

Bachelor of Electrical and Electronics Engineering with Honors

EEE4336 INDUSTRIAL TRAINING

FINAL REPORT

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# Abstract

This report details the task performed and experience gained as an intern at Cheng Hua Engineering Works Sdn. Bhd. from 2021-06-01 to 2021-08-20 as a part of the third year Industrial Training course (EEE4336).

Overall this report will explain in detail the background of the company, the description of all the tasks and projects performed, and finally an analysis of the problems that occurred during the internship both in the technical, and management aspects.

The internship was divided into three phases:

Phase 1: Understand warehouse operations, and system architectures.

Phase 2: Feasibility study, and researching existing AGV systems.

Phase 3: Product development.

It will mainly focus on Phase 3, where an attempt was made to develop electronics and software systems for a QR code guided Automated Guided Vehicle (AGV) fleet for the purpose of carrying a 5kg load in a 3 meter high warehouse designed to store e-commerce goods. This part introduces the industrial context which necessitates this development, followed by the process by which the design concept came to being, followed by the testing and prototyping stages, then the critical analysis of the problems faced during these stages. Also highlighted are the the administrative aspects of the product development such as cost management, time management, role delegation, and potential future work that can be done on top of what was left off.

It must be noted that due to time constraints the full prototype is yet to be completed. The focus thus would be on the camera QR detection, communication between AGV and server, and motor control.

Since I was working with another intern, Sara Hany Tawfik Hussien, when doing this project, the aspects of the work I completed will be the focus while referencing S.. Hussien’s work if needed.

# Acknowledgement

Firstly, I sincerely express my gratitude to Mr. Chris Chong Hock Siong for going through the extra effort to personally help us find this internship opportunity in the first place, at a time when, due to the pandemic, many students including us were unsuccessful in our endeavor to find a placement on our own. Also great thanks to your continued support as our academic supervisor during and after the internship.

I would also like to give special thanks to Mr. Tan Chung Men, industrial supervisor, for being a patient, big brother figure for us, and an excellent guide to the real world of industrial product design. Without you, our tasks surely wouldn’t have been completed.

Next, I would like to thank my co-intern Sara Hussien, who was so much more than a wonderful teammate, and an inspiration for me to always keep striving to hone my skills.

Finally, I would like to thank Electrical Engineering department of SEGi University for providing us with this course; and Mr. Sam, Ms. Penny Tan, Mr. Yew, Mr. Gan et al. from Cheng Hua.

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# Chapter 1: Introduction

This report will focus on the tasks performed during Phase 3, since it was the bulk of the internship, and Phase 1, and 2 acted as a background study in this case.

As industrialization and automation further entrenches itself within all aspects of society, it is essential for any business to improve its performance by upgrading technology in terms of robotics, information management, and automation. This is especially true in industries traditionally reliant on manual labor, in order to reduce costs, improve workplace efficiency, improve safety, and ensure feedback data collection for further improvement.

In the warehouse management industry it is no different. In the previous decades, various types of warehouses have implemented various types of robots, such as AGVs, AMRs, etc. to simplify and automate the industry practices of put away, replenishment, storage, picking and so on, each with its own specialty. Large e-commerce companies such as Alibaba and Amazon are examples where the implementation have yielded great results, thus encouraging middle and smaller businesses to innovate in these fields, and produce machines that join the competition and aim to be adopted by other e-commerce companies that would like to repeat this success.

As interns at Cheng Hua Engineering Works, our task was to aid in the early development of an AGV system that could, at the very minimum, have a fleet of AGVs that could each carry a load of 5kg, move in a 4-way grid fashion, and automatically navigate to any desired location on a single floor of a warehouse, without any collision, based on detecting coordinates encoded in QR codes pasted on the ground.

By the time this report was written, due to constraints that will be discussed later, preliminary work has been done on the QR detection, communication between AGV and server,motor control, object avoidance, and navigation algorithm.

# Chapter 2: Company Background

# Chapter 3: Description of Tasks and Project

# Chapter 4: Problems Occurred and Description

# Conclusion

# References

# Appendix