



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**DEVELOPMENT OF AIR QUALITY MONITORING
SYSTEM**

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor Of Electrical Engineering Technology (Industrial Automation And Robotics) With Honours.

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960822-03-5084

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TECHNOLOGY

2021

BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

Tajuk: DEVELOPMENT OF AIR QUALITY MONITORING SYSTEM

Sesi Pengajian: 2021

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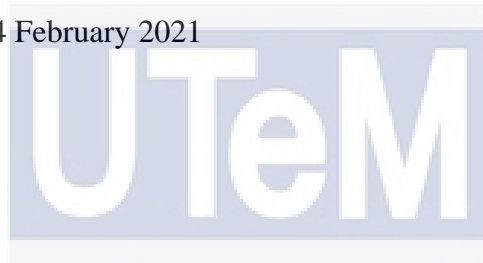
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APPROVAL

This report is submitted to the Faculty of Electrical and Electronic Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Electrical Engineering Technology (Industrial Automation and Robotics) with Honours. The member of the supervisory is as follow:


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ABSTRAK

Setiap tahun, sekitar 3.8 juta kematian dicatatkan akibat terdedah kepada pencemaran udara dan 9 dari 10 orang di seluruh dunia menderita sakit kepala, bersin berterusan, masalah resdung, penyakit pernafasan dan barah yang berkaitan dengan pernafasan udara tercemar, menurut World Health Organisasi (WHO). Memantau kualiti udara sangat penting, kerana dengan memantau kualiti udara kita dapat mempengaruhi risiko kesihatan dan kehidupan manusia. Menghirup *silent but deadly killer* ini boleh menyebabkan penyakit berkaitan pernafasan. Udara yang dihirup oleh orang ramai boleh membahayakan hati mereka, yang mereka mungkin atau mereka mungkin tidak sedar berlaku dalam kehidupan seharian mereka. Maklumat tentang kualiti udara dari segi kehadiran bahan pencemar perlu terus dipantau dan direkodkan. Oleh itu, dalam kajian ini, *development of an air quality system* untuk memantau kualiti udara di kawasan tertentu akan direkodkan. Tahap kualiti udara di beberapa tempat di sekitar Kelantan dan Melaka akan diukur. Tahap pencemaran udara ini akan dipantau dan diukur serta maklumat kualiti udara akan tersedia dan terpapar dalam *real time data* atau *notifications* di laman web. Akhir sekali, sistem pemantauan kualiti udara akan banyak membantu orang ramai berkaitan kualiti udara secara *real time* dan kualiti udara ini juga dapat digunakan mungkin sebagai ramalan kualiti udara pada masa akan datang seperti ramalan cuaca.

ABSTRACT

Every year, around 3.8 million deaths recorded due to the exposure from air pollution and 9 out of 10 people worldwide suffering headaches, constant sneezing, sinus problems, respiratory illnesses and cancers related from breathing the polluted air, according to the World Health Organization (WHO). Monitoring the air quality is very important, as it can affect human health and life. Inhaling this silent but deadly killer can cause breathing related diseases. The air breathed by people could harm their heart, which they may or they may not realize happened in their everyday daily life. The air quality information in term of the presence of pollutants are needed to be continuously monitored and recorded. Hence in this study, the development of an air quality system to monitor the air quality around the environment are going to be recorded as the project is being built. The air quality level in a few places around Kelantan and Melaka are going to be measure. While being continuously monitored and measured, the air quality information will be available in real time data or notifications in other places through a web server. Therefore, the air quality monitoring system would help people knowing the air quality in real time and can be used for future air quality prediction just like the weather prediction.

DEDICATION

All my hard work is only for you:

My beloved and awesome father, Rahmad Bin Salamat

My beautiful and lovely mother, Azania Binti Salleh

My kind sister,

Noor Zanirah Binti Rahmad,

And my all-dearest friends,

Ernesta Micheal Lopest, Nur Farina Binti Wilfred Kurin, Muhammad Shafiq Bin Saman, Pang Kok King, Nur Hanis Izzati Binti Hanapi, Hind Binti Khalil, Nadiatul Azwa Binti Ramli, Nor Afifah Binti Ismail and Nurul Natasha Binti Hidayatullah, for giving me moral support, money, cooperation, incentives, and understandings.

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I Am Grateful and Thank You So Much

ACKNOWLEDGEMENTS

In the name of Allah, the Most Gracious and the Most Merciful.

First and foremost, praise and thank God the Almighty for His showers of blessings throughout my research work to successfully complete this study.

I would like to express my deep and sincere gratitude to my supervisor, Ts. Mohd Razali bin Mohamad Sapiee for giving me the opportunity to do research and providing invaluable guidance throughout this research. His creativity, vision, thoughtfulness, and motivation inspired me deeply. He has taught me the methodology to carry out the research and presenting the research work as clearly as possible. It was an honor and a great privilege to work and study under his guidance. I am extremely grateful for the offer he has offered me.

I am deeply grateful to my parents, Rahmad Bin Salamat and Azania Binti Salleh for their love, prayers, care and sacrifices to educate and prepare me for my future. Also, I express my thanks to my sisters for her encouragement and precious prayers.

I would like to say thanks to my friends and classmates too. My Special thanks goes to my friends, Ernesta Micheal Lopest, Nur Farina Binti Wilfred Kurin, Muhammad Shafiq Bin Saman, Pang Kok King, Nur Hanis Izzati Binti Hanapi, Hind Binti Khalil, Nadiatul Azwa Binti Ramli, Nor Afifah Binti Ismail and Nurul Natasha Binti Hidayatullah for their help, helping me to complete this report successfully and for their constant encouragement. Finally, my thanks go to all those people who have supported me in directly or indirectly completing the research work.

May God shower in their lives the above-mentioned personalities with success and



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LIST OF SYMBOLS

μm - Micrometre



LIST OF ABBREVIATIONS

WHO	World Health Organization
API	Air Pollution Index
PM	Particulate Matter
MCO	Movement Control Order
WSN	Wireless Sensor Network
CO	Carbon Monoxide
CO₂	Carbon Dioxide
LPG	Liquefied Petroleum Gas
GSM	Global System for Mobile
GIS	Geographic Information System
IDE	Integrated Development Environment
VOCs	Volatile Organic Compounds
IOT	Internet of Things
IR 4.0	The Fourth Industrial Revolution
PPM	Parts Per Million
SO₂	Sulfur Dioxide
NO	Nitric Oxide
LCD	Liquid Crystal Display
AQI	Air Quality Index
HTTP	HyperText Transfer Protocol
JSON	JavaScript Object Notation

NO₂	Nitrogen Dioxide
µm	Micrometre
OS	Operating System
SOC	System on a Chip
TCP/IP	Transmission Control Protocol/Internet Protocol
USB	Universal Serial Bus
AC	Alternating Current
DC	Direct Current
I/O	input/output
NH₃	Ammonia
NO_x	Nitrogen Oxides
APSD	Automatic Power Save Deliver
VoIP	Voice Over IP
USB	Universal Serial Bus
AC	Alternating Current
DC	Direct Current
GPIOs	General-Purpose Input/Output
RF	Radio Frequency
MQTT	MQ Telemetry Transport
M2M	Machine to Machine
V_{cc}	Power Input of A Device
Gnd	Ground
TX/RX	Transmit and Receive

LIST OF PUBLICATIONS



CHAPTER 1

INTRODUCTION

1.1 Background

Every year, around 3.8 million deaths recorded due to the exposure from air pollution and 9 out of 10 people worldwide suffering headaches, constant sneezing, sinus problems, respiratory illnesses and cancers related from breathing the polluted air, as stated by World Health Organization (WHO). Monitoring the air quality is very important, as it can affects human health and life. Inhaling this silent but deadly killer can cause breathing related diseases. The air breathed by the people could be harming to their heart, which they may, or they may not realize happened in their everyday daily life.

Air pollution seems to have been a continuing concern in many countries around Asia and Southeast Asia, Malaysia as one of the most affected. There are two main causes of Malaysia's high levels of air pollution, one is cause by the burning of rainforests in Indonesia to provide territory for palm oil planting and the other one is due to urbanization in the country. It is seeming the high motor vehicle numbers are rising up the air pollutants around Malaysia and resulting in high levels of ozone in outlying areas.