

**UNIVERSITI TEKNOLOGI MARA
CAWANGAN PULAU PINANG**

**FRIDGE LOAD MANAGEMENT
SYSTEM WITH ARTIFICIAL
INTELLIGENCE (AI) AND
INTERNET OF THINGS (IOT)
ALERT**

**AG KU IZZUL HAMZI BIN
AG JAAFAR**

**BACHELOR OF ENGINEERING
(HONS) ELECTRICAL AND
ELECTRONIC ENGINEERING**

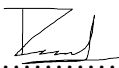
July 2020

AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations, Universiti Teknologi MARA, regulating the conduct of my study and research.

Name of Student : Ag Ku Izzul Hamzi bin Ag Jaafar
Student I.D. No. : 2016263884
Programme : Bachelor of Degree (Electrical and Electronic
Engineering) – EE200
Faculty : Electrical Engineering
Thesis : Fridge Load Management System With Artificial
Intelligence (Ai) And
Internet Of Things (Iot) Alert

Signature of Student : 

Date : July 2020

ABSTRACT

The technological development nowadays has allowed the use of smart appliances and machines almost anywhere. The refrigerator is considered one of the most significant appliances that is being used in almost every place for the purpose of storing foods, drinks, and medicines at cold temperatures, and in a sealed place to avoid it from being exposed. When drinks are out of stock, the seller sometimes forget to restock. Moreover, to prevent the content of the refrigerator from out of stock, the seller needs to check the refrigerator from time to time. When the seller needs to restock, he or she needs to make a list of what drinks are out of stock and need to be restocked. Therefore, a system is introduced which can manage fridge load with AI and IoT alert. Using object detection, the system is able to detect types of drinks which are cans and bottles. The dataset images of cans and bottles is trained using two models, Faster R-CNN and SSD mobilenet. The system will count the number of drinks detected by the camera, which the data obtained is sent to IoT cloud which is Ubidots. The Ubidots dashboard will show the number of drinks detected and the stock availability. In the same time, if the number of drinks detected is zero, it will send a notification to the Telegram to alert the user that the drinks are out of stock. Faster R-CNN model get the accuracy of 97% and above in detection the drinks while 66% - 75% accuracy can be achieved when using SSD mobilenet for the drinks detection. Using this system is better since it only need to use a camera as the medium to detect products instead of using many sensors which cause wiring hassle.

ACKNOWLEDGEMENT

First and foremost, I would like to express my utmost gratefulness to God Almighty Allah for giving me strength, wisdom and perseverance to successfully complete this Final Year Project thesis for this course.

My gratitude and thanks go to my supervisor Ts Dr. Zainal Hisham Che Soh for his patient guidance, enthusiastic encouragement and useful critiques of this proposed work. I would also like to thank her, for advising and assistance in keeping my progress on schedule.

My appreciation goes to my friends from the UiTM Cawangan Pulau Pinang who provided help and support during this final semester.

Finally, this thesis is dedicated to my lovely family for the vision and determination to educate me. This piece of victory is dedicated to all of you. Alhamdulillah.

TABLE OF CONTENTS

	PAGE
AUTHOR'S DECLARATION	i
ABSTRACT	ii
ACKNOWLEDGEMENT	iii
TABLE OF CONTENTS	iv
LIST OF TABLES	vi
LIST OF FIGURES	vii
LIST OF APPENDICES	ix
LIST OF SYMBOLS	x
LIST OF ABBREVIATIONS	xi
CHAPTER 1 INTRODUCTION	1
1.1 Overview	1
1.2 Problem Statement	2
1.3 Objective	3
1.4 Significance Of Study	3
1.5 Scope Of Work And Limitation	3
1.6 Thesis Structure	4
CHAPTER 2 LITERATURE REVIEW	6
2.1 Overview	6
2.2 Object Technologies In Identifying And Differentiating Products In The Fridge	6
2.3 Computing Platforms And Technologies Used To Construct The Smart Refrigerator System Architectures	11
CHAPTER 3 METHODOLOGY	14
3.1 Overview	14
3.2 Hardware	15
3.3 Software	16

3.4	System Analysis And Design	16
3.5	Object Detection	16
3.6	Dataset	20
3.6.1	Setup Anaconda (Python)	21
3.6.2	Setup Tensorflow And Anaconda Virtual Environment	21
3.6.3	Gather And Label Pictures	21
3.6.4	Generate Training Data	23
3.6.5	Create Label Map And Configure Training	24
3.6.6	Run Training	25
3.6.7	Export Inference Graph	26
3.7	Iot Cloud	26
3.8	Notification Alert	29
CHAPTER 4 RESULTS AND DISCUSSION		32
4.1	Dataset Training Result	32
4.2	Detection Result	35
4.3	Iot (Ubidots) Display Result	39
4.4	Notification Alert (Telegram) Result	40
CHAPTER 5 CONCLUSION AND FUTURE WORK		41
5.1	Conclusion	41
5.2	Future Work	41
REFERENCES		43
APPENDICES		45