reliable hardware development platforms for an industrial level projects.
		LO4	L	Benchmarking performance of an algorithm using different hardware platforms.	* Learned what to consider when choosing a development platform. * Compared timing requirement of an algorithm using a microcontroller, Raspberry Pi Single Board computer and a personal computer. (SB C) *
2	P02	LO1	L	Investigation on getting a Raspberry Pi (SBC) ready for specifically computer vision and Deep learning. * For	* Investigated different methods of installing "OpenCV" open source computer vision library on the Raspberry Pi, in such a way that that software is optimized for computer vision.
		LO4	L	Demonstration of a basic object detection model that runs on Raspberry Pi.	* Implemented a paper related to object detection and demonstrated the results to the supervisor for his feedback. * Debugged and fine tuned the algorithm using other online resources.
3	P03	LO4	L	Implementation of complete object detection model by referring a research paper.	* Implemented a paper related to object detection using openCV open source computer vision library and with modern "C++" language, for better hardware utilization.
4	P05	LO2	H	use of Raspberry Pi like SBCs for industrial product prototyping.	* Investigated pros and cons of using Raspberry Pi SBC for industrial product prototyping. * Discussed what makes Raspberry Pi a not so good choice for industrial applications.
5	P06	LO3	H	Discussion on respecting the intellectual properties of other inventors/researchers (IPs)	* Discussed about the necessity of respecting work done by others (IPs), an ethical way to use those and consequences of not respecting those.
		LO4	M	with N/A	
		LO5	H	Financial feasibility study on various hardware platforms for rapid, low cost prototyping.	* Carried out a feasibility study on various hardware platforms for rapid prototyping of the object detection model. In such a way that the platform's cost aligns with the allocated budget of the project.

					to manufacture Because we can not continue our products that uses their modules.
6	P07	LO5	L	Evaluation of Raspberry Pi in an industrial level product development using	* Learned about the importance of considering product support service duration of hardware platforms. Because in case the supplier/manufacturer terminate its production we will be in trouble.
7	P08	LO3	M	Discussion on respecting the intellectual properties of other inventors / researchers.	Discussed about the necessity of respecting work done by others (IPs), ethical ways of using them inside our engineering solutions and consequences of not respecting them.
		LO4	L	Discussion on importance of meeting deadlines when it comes to collaborative tasks.	* Discussed how to manage time and give the maximum dedication towards the allocated tasks in order to achieve the company targets within a given period of time.
8	P09	LO4	H	Discussion with other trainees and supervisor to understand and modify the requirements of interfaces of modules developed by each trainee.	* For the final system to function as a single unit the interfaces of sub modules must be compatible. Discussed those being developed by each trainee with other trainees for better understanding.
9	P10	LO1	L	Benchmarking performance of an algorithm using different hardware platforms, to choose the best.	* Benchmarked timing requirement of an algorithm using a microcontroller and Raspberry Pi in order to choose/select the hardware platform to move forward with.
		LO4	M	Discussion with other trainees and supervisor to understand and modify the requirements of interfaces of the modules developed by each trainee.	* Presented the workings of object detection model that runs on Raspberry Pi and showed the kind of output, generated by each trainee.
		LO5	H	Feasibility study on various available hardware platforms for rapid low cost prototyping.	* Carried out a feasibility study on various hardware platforms for rapid prototyping which aligns with the budget allocation of the project. * Reported the found details to supervisor.
10	P11	LO1	L	Feasibility study on various hardware platforms for rapid prototyping and low cost prototyping.	* Carried out a feasibility study to choose a low cost hardware platform that aligns with budget allocation of the project.
		LO4 LO5	M L	Evaluation of Raspberry Pi in terms of its support periods to use that inside a product.	* Each device has its own support period after which the manufacturer stops producing the device, after that there will be no support for that specific device in the market. Learned the importance of this fact when we are developing a product that uses such a device inside it.
		LO5 LO4	M	Demonstration of the object detection model's performance. in terms of time and accuracy.	* Demonstrated the timing requirements and accuracy of the model in order to receive the further instructions to develop the system.

11	P12	LO1	M	Investigation on methods to improve the performance of object detection model to achieve real time behavior.	* Learnt about multithreading based C++ programming to improve the efficiency of the object detection algorithm. * Learnt about camera calibration process.
		LO3	M	Discussion on specifications to consider when selecting a hardware platform for industrial projects.	* Learnt about the specifications to consider when choosing a hardware platform for industrial product prototyping.
		LO4	H	Benchmarking performance of an algorithm using different hardware platforms.	* Investigation on Pros and Cons of Raspberry Pi's in industrial level. * Learnt how to properly carry out timing analysis of an algorithm (time required to run an algorithm once using some device).
		LO5	H	Feasibility study on various hardware platforms for rapid and low cost prototyping.	* Learnt about time complexity analyzing in a mathematical way. * In industrial level project time it takes to design and manufacture a product is crucial. Therefore, I had to learn how to choose a hardware platform for rapid prototyping, and at the same time choose it in a way that its cost is aligned with the budget of the project!

Undergraduate				Supervisor	
Name	THALAGALA B.Po			Name	J.A.L. Jayasinghe
Student ID	1806315	Field	EN	Position	L.E. ROBOTICS (PVT.) LTD.
Signature	<u>Diyuman</u>			Signature	<u>Jake</u> Engineer - In - Charge
Date	01/03/2022			Date	09/05/2022

FOUR WEEKLY EXPECTED OUTCOMES FOLLOW-UP REPORT

#	PO Ref	LO Ref		Structured Training Program Items	Activity Carried Out Under <small>(You may generate a list of activities carried out and the list number can be mentioned here. A single activity can be considered for more than one learning outcome achievement)</small>
		No.	Scale (H,L,M or N/A)		
1	P01	LO2	H	Implementing a backprojection algorithm to map image coordinates back to real world.	* Implemented a backprojection algorithm to map 2D image coordinates back to the real world, so the robot knows where the object is w.r.t its coordinate system.
		LO3	L	use object oriented programming techniques to restructure the source code to improve readability.	* learnt about object oriented programming techniques in C++ programming to restructure my source code so the future employees can easily understand my work.
		LO4	L	Documenting of the Documenting the implementation method of object detection model.	* Documented the required 3rd party software/package installation, of the object detection model.
2	P02	LO1	L	Researching about various methods on backprojecting 2D image points to real world.	* Documented explanations of the algorithms for future use. * carried out a little research about various backprojection methods to be used in object detection framework.
		LO4	L	Demonstration of the object detection model with the added backprojection algorithm.	* Implemented a method found on one of the research papers. for Mat. * Demonstrated the performance of object detection model with the added backprojection functionality. * Figured out some of the errors in the implemented method for further modifications.
3	P03	LO4	L	Implementing backprojection functionality for the existing object detection framework.	* Implemented and demonstrated the object detect functionality of the backprojection algorithm inside the object detection framework. * Documented the functionality of the backprojection algorithm.
4	P05	LO2	H	Building software projects from source files using "CMake".	* Learnt about "Cmake" a powerful, cross-platform build environment to easily compile source codes and link them to generate a the final single executable file.
5	P06	LO3	H	Discussion on how to compose various documents targeting different users(eng.s/ technicians).	* Learned what needs to be known in order to compose documentation for different users. (a technical engineer/ technician a technician without much knowledge etc.)
		LO4	M	Discussion on importance of well documented source code maintenance at a temporary employee.	* Received discussed and received instructions on how to maintain a well documented source code of a software as a temporary employee.
		LO5	H	N/A	-

6	P07	LO5	L	Carry out a timing analysis to assess the eligibility of Raspberry Pi in further system implementations.	<ul style="list-style-type: none"> Analyzed the timing requirement of the algorithm upto now, to assess the eligibility of Raspberry Pi in further developments of the system. (As our final goal is to design a real time system.)
7	P08	LO3	M	Discussion on importance of well documented source code maintenance as a temporary engineering intern.	<ul style="list-style-type: none"> Learnt how to be maintain a well documented source code as a temporary engineering intern. (Because if someone engineering intern wants to do any modification he may not be able to contact me!)
		LO4	L	composing documentation of the same system by targeting different users.	<ul style="list-style-type: none"> Discussed and learnt what to keep in mind when producing documents of a system for users with different skill's sets. (Engineers / technicians / Laymen.)
8	P09	LO4	H	Discussion with the team members to get to know their status of each other's project/tasks.	<ul style="list-style-type: none"> Discussed each other's progress of the allocated tasks in order to understand the overall program of the project allocated to the intern students.
9	P10	LO1	L	Documenting the implementation method of the object detection framework (with backprojection)	<ul style="list-style-type: none"> Documented the required 3rd party software / package installation methods of the object detection framework.
		LO4	M	Demonstration of the object detection model with the added backprojection algorithm.	<ul style="list-style-type: none"> Documented the explanation of the algorithm for future use. Demonstrated the performance of the object detection framework with newly added backprojection algorithm to the supervisor and received instructions for the next step of the task.
		LO5	H	Carry out a timing analysis of the system to check whether the Raspberry Pi is enough for further development as a temporary employee.	<ul style="list-style-type: none"> As the final target is implementing a real time system, timing requirements are in greater importance. They need to be checked at each stage to check whether the hardware platform that we use is enough for the job.
10	P11	LO1	L	Discussion on importance of well documented source code maintenance as a temporary employee.	<ul style="list-style-type: none"> Discussed how to maintain a well documented source code, as a temporary engineering intern.
		LO4	M	Documenting the implementation method of the model with newly added backprojection algorithm.	<ul style="list-style-type: none"> Documented the methods of installing 3rd party softwares / packages required for proper working of the object detection model. Documented the working principals of the algorithms.
		LO5	L	Carry out a timing analysis to assess the eligibility of the Raspberry Pi for further system implementation.	<ul style="list-style-type: none"> Carried out a timing analysis of the complete system upto now to check whether time consumption of the algorithm is still within the limits.

11	P12	LO1	M	Research on various methods of backprojecting 2D image points to real world coordinate system.	* Carried out a research on various backprojection methods to be used inside an object detection framework.
		LO3	M	Building software projects from source files using "CMake"	* Implemented an algorithm found on one of the research papers. * Raspberry Pi is a Linux based system and when it comes to build applications from source files "Cmake" comes handy. was very useful * Learnt how to use Cmake to build the executable file related to the object detection model.
		LO4	H	Compose documentations of the same system targeting different users.	* Discussed and learnt what to keep in mind when producing documentation of a system for different users.
		LO5	H	Carry out a timing analysis to assess the eligibility of the Raspberry Pi for further system implementation.	* Measured and analysed the time consumption of the complete algorithm upto now, to assess the eligibility of Raspberry Pi for further implementation.

Undergraduate				Supervisor	
Name	B.P.			Name	J. A. L. Jayasinghe
Student ID	180631J	Field	EN	Position	L.E. ROBOTICS (PVT.) LTD.
Signature	<u>Dijurum</u>			Signature	<u>Jalene</u> Engineer - In - Charge
Date	29/03/2022			Date	10/05/2022

FOUR WEEKLY EXPECTED OUTCOMES FOLLOW-UP REPORT

#	PO Ref	LO Ref		Structured Training Program Items	Activity Carried Out Under <small>(You may generate a list of activities carried out and the list number can be mentioned here. A single activity can be considered for more than one learning outcome achievement)</small>
		No.	Scale (H,L,M or N/A)		
1	P01	LO2	H	Develop a graphical user interface (GUI) for camera calibration.	* Designed the appearance of the application in such a way that it can be easily used by an inexperienced person. * Implemented the associated algorithms from scratch.
		LO3	L	Discussion on how to hide the technical complexity of an engineering solution.	* Designed an intuitive interface for the camera calibration application. * Added interactive guidelines / button enabling / disabling functionality to make it easy to use.
		LO4	L	Demonstrate the functionality of the developed software to the supervisor.	* Demonstrated the functionality of the camera calibrator application to the supervisor to receive the further instructions and a feedback for the improvements.
2	P02	LO1	L	Research literature to find out efficient / reliable ways for camera calibration.	* Carried out a literature survey to find out various methods to calibrate cameras in an industrial setting. * Compared the feasibility study of the found methods.
		LO4	L	Presentation of the various methods of camera calibration.	* Discussed feasibility of the found camera calibration techniques with the supervisor. * Decided a suitable method for the implementation.
3	P03	LO4	L	Develop a graphical user interface for camera calibration.	* Developed a windows software for camera calibration which generates required data to run the object detection framework successfully.
4	P05	LO2	H	Develop a graphical user interface for camera calibration.	* Used visual studio 2019 software to design the mentioned software. * Used "Bif" version controller to track the development process of the software.
5	P06	LO3	H	Develop a graphical user interface for camera calibration.	* Designed and implemented a windows software for camera calibration in such a way that a beginner can adopt it easily as the technical complexity is hidden well.
		LO4	M	Composition of the user manual for the developed software.	* Composed a beginner friendly user manual for the software in such a way that the user does not need any literature specific knowledge to maintain / use it.
		LO5	H	Evaluation of various graphical camera calibration methods in terms of their financial feasibility.	* Investigated about low cost and simple and reliable camera calibration methods to be integrated into the object detection framework (the windows software).

				N/A	N/A
6	P07	LO5	L	Evaluation of the various camera calibration methods to find an economically sustainable solution.	* Evaluated various camera calibration methods used in literature to find out their economical sustainability and validity of the method for longer run of production.
7	P08	LO3	M	Discussion on the importance of meeting deadlines and achieving goals within allocated time period.	* Discussed about the importance of achieving targets within allocated time period. * Discussed about the actions an employee can take to minimize the impact, if he is unable to do so.
		LO4	L	Demonstration of the performance of the developed camera calibrator application.	* Demonstrated the performance of the developed software to the supervisor for his feedback. * Made requested changes to the application to meet standards.
8	P09	LO4	H	Discussions with supervisor to get to know about previously developed ODIS.	* Discussed and got to know about the requirements to be fulfilled by the application developed by me to be compatible with the robot's main software.
9	P10	LO1	L	Decomposition of the user manual of the developed application.	* Composed a beginner friendly user manual, describing how to use the software for effective camera calibration.
		LO4	M	Demonstration of the working of the developed camera calibration application.	* Demonstrated how to operate the developed software for effectively calibrate a camera. (Value to the software)
		LO5	H	Presentation of the results obtained by evaluating various camera calibration methods.	* Identified possible improvements that can be done to add more features. * Presented the results obtained by evaluating various camera calibration methods to find the most sustainable solution. * Received feedback from the supervisor on the results.
10	P11	LO1	L	Feasibility study on various camera calibration methods used in computer vision literature.	* Carried out a feasibility study on various camera calibration methods to find out the ideal solution for my allocated task.
		LO4	M	Composition of user manual for the software.	* Composed a beginner friendly user manual for the software so that anyone without much knowledge can easily adopt the software in future.
		LO5	L	Evaluation of various camera calibration methods in terms of their financial feasibility.	* Camera calibration is just a single part of my allocated task. Therefore financial feasibility must be considered at first place. of several calibration methods were considered, prior to deciding what to implement. (make changes or)

11	P12	LO1	M	Development of a user interface for camera calibration.	* Learnt various techniques to hide the technical complexity of an engineering solution from a non-tech-savvy people. * And the importance of doing so.
		LO3	M	Discussion on the importance of meeting deadlines and achieve targets within the given time.	* Learnt about various actions an employee can take in order to minimize the effect of not able to meet deadlines.
		LO4 LO5	H	Evaluation of various camera calibration methods in terms of their technical / financial feasibility.	* Learnt the importance of having an overall picture of the project you are involved in, so that one can decide what to focus more and best way to manage.
		LO3 LO4	H	Demonstration of the working of developed windows software.	* Learnt various industry standards, we have allocated budget to follow when developing software solutions eg: programming styles / design decisions related to user interface layout.

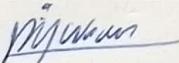
Undergraduate				Supervisor	
Name	THALAGALA Bo P.			Name	J. A. L. Jayasinghe
Student ID	180631J	Field	EN	Position	L.E. ROBOTICS (PVT.) LTD.
Signature	<u>Thalagala</u>			Signature	<u>Jahneb</u> Engineer - In - Charge
Date	31/05/2022			Date	31/05/2022

FOUR WEEKLY EXPECTED OUTCOMES FOLLOW-UP REPORT

#	PO Ref	LO Ref		Structured Training Program Items	Activity Carried Out Under <i>(You may generate a list of activities carried out and the list number can be mentioned here. A single activity can be considered for more than one learning outcome achievement)</i>
		No.	Scale (H,L,M or N/A)		
1	P01	LO2	H	Developing a graphical user interface to train an image classification model.	<ul style="list-style-type: none"> * Designed the layout of the application in such a way that it can be easily used by an inexperienced user. * Implemented associated algorithms using from scratch. * Added interactive for guidelines to the software for "novice" users. * Integrated button enabling/disabling effect to the buttons of application to avoid any misuse of the app. * Demonstrated the functionality of the application to the supervisor to receive further instruction on improving the user experience.
		LO3	L	Discussion on hiding technical complexity of an engineering solution, from the user.	<ul style="list-style-type: none"> * Integrated button enabling/disabling effect to the buttons of application to avoid any misuse of the app.
		LO4	L	Demonstration of the application to the supervisor, for getting some feedback.	<ul style="list-style-type: none"> * Demonstrated the functionality of the application to the supervisor to receive further instruction on improving the user experience.
2	P02	LO1	L	Carrying out a literature survey on on efficient image classification methods.	<ul style="list-style-type: none"> * Conducted a literature survey to find out efficient methods to classify images in an industrial setting. * Compared the technical feasibility of the found methods.
		LO4	L	Presentation of various image classification methods that are suitable for an industrial setting.	<ul style="list-style-type: none"> * Presented the pros and cons of the found image classification methods to the supervisor to get some setting. feedback. * Decided what method to implement.
3	P03	LO4	L	Developing a graphical user interface to train an image classification model.	<ul style="list-style-type: none"> * Developed a windows graphical User Interface for training an image classification model. It is is capable of generating required data to run the object detection framework.
4	P05	LO2	H	Developing a graphical user interface to train an image classification model.	<ul style="list-style-type: none"> * Used a Machine learning technique named as Support Vector Machines (SVM) to classify images. It uses what is known as SIFT (Scale Invariant Features) as input and output.
5	P06	LO3	H	Developing a graphical user interface to train an image classification model.	<ul style="list-style-type: none"> * Designed and implemented a windows GUI the class of an image for training an image classification model, in such a way that a beginner can adopt the software easily, as the technical complexity is high.
		LO4	M	Composing a user manual for the developed GUI.	<ul style="list-style-type: none"> * Composed a beginner friendly user manual hidden well-manually, in such a way that the user of the application does not need any field specific knowledge to use it.
		LO5	H	Evaluation of various image classification methods in terms of their and technical/feasibility financial	<ul style="list-style-type: none"> * Investigated about low cost and image classification methods that are robust in an industrial setting. * Because the machine learning model can be trained easily and with a minimum effort and should have reasonable accuracy.

6	P07	LO5	L	N/A	
					N/A
7	P08	LO3	M	composition of the user manual for the new developed windows software.	* learnt the importance of properly documenting the work carried out, when when handing over / preserving a project for for further developments.
		LO4	L	Demonstration of the performance of the developed windows graphical user interface (GUI)	* Demonstrated the performance of the developed software to the supervisor for his feedback, and made requested changes in the layout design and algorithm to meet standards.
8	P09	LO4	H	N/A	N/A
9	P10	LO1	L	Composition of the user manual for the developed image classification model trainer app	* Composed a beginner friendly user manual describing how to use the software for training an image classification model and export necessary data.
		LO4	M	Demonstration of the working of the developed windows application.	* Demonstrated how to operate the developed to train an unbiased classification model. * Identified possible improvements that can be done done to add more value to
		LO5	H	Presentation of the results of the technical / financial feasibility study of image classification methods	* Presented the results of the feasibility study the software to choose the most suitable image classification method for the given industrial setting.
10	P11	LO1	L	Technical / financial feasibility on various commercial applications image classification methods methods	* carried out a feasibility study on various image classification methods to find out the ideal solution for my allocated task, of building an object detection framework.
		LO4	M	Composition of the user manual of the mentioned windows GUI.	* Composed a beginner friendly user manual for the software so that anyone without much knowledge, can easily adopt the software / or can make changes to it in future.
		LO5	L	Evaluation of various image classification methods, in terms of their technical / financial feasibility	* Image / object classification is just a single part of my allocated task. Therefore technical and financial feasibility of several classification methods were considered, prior to deciding what to implement.

11	P12	LO1	M	Development of a Graphical User Interface for training an image classification model.	a machine learning concept called support vector machines (SVMs), which are very powerful in classification tasks.
		LO3	M	Discussion on the importance of proper documentation of a project/work.	* Learnt about STFT (scale invariant feature transform) features in computer vision * Learnt the importance of properly documenting the work carried out when handing over / preserving a project for further development.
		LO4	H	Demonstration of the working of the developed windows software.	* Learnt various industry standards / professional ethics that should be respected when developing industry level softwares.
		LO5	H	Evaluation of various image classification methods in terms of their technical / financial feasibility.	* Learnt the importance of giving attention to the allocated budget / when making design decisions related to various parts of the project. (and available resources)

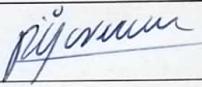
Undergraduate				Supervisor	
Name	THALAGALA Bo Po			Name	J.A.L. Jayasinghe
Student ID	180631J	Field	EN	Position	L.E. ROBOTICS (PVT.) LTD. Engineer - In - Charge
Signature				Signature	 Engineer - In - Charge
Date	14/06/2022			Date	15/06/2022

FOUR WEEKLY EXPECTED OUTCOMES FOLLOW-UP REPORT

#	PO Ref	LO Ref		Structured Training Program Items	Activity Carried Out Under (You may generate a list of activities carried out and the list number can be mentioned here. A single activity can be considered for more than one learning outcome achievement)
		No.	Scale (H,L,M or N/A)		
1	P01	LO2	H	Interfacing the computer vision subsystem to the main robot controller.	* Interfaced the developed computer vision module to the main robot controller using UART (Universal Asynchronous Receiver Transmitter circuitry).
		LO3	L	Analyzing the existing program of the robot's controller to identify its requests.	* Vision system was needed to be compatible with the existing robot. Therefore, robot's controller's code was analyzed thoroughly to understand how it communicates with vision module.)
		LO4	L	Demonstration of the basic communication between the robot and the computer vision module.	* Demonstrated the basic communication between robot and the vision module. That includes handshaking between two system to properly synchronize with each other.
2	P02	LO1	L	Analyzing the existing program of the robot's controller to identify how it communicates.	* Analyzed the program of the main robot to understand how it communicates with the a vision module.
		LO4	L	Presented the presentation of the required changes in the vision system to be compatible with the robot.	* Configured the computer vision module to be compatible with that program. * Presented the modifications that should be done on the computer vision subsystem, for it to be compatible with the robot. * Feedbacks were received also.
3	P03	LO4	L	Interfacing the computer vision subsystem to the main controller of the robot for operation.	* Modified the program of the object detection framework to communicate with robot. Because vision system's purpose was to provide data of detected objects, to the robot for further processing.
4	P05	LO2	H	Interfacing the computer vision subsystem to the main controller of the robot.	* Used oscilloscope with the help of the Supervisor to debug some of the issues found in the communication between the robot and vision unit.
5	P06	LO3	H	Discussion on the importance of documenting the undertaken project when it's handed over.	* Received information related to the best practices that should be followed when composing documentation of a project when it is handed over.
		LO4	M	Demonstration of the core functionality of the vision unit, during operation of pick and place machine.	* Presented the possible further development areas of the vision unit, as it will be useful for future development of the system, for someone else.
		LO5	H	N/A	* Documented such areas of developments.

6	P07	LO5	L	N/A	
					N/A
7	P08	LO3 LO4	M	Documentation of the developed computer vision unit.	* Documented the installation procedure of the vision unit in order to hand over the project, prior to leave the company. * Created a backup folder including everything to setup and integrate vision unit and integrate it to robot.
		LO4 LO3	L	Discussion on the importance of documenting the work carried out when leaving the company.	* Received instructions on how to properly document a project when it's handed over.
8	P09	LO4	H	Interfacing the computer vision unit to the pick and place machine.	* Worked together with the supervisor and another employee of the company to integrate vision module to the robot. * Debugged some problems.
9	P10	LO1	L	Documentation of the developed computer vision unit.	* Documented the installation procedure of the vision unit and method of integration it to the main pick and place machine.
		LO4	M	Presentation of the basic functionality of the vision unit during operation.	* Presented the functionality of the vision module to the supervisor, during the operation of the pick and place machine (communication between the two entities.)
		LO5	H	N/A	N/A
10	P11	LO1	L	Documentation of the developed computer vision system.	* Documented the installation and integration procedure of the computer vision system, in order to hand over the project to the company for future use.
		LO4	M	Presentation of the core functionality of the vision unit, during operation.	* Presented the core functionality of the vision unit to the supervisor, during the operation of the pick and place machine. * Showed the methods of further development of the computer vision unit to the supervisor.
		LO5	L	N/A	N/A

11	P12	LO1	M	Interfacing the computer vision unit to the main pick and place machine.	* learnt how to integrate two embedded systems to function as a single unit, using various communication protocols. * learnt various debugging methods, useful in such scenarios.
		LO3	M	Documentation of the developed computer vision unit.	* Documented installation and integration procedure scenario of the vision unit, in order to hand over the project to the company for further developments.
		LO4	H	Demonstration of the core functionality of the vision unit during operation of pick & place machine.	* Learnt how to demonstrate a finalized project when the project is handed over to the company when leaving. * learnt the importance of showing areas of development undertaken project when leaving a company
		LO5	H	N/A	N/A

Undergraduate				Supervisor	
Name	Thalagala Bo Po			Name	J. A. L. Jayasinghe
Student ID	180631J	Field	EN	Position	L.E. ROBOTICS (PVT) LTD.
Signature				Signature	Engineer - In - Charge
Date	25/06/2022			Date	28/06/2022