AUTOMATIC TOILET SYSTEM USING ARDUINO PLATFORM

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DECLARATION

" I hereby declare that I have read through this report entitle 'Automatic Toilet' and found that it have comply the partial fulfilment for awarding the Bachelor of Electronic Engineering in Industry with Honour."

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Date : ....29/ 5/ 2017...........

This report entitle 'Automatic Toilet system using Arduino Platform' is based on my own efforts and the result is on my own research expert as cited in the references.

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This thesis is dedicate to

My family for their supports

and guide me throughout my academic career

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ABSTRACT

Dirty toilet is the critical issue of the toilet due to the inefficient toilet control system. The present toilet provides toilet control plan which the system need human effort for the working. It is not really systematic for all kind of user. This will cause the toilet become dirty and smelly, also need to be clean all the time to keep it fresh and clean. Moreover, this will affect the other toilet user to wait for the cleaner to clean or they need to clean the toilet first before use it. Furthermore, the users have to wait for certain period of time to use it. In order to solve this problem, an automatic toilet system using Arduino platform is designed to maintain the cleanliness of the toilet. This automatic toilet are used to operate flush systems, light and fan also to control the fragrance only when there is a presence of human in the toilet. In this project, the Arduino Uno R3 microcontroller is used to interact with the Passive Infrared (PIR) sensors. For this project, the PIR sensor is used to detect the presence of human to operate the systems automatically by sensing the infrared (IR) energy produces by human body. When someone enters the toilet, the IR energy sensed by PIR sensor changes and activates the sensor to automatically ON or OFF the toilet control. Further, the signal sends to microcontroller to control the system. This system tries to reduce amount used of electric consumption cause by the toilet to work for certain time only also save energy and maintain the cleanliness of the toilet.

ABSTRAK

Tandas yang kotor merupakan isu yang kritikal oleh kerana sistem pengawalan tandas yang tidak cekap dan canggih. Sistem pengawalan dan penggunaan tandas pada masa kini memerlukan usaha dan tenaga manusia untuk menggerakkan sistem pengaalannya. Sistem ini sudah semestinya tidak sistematik dan tidak sesuai untuk sesetengah pengguna. Hal ini secara tidak langsung akan menyebabkan tandas kotor dan berbau, malahan tands terpaksa dibersihkan sepanjang masa utntuk memastikannya sentiasa dalam keadaan yang bersih dan selesa serta segar. Bukan itu sahaja, hal ini akan memberi kesan kepada pengguna yang lain kerana terpaksa menunggu ketika hendak menggunakan tandas supaya tandas berada dalam keadaan yang bersih serta selesa untuk digunakan. Bukan itu sahaja, kesannya juga akan menyebabkan masa terbuang begitu sahaja dek kerana terpaksa menunggu tandas dibersihkan atau terpaksa membersihkan tandas itu sendiri ketika hendak menggunakannya. Oleh itu, untuk menyelesaikan masalah ini, satu sistem telah dicipta iaitu sistem tandas automatik menggunakan Arduino sebagai platform. Di dalam sistem ini, ciri-ciri tandas seperti flush, lampu dan kipas penyerap bau, juga semburan minyak wangi telah direka selaras dengan aras pembangunan yang serba canggih dan berteknologi tinngi. Sistem ini berfungsi apabila terdapat kehadiran manusia di dalam tandas. Oleh itu, projek ini telah menggunakan Arduino Uno R3 micropengawal yang akan berinteraksi dengan pasif infrared (PIR) sensor dimana sensor ini berfungsi secara automatik dengan mengesan pergerakan tubuh manusia. Sistem ini juga dapat mengurangkan penggunaan tenaga eklektrik serta dapat menjimatkan tenaga bahkan kebersihan tandas juga terjaga.

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LIST OF ABBREVIATIONS

EEPROM	Electrically erasable programmable ROM
SRAM	Static Random Access Memory
ROM	Read Only Memory
PWM	Pulse Width Modulation
LED	Light-emitting Diode
USB	Universal Serial Bus
PCB	Printed Circuit Board
PIR	Passive-Infrared Sensor
NPN	P-type doping
BJT	Bipolar Junction Transistors
TTL	Transistor-transistor Logic
I/O	Input / Output
NO	Normally Open
NC	Normally Close
KB	Kilo Byte
AC	Analogue Current
DC	Digital Current
IR	Infrared
kΩ	kilo Ohm
mA	milli Ampere
mm	millimetre
V	Volt
G	gram
s	second
m	meter
°	Degree

CHAPTER 1

INTRODUCTION

1.0 Introduction

This chapter will provide an overview of this project regarding on an automatic toilet system using Arduino platform. Besides that, it also will be discuss about the problem statement of this project, its objective, significance of the project, scope of work, and description of methodology of this project. Lastly, the structure of this report will be explained in the end of this chapter.

1.1 Project Overview

Dirty toilet is the critical issue of the toilet due to the inefficient toilet control system. The present toilet provides toilet control plan which the system need human effort for the working. It is not really systematic for all kind of user. This will cause

the toilet become dirty and smelly, also need to be clean all the time to keep it fresh and clean. Moreover, this will affect the other toilet user to wait for the cleaner to clean or they need to clean the toilet first before use it. Furthermore, the users have to wait for certain period of time to use it. A dirty and smelly toilet have been always a big problem whether in home or public area especially in places which people always get in and out. Therefore, the solution to fix the dirty and smelly toilet is by designing automatic toilet system using Arduino platform. This project is used to sense any body movement in the toilet so the control system starts working. This automatic toilet are used to operate flush systems, light and fan also to control the fragrance only when there is a presence of human in the toilet. In this project, the Arduino Uno R3 microcontroller is used to interact with the Passive Infrared (PIR) sensors. The switches or sensor is installed in the toilet, so no human effort needed for the operation in the sensor mode operation. Basically, the PIR sensor detects a human body that emits the infrared energy. For this project, the PIR sensor is used to detect the presence of human to operate the systems automatically by sensing the infrared (IR) energy produces by human body. When someone enters the toilet, the IR energy sensed by PIR sensor changes and activates the sensor to automatically ON or OFF the toilet control. Further, the signal sends to microcontroller to control the system.

This system tries to reduce amount used of electric consumption cause by the toilet to work for certain time only also save energy and maintain the cleanliness of the toilet. This signal which is detected by the PIR sensor is fed to the microcontroller to make the light and fan also the automatic fragrance function. The flush system will operate once the users get up from the bowl. When a body reaches the operating range of the PIR sensor, it sends a signal to the microcontroller to switch ON and OFF the control system of the toilet.

1.2 Problem Statements

The idea on developing this project comes from the scenario that have been observed when using the toilet either in public or private toilet in Malaysia. To design this project, several studies have been conducted to identify the main problems encountered by users. The problems of this study have been identified. As we can see, the toilet is smelly and dirty and of course when we want to use it, we need to clean it first. The tourists that travel to our country will look down to the cleanliness of the toilet. The statistic shows that the majority of public toilets in the country are still dirty, according to an audit carried out on 10,257 of these facilities [11].

On the other hand, when using the toilet, sometimes the flush is not working. Therefore, people sometimes not flush their waste after they have used it. This can make other users maybe could not use the toilet or can make the toilet dirty and very smelly. Not just that, people needs to touch the dirty toilet when they need to use it. This could make users easily being infected by germs. Besides that, toilet is the place that for sure people will get in and out every day. It need to be clean to make sure it is always clean and fragrance. This could be a problem to some users because not everybody has enough time to clean the toilet every time they need to use it. Besides, in this modern era, technology and sophisticated, everything nowadays need to be function automatically to sync with the modernization. The toilet clogged and overflowing also one of the problems when using the toilet. Moreover, in term of electricity, as we can see sometimes the light was still on although it was already noon or there is nobody using the toilet. We can consider it is a waste in power consumption.

1.3 Objectives of Project

There are several objectives in designing this project, for example:

a. To investigate existing toilet system using Arduino Platform.
b. To design fully automatic toilet system that consists of an automatic flush, automatic fragrance, and automatic power consumption.

c. To stimulate and analyse the consumption of electricity.

The benefit of toilet features:

a. Improve sanitation – All waste is disposed of quickly and having and automatic flush.
b. Prolonged lifespan – Having a hands-free system can prolong the lifespan of facilities due to less wear and tear and clumsy handling.
c. The environment of the toilet will make the users feel comfortable when they used the toilet.
d. The energy also is saving because the electricity is used only when there is a presence of human.

1.4 Significance of project

This project is very useful in our day to day life. This system also can make people life easier. On the other hand, the used of this project makes prolong lifespan with having a hands-free system due to less wear and tear, and clumsy handling. The environment of the toilet also will make the users feel comfortable when using the toilet. Besides that, all waste is disposed of quickly by having an automatic flush that improve the sanitation. Furthermore, in terms of electricity also is saving because this system is only worked when there is presence of human in the toilet.

1.5 Scope of Work

After a several research, this project is suitable for toilet used only. It is also can be used for bowl and squad toilet. Moreover, this system can be used either public toilet or private toilet. Besides that, the scope of this project will cover the software

and hardware of a circuit. The system used a microcontroller as heart of this project. A microcontroller used needs a coding to make it run and understand by the circuit of the automatic toilet. The coding is important in order to make the toilet function well. This project is important in order to make people life more comfortable and easier. The design of the circuit must be good to make the components compatible with each other. In this project, the software that has been used to design this system is the Proteus 8 Professional software. For the coding, Arduino IDE software is used. For the hardware, prototype in designing circuit is built with few components such as Arduino Uno R3, Passive-Infrared sensor (PIR), 12Vdc fan, transistor 2N2222A, LEDs, and battery 9V.

1.6 Report Structure

This thesis report consists of five chapters which covers all the matters in developing this project.

Chapter 1: Introduction

In this chapter is including an overview of the project, problem statement, objectives of this project, significance of the project, and scope of work. The structure of this thesis will be listed at the end of this chapter.

Chapter 2: Literature Review

In this chapter, it will highlight about the past studies and researches related to the subject of this project. It provides review from previous research, journals, patents, articles, and books that related to the toilet system. Background studies will also be included in this chapter.

Chapter 3: Methodology

In this chapter, it will explain about the flow of this project. It also will explain about the methods and approaches that are being used to complete this

project. The methodology of this project is represented by using block diagram and flow chart with clear description on how the process works.

Chapter 4: Results and Discussion

In this chapter, it shows the simulation result obtained from the designation system. This chapter combines both for textual and visual representation of project findings. The analysis of the whole system performances in terms of accuracy and compatibility of the project also include in this chapter.

Chapter 5: Conclusion and recommendation

In this chapter, it contains a brief explanation of the entire work, including methods, results and the conclusions in completing this project. The recommendation for future work will also be included in this chapter together with the contributions of the project.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

In this chapter, it shows the simulation result obtained from the designation system. This chapter combines both for textual and visual representation of project findings. The analysis of the whole system performances in terms of accuracy and compatibility of the project also include in this chapter. Besides that, this chapter also will review some related project and studies, also the solutions of related projects, and overview on different approaches made by the previous researches and make a comparison between this project and those related project.

2.1 Literature Survey

Nowadays, the toilet system is undergoing tremendous growth with the growth of the urbanization and industrialization. Toilet is the place where people for sure will get in and out every day. The existing to control and regulate the toilet control has proven to be inadequate and costly. A toilet refers to an environment that contains sanitary fixtures. A toilet may contain a plurality of urinals, toilet sinks or the like, for use by one or more person [1]. Some public facilities in some urban and suburban areas has never been improved, mostly because a very poor maintenance by the local authority [4]. A very 'unpleasant' and 'dirty spaces'; about public toilet that is attached at Pengkalan Hulu's bus station shows some inconsistency services by the Auhthority-Majlis Daerah Pengkalan Hulu (MDPH), to maintain these public building [4].

This invention relates to a standard flush toilet having auxiliary features including odour removal and a self-cleaning toilet system [2]. The wetness of toilets affect the cleanliness of toilets as when the sink tops and ground is wet, and more users step into the toilets with dirty shoes and hands, the toilets get dirtier even though it might have be cleaned earlier before [2]. Therefore, for user comfort, the toilet should be improved with appropriate features including self-cleaning toilet, automatic flush, slow closing lead and self-deodorizing. Keeping the toilets clean is important because bacteria and germs can reproduce very well in damp and warm places. The dirty footprints on the floor are the result of a wet floor [3]. Similar occurrences also happen at the surau (prayer room) nearby where so much of rubbish is thrown everywhere and it creates a smelly environment [4].

There are many ways in which unpleasant or obnoxious toilet odour are dealt with. Most commonly, in both domestic and commercial or public practice, a room exhaust fan is provided, usually in conjunction with a wall mounted switch. In business or public establishment, deodorants are commonly used to primarily mask the undesirable odour. Even so, the use of which is not efficient resulting in a waste of energy and deodorizer itself. Therefore, the invention which provides a toilet with auxiliary components that includes an automatic deodorizing. A main object of the invention is to provide a novel and improved supporting and dispersing attachment for an aerosol deodorant container, said attachment being easy to amount, being

conveniently accessible for operation, and being effective in preventing offensive odours from escaping [7]. The components are regulated by a unique control system which allows the user's choice but assures proper sequential use and prevents actuation when the user is not seated. A remote control for activating at least one of washing, odour evacuation, or drying stages associated with the seat [8]. The self-deodorizing can only be turned on when by the user when the sensor can sense the presence of human in the toilet. Incorporated in it's entirely herein by reference, it is generally desirable to be able to use a toilet without touching the toilet or at least touching the toilet as little as possible[7]. The soil and odour associated with a conventional toilet is a source of considerable concern to many people [6].

On the other hand, this smart toilet also relates generally to self-closing toilet seats and more particularly to a self-lowering toilet seat assembly whose self-lowering operation is automatically initiated and does not require any type of manual actuation by the user. It would be advantageous to provide a self-closing toilet lid assembly which inhibits automatic closing rotation of the toilet lid for as long as a user is still using the toilet. The self-closing mechanism is responsive to the presence of human on the toilet for inhibiting closing rotation of the toilet lid until the user get out from the toilet. For health reasons, it is to minimize or eliminate touching of a toilet or any of its components by hand [5].

2.2 The Components

2.2.1 Microcontroller

A microcontroller is compact microcomputers that are designed for control the operation of embedded system. The microcontroller includes the processor, peripherals, and memory. It is programmable, small, cheap, requires almost zero power, can handle abuse and it can suit many varieties for every need.