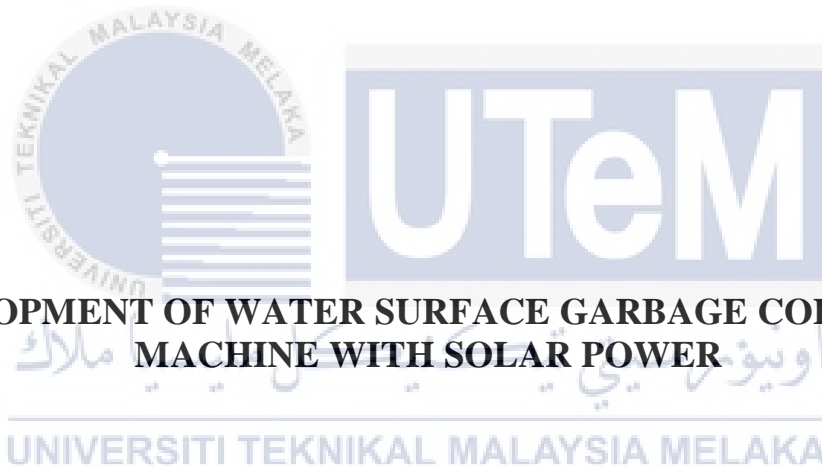




Faculty of Electrical and Electronic Engineering Technology



**DEVELOPMENT OF WATER SURFACE GARBAGE COLLECTOR
MACHINE WITH SOLAR POWER**

LUQMAN NULHAKIM BIN ABDUL KADIR

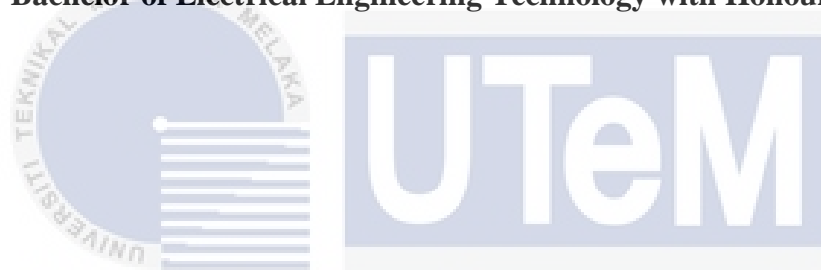
Bachelor of Electrical Engineering Technology with Honours

2022

**DEVELOPMENT OF WATER SURFACE GARBAGE COLLECTOR MACHINE
WITH SOLAR POWER**

LUQMAN NULHAKIM BIN ABDUL KADIR

**A project report submitted
in partial fulfillment of the requirements for the degree of
Bachelor of Electrical Engineering Technology with Honours**



Faculty of Electrical and Electronic Engineering Technology

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2022

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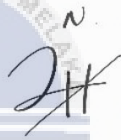
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DECLARATION

I declare that this project report entitled “Development of Water Surface Garbage Collector Machine with Solar Power” is the result of my own research except as cited in the references. The project report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

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APPROVAL

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Date : 13/01/2023



APPROVAL

I hereby declare that I have checked this project report and in my opinion, this project report is adequate in terms of scope and quality for the award of the degree of Bachelor of Electrical Engineering Technology with Honours.

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13/01/2023

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Date :

DEDICATION

First of all, thanks to Allah Almighty for providing me with strength and good health throughout this Final Year Project. To my beloved mother, Suziana, and father, Abdul Kadir, who have never stopped supporting and motivating me throughout my life and journey in Universiti Teknikal Malaysia Melaka. Also, thanks to my supervisor, Associate Professor Mohd Ariff bin Mat Hanafiah, who has always been supportive and helpful in completing my final year project. Last but not least, my sincere thank you to my sisters, Dhamirah Nabiilah and Dhamirah Hadirah that always help me in giving idea, advising and solving problem.



ABSTRACT

Urban expansion and population growth have led to an ever-growing demand for water while also increasing water pollution in Malaysia. In Malaysia, the quality of water is a major concern as well as access to water in general. Domestic, agricultural, navigational, hydroelectric, commercial and recreational water resources are all provided by lakes and reservoirs. Rivers' pollution has been a major concern as 98% of water comes from rivers. Malaysia's Department of Environment reports that 195 rivers are slightly polluted and 34 are polluted. In Selangor only, 30 rivers are slightly polluted while three rivers are completely polluted. In addition, The Klang River has become one of Malaysia's most polluted rivers as it is frequently used as a quick waste dump. This project presents a proper procedure to build a water surface garbage collector machine with solar power. The machine will use NodeMCU ESP8266 as the micro-controller. The machine navigation will be controlled by Blynk app that can be installed in both Android or iOS devices. The machine will also be powered by battery as well as solar panel where it will draw solar power to continuously charge the battery. It will assure the machine to operate in a long time. This machine will collect garbage on water surface and unload them in the tray. This project indicates the ability to control the machine in order to collect garbage on water surface thus reduce river pollution.

ABSTRAK

Peluasan bandar dan pertumbuhan penduduk telah membawa kepada peningkatan terhadap permintaan air sekaligus meningkatkan pencemaran air di Malaysia. Di Malaysia, kualiti air merupakan isu utama yang diberi perhatian serta akses kepada air secara amnya. Sumber air domestik, pertanian, pelayaran, hidroelektrik, komersial dan rekreasi disediakan daripada tasik dan takungan. Pencemaran sungai telah menjadi kebimbangan utama dimana 98% air berasal daripada sungai. Jabatan Alam Sekitar Malaysia melaporkan bahawa 195 sungai sedikit tercemar dan 34 sungai tercemar. Di Selangor sahaja, 30 sungai sedikit tercemar manakala tiga sungai tercemar sepenuhnya. Selain itu, Sungai Klang juga telah menjadi salah satu sungai yang paling tercemar di Malaysia kerana sungai ini sering digunakan sebagai tempat pembuangan sampah. Oleh itu, projek ini akan membentangkan prosedur yang tertib untuk membina sebuah 'Water Surface Gargabe Collector Machine with Solar Power'. Mesin ini akan menggunakan NodeMCU ESP8266 sebagai pengawal mikro. Navigasi mesin akan dikawal oleh aplikasi 'Blynk' yang boleh dimuat turun sama ada dalam peranti Android atau iOS. Mesin ini jugan mendapat kuasa daripada bateri serta panel solar di mana panel ini akan menarik kuasa solar untuk mengecas bateri secara berterusan. Ini akan memastikan mesin untuk beroperasi dalam jangka masa yang lama. Mesin ini akan mengumpul sampah di permukaan air dan akan disimpan di dalam tempat penyimpanan sampah. Projek ini menunjukkan keupayaan mesin untuk mengumpul sampah di permukaan air sekaligus mengurangkan pencemaran sungai.

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TABLE OF CONTENTS

	PAGE
ABSTRACT	i
ABSTRAK	ii
ACKNOWLEDGEMENTS	iii
TABLE OF CONTENTS	i
LIST OF TABLES	iv
LIST OF FIGURES	vi
LIST OF SYMBOLS	ix
LIST OF ABBREVIATIONS	x
LIST OF APPENDICES	xi
CHAPTER 1 INTRODUCTION	1
1.1 Background	1
1.2 Problem Statement	3
1.3 Project Objective	4
1.4 Scope of Project	5
1.5 Thesis Organization	5
CHAPTER 2 LITERATURE REVIEW	7
2.1 Introduction	7
2.2 Past Studies	7
2.3 IoT as A Water Surface Cleaning Medium	11
2.3.1 Why using IoT?	12
2.3.2 The Need of Automatic Garbage Collector Machine	13
2.4 Garbage Collector Machine	15
2.4.1 Comparison of Components	15
2.4.1.1 Microcontrollers	15
2.4.1.2 Motor Driver	16
2.5 Solar as Power Supply	18
2.5.1 Type of Solar Panel	19
2.5.1.1 Monocrystalline	19
2.5.1.2 Polycrystalline	20
2.5.1.3 Thin-film Solar Panel	20
2.5.1.4 HIT Solar Panel	21
2.5.2 Type of Solar Power System	22
2.5.2.1 Grid-tied Solar Power System	22
2.5.2.2 Off-grid Solar Power System	23
2.5.2.3 Hybrid Solar Power System	24

2.5.3	Solar Tilt Angle	25
2.5.4	Shading on Solar Panel	27
2.6	Battery Storage	28
2.6.1	Type of Battery Storage	28
2.6.1.1	Sealed Lead Acid (SLA)	28
2.6.1.2	Nickel Cadmium (NiCd)	29
2.6.1.3	Nickel Metal Hydride (NiMH)	29
2.6.1.4	Lithium Iron Phosphate (LiFePO ₄)	30
2.6.1.5	Lithium Ion Polymer (LiPol)	31
2.7	Best Component to be Used	32
2.7.1	Microcontroller	32
2.7.2	Motor Driver	32
2.7.3	Solar Panel	33
2.7.4	Battery (Energy Storage)	33
2.8	Summary of Literature Review	34
2.9	Summary	42
CHAPTER 3 METHODOLOGY		43
3.1	Introduction	43
3.2	Methodology	43
3.3	Project Characteristics	47
3.3.1	System of The Project	47
3.4	Software and Component	48
3.4.1	Software	48
3.4.1.1	Proteus	48
3.4.1.2	Arduino IDE	49
3.4.1.3	Blynk Application	50
3.4.1.4	AutoCAD Software	51
3.4.2	Component Used	52
3.4.2.1	NodeMCU ESP8266	52
3.4.2.2	L298N Motor Drive	53
3.4.2.3	Solar Charge Controller	54
3.4.2.4	DC Motor	55
3.4.2.5	Solar Panel	56
3.4.2.6	Battery Storage	56
3.5	Motor Sizing Calculation	57
3.6	Solar Panel Calculation	61
3.7	Battery Calculation	62
3.7.1	System Specific Requirements	62
3.7.2	Average Daily	62
3.7.3	Battery Bank Capacity, Wh	62
3.7.4	Battery Bank Capacity	63
3.8	Solar Charge Controller Calculation	63
3.9	Summary	63
CHAPTER 4 RESULTS AND DISCUSSIONS		64
4.1	Introduction	64
4.2	Preliminary Results	64
4.2.1	Initial Design of Water Surface Garbage Collector Machine	64

4.2.2	Circuit Design	66
4.2.3	Initial Arduino IDE Coding	68
4.2.4	Project Planning – Cost	69
4.2.5	Project Potential of Commercialization	70
4.3	Result and Analysis	71
4.3.1	Hardware Circuit	71
4.3.2	Garbage Collector Machine Design	72
4.3.3	Solar and Battery Calculation	73
4.3.3.1	Required Torque	73
4.3.3.2	Solar Panel Calculation	73
4.3.3.3	Battery Calculation	74
4.3.4	Parameter Analysis	75
4.3.4.1	Motor Movement	75
4.3.4.2	Results When Operating the Machine	75
4.3.4.3	Battery Charging using Solar Panel	80
4.3.5	Parameter Results	82
4.3.5.1	Machine Operation	82
4.3.5.2	Battery Charging using Solar Panel	83
4.3.6	Blynk Application (Control)	85
4.3.6.1	Mobile Dashboard	85
4.4	Summary	86
CHAPTER 5 CONCLUSION AND RECOMMENDATIONS		87
5.1	Conclusion	87
5.2	Objective Achievement	88
5.3	Future Works	89
REFERENCES		90
APPENDICES		93

LIST OF TABLES

TABLE	TITLE	PAGE
Table 2.1	Top 20 Countries Ranked According to Annual Plastic Emission into Ocean	14
Table 2.2	Differences between Arduino UNO and NodeMCU ESP8266	15
Table 2.3	The Difference Between L298N Motor Drive and L293D Motor Drive	16
Table 2.4	Advantages and Disadvantages of Monocrystalline Solar Panel	19
Table 2.5	Advantages and Disadvantages of Polycrystalline Solar Panel	20
Table 2.6	Advantages and Disadvantages of Thin-film Solar Panel	21
Table 2.7	Advantages and Disadvantages of HIT Solar Panel	22
Table 2.8	Advantages and Disadvantages of Grid-tied Solar Power	23
Table 2.9	Advantages and Disadvantages of Off-grid Solar Power	24
Table 2.10	Advantages and Disadvantages of Hybrid Solar Power	25
Table 2.11	Advantages and Disadvantages of Sealed Lead Acid Battery.	28
Table 2.12	Advantages and Disadvantages of Nickel Cadmium Battery	29
Table 2.13	Advantages and Disadvantages of Nickel Metal Hydride Battery	30
Table 2.14	Advantages and Disadvantages of Lithium Iron Phosphate Battery	31
Table 2.15	Advantages and Disadvantages of Lithium Ion Polymer Battery	31
Table 2.16	Summary of Literature Review	34
Table 3.1	Solar Panel Characteristics	56
Table 3.2	Characteristic of SLA Battery	57
Table 4.1	Main Components of Garbage Collector Machine	66
Table 4.2	Component Pin to Arduino	67
Table 4.3	L298N Motor Driver Component Pins	67
Table 4.4	Price List for Project Hardware	69

Table 4.5 Present Garbage Collector Machine in the Market	70
Table 4.6 Motor Movement	75
Table 4.7 Machine Operated without Solar as Supply	76
Table 4.8 Machine Operated with Solar as Supply	76
Table 4.9 Battery Voltage without Solar Panel Attached After 30 Minutes of Operation	77
Table 4.10 Battery Voltage with Solar Panel Attached After 30 Minutes of Operation	78
Table 4.11 Data of the Battery Charged using A Solar Panel for 30 Minutes	81



LIST OF FIGURES

FIGURE	TITLE	PAGE
Figure 1.1	Potential application domain of IoT	2
Figure 1.2	Process of Industrial Revolution	2
Figure 2.1	IoT as a Network of Networks	12
Figure 2.2	Global distribution of IoT projects among America, Europe and APAC	13
Figure 2.3	NodeMCU ESP8266	16
Figure 2.4	Arduino UNO	16
Figure 2.5	L298N Motor Drive	17
Figure 2.6	L293D Motor Drive	17
Figure 2.7	The Working of Solar Energy	18
Figure 2.8	Monocrystalline Solar Panel	19
Figure 2.9	Polycrystalline Solar Panel	20
Figure 2.10	Thin-film Solar Panel	21
Figure 2.11	HIT Solar Panel	22
Figure 2.12	Grid-tied Solar Power	23
Figure 2.13	Off-grid Solar Power	24
Figure 2.14	Off-grid Solar Power	25
Figure 2.15	a) The Optimum Tilt Angle Versus Month for Five Locations In Malaysia b) Monthly Average Solar PV Energy Production for Five Locations In Malaysia	26
Figure 2.16	Latitude Angle at Different Site in Malaysia	26
Figure 2.17	Relation Between Latitude Angle and Optimum Tilt Angle	27
Figure 2.18	Effect of Shading on Solar Panel	27
Figure 2.19	Sealed Lead Acid Battery	28

Figure 2.20 Nickel Cadmium Battery	29
Figure 2.21 Nickel Metal Hydride Battery	30
Figure 2.22 Lithium Iron Phosphate Battery	30
Figure 2.23 Lithium Ion Polymer Battery	31
Figure 2.24 NodeMCU ESP8266	32
Figure 2.25 L298N Motor Driver	32
Figure 2.26 Monocrystalline Solar Panel	33
Figure 2.27 Sealed Lead Acid Battery	33
Figure 3.1 Project methodology flowchart BDP I	44
Figure 3.2 Project methodology flowchart BDP II	45
Figure 3.3 Flowchart of system project	47
Figure 3.4 Proteus Software	49
Figure 3.5 Arduino IDE software	49
Figure 3.6 Connectivity of Blynk App	50
Figure 3.7 AutoCAD Software	51
Figure 3.8 NodeMCU ESP8266	52
Figure 3.9 NodeMCU ESP8266 Pin Diagram	53
Figure 3.10 L298N Motor Drive	53
Figure 3.11 L298N Motor Drive Pin Diagram	54
Figure 3.12 Solar Charger Controller	54
Figure 3.13 The Working of Solar Charge Controller	55
Figure 3.14 DC Motor	55
Figure 3.15 Solar Panel	56
Figure 3.16 Sealed Lead Acid Battery	57
Figure 3.17 Motor Sizing Result	61
Figure 4.1 a) Isometric view b) Front view c) Back view d) Top view e) Side view	65

Figure 4.2 Project Hardware Circuit Design	67
Figure 4.3 Arduino IDE Initial Coding	69
Figure 4.4 Hardware Circuit	71
Figure 4.5 Hardware Circuit with Solar as Supply	71
Figure 4.6 Garbage collector machine design	72
Figure 4.7 Garbage Collector Machine with Solar Panel	72
Figure 4.8 Battery Voltage vs Time Graph	78
Figure 4.9 Battery Voltage vs Time Graph	79
Figure 4.10 Connection of The Solar Panel to The Battery	80
Figure 4.11 Connection of Solar Panel to The Hardware Circuit	80
Figure 4.12 Battery Voltage vs Time	81
Figure 4.13 Testing	82
Figure 4.14 Multimeter	83
Figure 4.15 Stopwatch	83
Figure 4.16 Testing on The Solar Panel Functionality	84
Figure 4.17 Multimeter	84
Figure 4.18 Solar Charge Controller	84
Figure 4.19 Blynk Application Mobile Dashboard	85
Figure 4.20 Controller Interface	85

LIST OF SYMBOLS

\$	-	US Dollar
°	-	Degree
ρ	-	Density coefficient of material
π	-	Pi
$\Delta\Theta / \Delta l$	-	Stopping accuracy
η	-	System efficiency
\approx	-	Almost equal to



LIST OF ABBREVIATIONS

V	-	Voltage
A	-	Ampere
W	-	Watt
Wh	-	Watt-hour
Ah	-	Amp-hour
RPM	-	Rotation per minute
hp	-	Horsepower
Nm	-	Newton meter
kgm ³	-	Density
s	-	Seconds
kg	-	Kilogram
mm	-	millimeter
mA	-	milliAmps



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LIST OF APPENDICES

APPENDIX	TITLE	PAGE
Appendix A	NodeMCU ESP8266 Technical Specification	93
Appendix B	L298N Motor Driver Technical Specification	94
Appendix C	Solar Panel 10W Technical Specification	95
Appendix D	Sealed Lead Acid Battery 12V 7.2Ah Technical Specification	96
Appendix E	12V 380RPM DC Motor Technical Specifications	97
Appendix F	Gantt Chart	98



CHAPTER 1

INTRODUCTION

1.1 Background

Nowadays, people live in a technologically driven environment, and it is an essential component of every individual's everyday life. There are several devices that are around people which will aid in making works easier which operate either manually or by the help of internet. In the past, prior to the development and invention of the internet, human did everything manually. This involved a lot of effort and required a long time to be done. Now, the technology has totally changed as internet is involved in everything that need to be done such as travelling, shopping, education and entertainment. As a result, the internet is now an essential component to people where it enables people to perform various tasks without the need for human intervention. Some examples that is now widely available in the market are medical sensors, smartwatches, smart mobiles and fitness trackers. All of these examples are related to the Internet of Things (IoT).

Internet of Things (IoT) refers to a collection of several sorts of everyday produced and gadget utilized in various sectors that are expanding the aspect of the internet. According to AbdelRahman H. Hussein (2019), the Internet of Things can also be referred as a networked system of uniquely addressable physical devices with varying degrees of sensing, processing and actual capabilities that share the capacity to interoperate and communicate over the Internet as common platform [16]. The increasing involvement of technology and IoT devices in daily lives, a significant transformation can be seen. IoT has also demonstrated its usefulness and potential in a developing region involving economic and

industrial growth as mentioned by Sachin Kumar, Prayag Tiwari and Mikhail Zymbler (2019) [17]. Figure 1.1 shows the potential application domains of IoT.

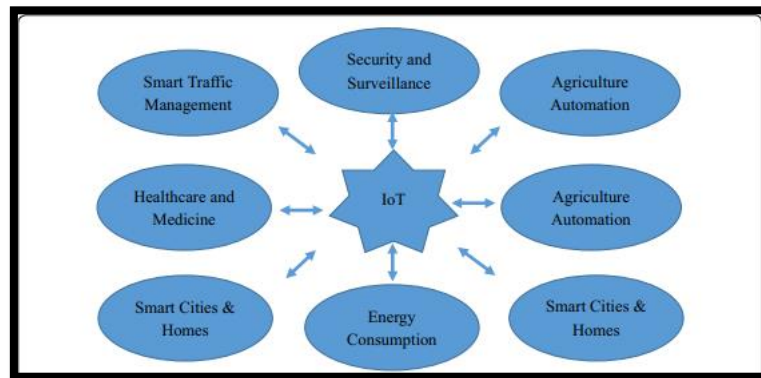


Figure 1.1 Potential application domain of IoT

Industrial revolution involves First Industrial Revolution where water and steam power were used to mechanise production. The Second employed electricity to mass produce good while the Third utilized electronics and computer technologies. The Fourth Industrial Revolution is now expanding on the Third where the digital revolution has been taking place since the mid-twentieth century. Figure 1.2 shows the process of Industrial Revolution.

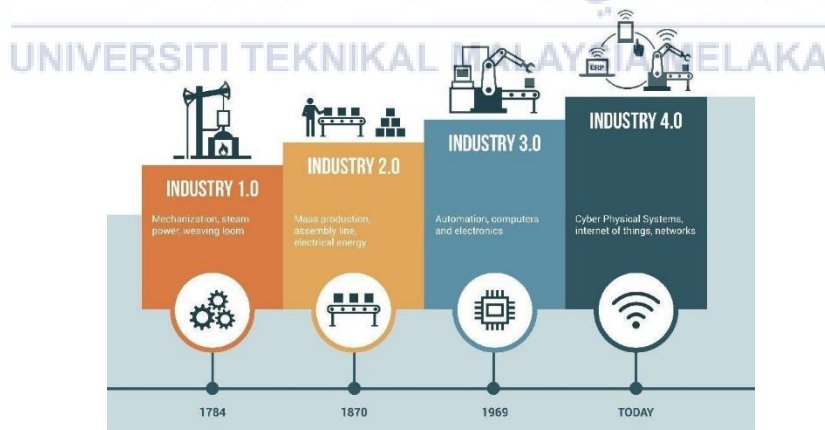


Figure 1.2 Process of Industrial Revolution

Industry 4.0 is a new phase of the Industrial Revolution that aspires to make industries smarter through automation, interconnection and real time data monitoring and

exchange. Internet of Things is connected to industry 4.0 where it is essential for the super-fast emergence of industry 4.0, in which everything is connected inside a shared network and processes which are mostly automated where it reduces the need for human participation.

As mentioned by Lourens J.J. Meijer, Tim van Emmerik, Ruud van der Ent, Christian Schmidt and Laurent Lebreton (2021), plastic pollution in rivers and oceans is a growing environmental threat, and deposition on riverbanks, beaches, and ocean surface is developing rapidly. It is claimed that 60% of all plastics ever produced have been dumped in the natural environment and in landfills [18].

1.2 Problem Statement

River gives many benefits to human as it will offer water for agriculture, domestic use, industry and power generation as well as a variety of other ecosystem functions and biodiversity values. Preserved rivers are very important to communities because it will provide a range of benefits to communities including clean water, improved quality of life and better local economy. Moreover, rivers that are in good condition serve communities, industries, and people's quality of life.

Therefore, river that are severely polluted by industries or widely dispersed due to inadequate water management method can be a life-or-death situation. In 2020, Malaysian's has used 148,000 tonnes of plastic packaging for food. Plastics packaging has led Malaysia to be one of Asia countries that affected by plastic pollution. Development of this project can help to reduce river pollution on water surface.

Garbage collector machine can be done using mechanical system with no automation involved when is used. Unfortunately, this will lead to significant amount of manpower to move the cleaning boat pedals. Conveyor mechanism in the garbage collector machine is also a good design as it will lessen the manpower because the garbage is