UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF GRAPHICAL USER INTERFACE (GUI) FOR SMART WASTE MANAGEMENT SYSTEM

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor Degree of Electrical Engineering Technology (Industrial Automation and Robotic) with Honours.

by

MUHAMAD LUQMANUL HAKIM BIN MOHD YUSOH
B071310138
901223-03-5437

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I hereby, declared this report entitled "Development of Graphical User Interface (GUI) for Smart Waste Management System" is the results of my own research except as cited in references.

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Date   :

APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Electrical Engineering Technology (Industrial Automation and Robotic) with Honours. The member of the supervisory is as follow:

…………………………

(Siti Nur Suhaila Binti Mirin)

ABSTRAK

Dalam kehidupan harian kita, keadaan tong sampah yang penuh dan sampah yang melimpah keluar akan menyebabkan pemandangan yang tidak menyenangkan. Tiada sistem pemantauan untuk memantau kandungan tong sampah dan ianya membuat Perkhidmatan Pengurusan Sisa (WMS) perlu menyemak setiap tong sama ada penuh atau tidak, dan ia memberi kesan terhadap penggunaan tenaga kos dan masa yang dihasilkan oleh WMS. Untuk mengatasi masalah ini, satu sistem yang menggunakan Antaramuka Pengguna Grafik (GUI), Smart Waste Management System dicipta supaya dapat memantau status dan lokasi bin, ia juga memberi amaran kepada WMS apabila kandungan tong adalah melebihi 70%. Sistem ini dikodkan sepenuhnya dengan menggunakan Microsoft® Visual Studio 2010 (Visual Basic) yang memaparkan peratusan kandungan tong, lokasi tong dan ia juga memberi amaran jika tahap tong adalah melebihi 70%. Data antaramuka masa sebenar telah dihantar melalui RFBee dari pemancar perkakasan ini. Sebelum sistem dicipta, data telah dikumpulkan secara manual dengan mengukur kandungan tong untuk satu bulan dan kemudian kita bandingkan data manual dengan data sistem yang telah diciptakan. Sebagai kesimpulan, sistem ini memberikan kita salah satu cara yang berkesan untuk menjaga alam sekitar kita, WMS boleh memantau kandungan tong melalui paparan sistem, lebih sistematik, dan ia juga boleh mengurangkan kos dan masa penggunaan tenaga yang dihasilkan oleh pengendali WMS. Kesimpulanya, sistem ini akan membantu untuk mengurangkan kos dan tenaga masa yang digunakan oleh WMS kerana memantau pengurusan sisa melalui sistem Smart Waste Management System, dengan itu sistem ini memegang kepercayan bahawa limpahan sisa dari tong boleh dielakkan dan akhir sekali, ia membantu untuk mengekalkan persekitaran yang bersih dan sihat di seluruh kawasan.

ABSTRACT

In our daily life, the pictures of waste bins being overfull and all the bin spills out and it will cause an unpleasant sight. No monitoring system to monitor the bin's content and make the Waste Management Services (WMS) need to check each bin either the bin is full or not, and effect the consumption of cost and time energy that produced by WMS. To overcome these problems, a Graphical User Interface (GUI) for a Smart Waste Management System is implemented and able to monitor the status and the location of the bin, also alert the WMS when the bin's content exceed 70%. This system is fully coded by using Microsoft® Visual Studio 2010 (Visual Basic) that displays the bin's content level percentage, the bin's location and it's also pop up alert if the bin's level is exceed 70%. The real time interface data were been send via RFBee from the hardware's transmitter. Before the systems implemented, the data had been collected manually by measuring the bin's content for one month and then we compare the manual data with the data when the system was implemented. As result, the system is one of the efficient ways to keep our environment clean, the WMS can monitor the bin's content through the system's display, more systematic, and it's also can reduce cost and time energy consumption that provided to WMS operator. In a nut shell, this system will help to reduce the cost and the time energy that consumed by the Waste Management Services due monitor the waste management Smart Waste Management System, thus this system holds the belief that overflows of the waste from the bins could be avoided and lastly, it helps to maintain a clean and healthy environment throughout the area.

DEDICATION

To my beloved parent, Mohd Yusoh Dollah and Rosnah Roslan, my siblings Muhamad Hasif Adha Bin Mohd Yusoh, Sarah Nur Ain Binti Mohd Yusoh and Muhamad Harith Danial Bin Mohd Yusoh, and families member, the love one, friends and lecturer from ILP, thanks for all the non-stop supports, encouragements, and advices.

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As this project is my last task before I finish my journey as a bachelor student, I fell honoured to express my appreciation to all those who gave me the possibility to comprehend this project report especially my dear housemate. They keep reminding me to settle down my work in an appropriate way and also help me in generating a new idea for analysis of the mould base weight optimization.

Furthermore, I also want to deliver a special thanks to my classmate that helps me in making this project done. I also would like to thanks to the other supervisors as well as the panels especially in my project presentation in helping me to improve my presentation skills with their statement, comment, and tips.

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LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

ANSI	-	American National Standards Institute
API	-	Application Program Interface
FTK	-	Fakulti Teknologi Kejuruteraan
GUI	-	Graphical User Interface
GSM	-	Global System for Mobile
IDE	-	Integrated Development Environment
ISO	-	International Standards Organization
L7	-	Level 7
RW	-	Right Wing
MCU	-	Multi-point Control Unit
PC	-	Personal Computer
RFID	-	Radio Frequency IDentification
SQL	-	Structure Query Language
UART	-	Universal Asynchronous Receiver/Transmitter
UTeM	-	Universiti Teknikal Malaysia Melaka
ILP	-	Institut Latihan Perindustrian
WMS	-	Waste Management Services
$\geq$	-	More than or equal to

CHAPTER 1

INTRODUCTION

1.0   Introduction

This chapter will briefly explain the project overview on how the system is implemented and that are include the background of the project, the problem statement, the work scope, and the objective of the project.

1.1   Project Background

To develop a user friendly Graphical User Interface (GUI) called Smart Waste Management System for Waste Management Services (WMS) to monitor the waste's level. The system are included the location, percentage of the contents in the bin in real-time and it's also give alarm to collect the garbage in the bin if the bin's percentage are exceed 70 percentage. Lastly, its help to reduce cost of Waste management service lorry's to come to faculty to collect the garbage and the time energy that provide to WMS operator to clear each bins (Anagnostopoulos 2015).

1.2   Problem Statement

In our daily life, the pictures of waste bins being overfull and all the bin spills out and it will cause an unpleasant sight at certain areas (Thakker 2015). No monitoring system or device to monitor the waste level in a bin (Ali et al. 2012) and make the WMS need to check each bin either the bin is full or not, and effect the consumption of cost and time energy that produced by WMS.

1.3 Work Scope

The Smart Waste Management System does monitoring activities and focuses on the interface that's displays the percentage of contents in the bin, and the location.

To achieve the objectives of this project is by collect the data by measuring the waste's levels in the bin by days before the system implemented for one month, develop the GUI by using Microsoft® Visual Studios 2010 (Visual Basic) that shows the content's level percentage, and the location of the bin, pop up window to alert the WMS when the waste exceed 70%. Receive data from hardware that been transmitted via RFBee. Compare the manually measured waste's level and the data that receive from the hardware via the system implemented.

1.4 Objective

There are several objectives need to achieve in this project:

a) To design the Graphical User Interface (GUI) for a Smart Waste Management System that able to monitor the status and the location of the bin in real time analysis.

b) To alert the Waste Management Service operator to collect the waste when the percentage shows more than 70%.

c) To reduce cost and time energy for WMS.

1.5   Conclusion

As conclusion, this project is to development a GUI system by using Microsoft® Visual Studios 2010 (Visual Basic) as its interface to minimized the problem statements such as unpleasant view that cause by overfull and spills out bins (Thakker 2015), no monitoring system (Ali et al. 2012) that can reduce WMS's time and energy to check each bins. To overcome the problem statement is by propose these objective, that is to design the GUI for Smart Waste Management System that able to monitor the status and the location of the bin in real time analysis, to alert the Waste Management Service operator to collect the waste when the percentage shows more than 70% and lastly to reduce cost and time energy that consume by the WMS.

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CHAPTER 2

LITERATURE REVIEW

2.0   Introduction

This chapter will review from related journal to get the idea to implement the Smart Waste Management System including the system that to use, the design of the interface, how to collect the data and all the related information.

2.1   Smart Waste Management System

From the exploration journal, a lot of the journals are from India, the fact that their nation got a considerable measure of pollution and one of the significant pollution is the solid waste pollution. Refuse been heaped at the road corner, open spot furthermore walkways are ruined with rottenness and litter, streams and channels go about as waste dumps, it cause repulsive sight at certain region and undesirable environment To overcome this issue, the development of the system will be created to alert and inform the authorized person when the bin is going to full (Thakker 2015); (Arebey et al. 2009).

To create a system that can be able to monitor the waste been spilled out from the garbage bins in real time as soon as people throw trash into the bins is needed. (Mamun et al. 2014); (Sharma et al. 2015); (Bhor & Morajkar 2015).

2.2   Graphical User Interface (GUI)

The purpose of GUI in this system is for the Waste Management easy to monitoring. A journal use Android application that called the application *SVASTHA* which is a Sanskrit word which means "be healthy and hygienic", that can monitor actively monitor the waste collection process and will provide real time feedback such as the waste collection status, live tracking of trucks and location of the bins. This system also can receive complaint from residents about the uncollected waste as well as the illegal disposal of wastes (Issac & Akshai 2013).

The system can also can monitor the status of the waste level in the bin by MATLAB software and then when the bin is about to full, the system will alert the authorized person by using Global System for Mobile (GSM) (Bhor & Morajkar 2015).

Microsoft® Visual Studio (Visual Basic) is one of the interfaces that been used to view regarding the removal of trash is sent to the respective area truck driver about the location of the field trash can. It's also contains the complaint with the exact location of the trash can and if the trash can is not replaced at a right time, the microcontroller placed at the trash can intimate the information to the corporation office once again (Nadu 2014).

2.3   Data Receiving

To show up the ongoing status, a gadget that conveyed between the equipment and the framework interface is necessary. There a few gadgets that can be use and one of it are utilizing Zigbee to exchanging and accepting information reason. Zigbee gadgets can use for more separations and going information through middle of the road gadgets to achieve more removed ones. This permits its systems to be shaped promptly, with no brought together control or high-control transmitter/receiver ready to achieve the majority of the gadgets (Nadu 2014).

2.4   Database

The collected information from the gadget can been stored in a database. One of the databases is Structure Query Language (SQL), it's can stores all the important data for present and future utilize, the interface of the strong waste administration framework can demonstrates the current information of the database and its occasionally redesigns its information (Corlăţan et al. 2014).

2.5   Conclusion

As conclusion for this chapter, there is a lot of GUI, method and hardware of data receiving and database that can be use. For development of this project, Microsoft® Visual Studio 2010 (Visual Basic) is being use as the interface of the system because its user friendly, using RFBee as the data receiving hardware and Microsoft® Access 2010 as the database to store the information that receive from hardware via RFBee.

CHAPTER 3

METHODOLOGY

3.0   Introduction

This chapter will briefly explain on the methods that use to develop the GUI for Smart Waste Management System, including the flow to ensure the development of the project runs smoothly, the software and the hardware used.

3.1   The flow of work progress

To ensure the work progress run smoothly, there are several steps that need to be followed. First, do researches of literature review from the previous journal and analysed it to understand the project that is needed to development the system, and then, design the system by using Microsoft® Visual Studio 2010 (Visual Basic).

After the system has been created, the system will be simulated with the hardware, if the system didn't success, the needs to analysis back the literature review is highly needed, but if it success, the flow of the work progress had been achieved to implemented the system, and the process has been summarized as the Figure 3.1 below:
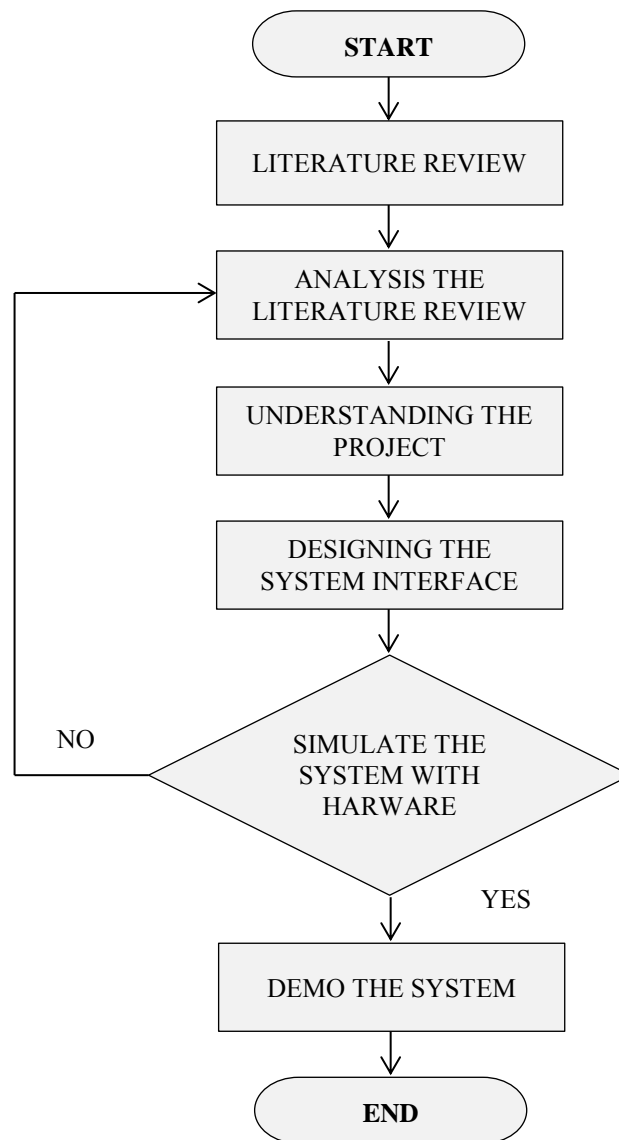
Figure 3.1: Methodology Flow Chart

3.2   Development of the overall system

Before develop the system, the data before and after the system implemented must be collected. The purpose of the data collection is to compare the advantages if the system has been created. First step, collect the data by measuring the bin's content by days for one month on April 2016.

Then, develop a GUI that called Smart Waste Management System by using Microsoft® Visual Studio 2010 (Visual Basic) to display the status of the bin including the percentage of the bin's content (Mamun et al. 2014); (Sharma et al.

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2015) and the location of the bins (Issac & Akshai 2013). The data are been receive from the hardware via RFBee. It also will show the content's level percentage of the bins content by monthly.

The system will alert the WMS thru the pop up window on the system if the bin's content reach more than or equal to 70 percent (Nadu 2014); (Ar 2015). Lastly, we compare the data of manually measured waste's level and the data that receive from the hardware via the system implemented. The summarized of this method are been show as Figure 3.2 below:
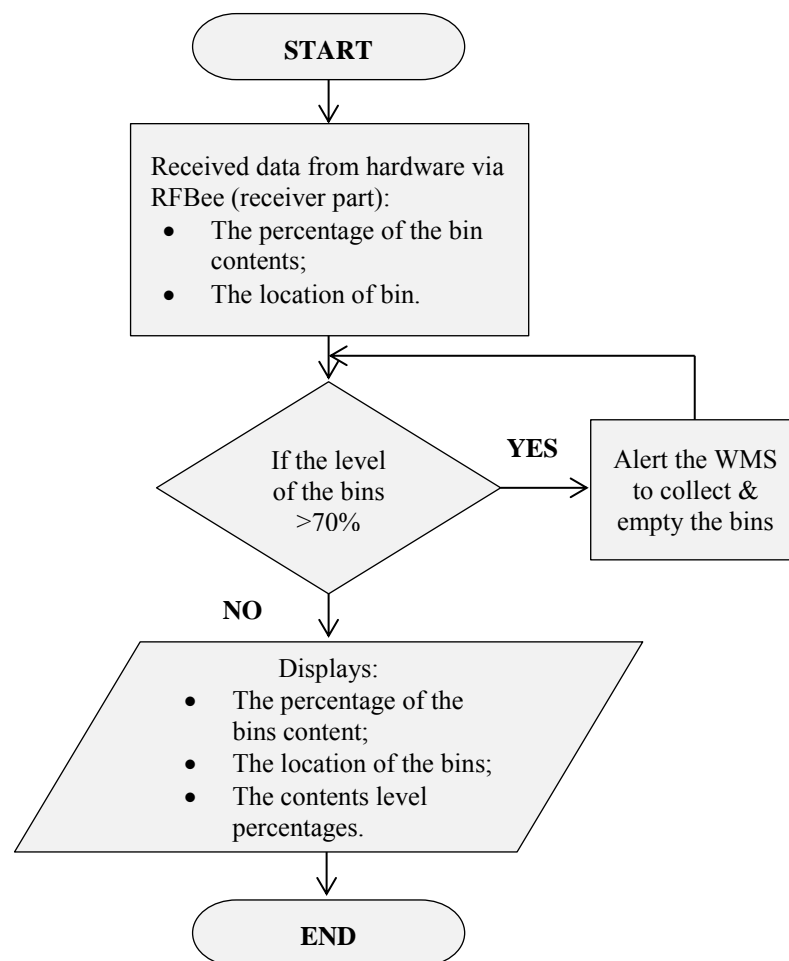

Figure 3.2: System Flow Chart