UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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LIQUID LEVEL CONTROLLER SYSTEM WITHOUT CONTACT

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Computer Engineering Technology (Computer Systems) with Honours.

by

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2019

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

Tajuk: Liquid Level Controller System Without Contact

Sesi Pengajian: 2019

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I hereby, declared this report entitled Liquid Level Controller System Without Contact is the results of my own research except as cited in references.

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Date: 8/1/2020

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 Computer Engineering Technology (Computer Systems) with Honours. The member of the supervisory is as follow:

Signature: .....

Supervisor : FAKHRULLAH BIN IDRIS

Signature: 8/1/2020

Co-supervisor: AHMAD FAIRUZ BIN MUHAMMAD AMIN

ABSTRAK

This project is to build and to test a liquid level control system without contact. The system is more advanced than the conventional liquid level controller and is designed to improve life by having a more convenient control system. For example, the system is designed to control the liquid level in the tank and user get to access the data using WIFI. Using an ultrasonic sensor to detect liquid levels, it will make the project wireless or without any liquid contact. The system uses the Raspberry Pie B+ as the microcontroller to automatically control the water pump and display data in sequence. The water pump is controlled based on the programming code that was programmed in the Raspberry. The project uses the ultrasonic sensor to detect the liquid level. First, the sensor detects the liquid level if the liquid level is low, the system will give data and display to the user and the operation will start operating. When the liquid level reaches high or full, the process will cease and send another information to the administrator, and then it will run automatically.

ABSTRACT

Projek ini adalah untuk di bina dan menguji sistem pengawal tahap cecair tanpa sentuhan. Sistem ini lebih maju daripada pengawal tahap cecair konvensional dan direka untuk memperbaiki kehidupan dengan mempunyai sistem kawalan yang lebih mudah. Contohnya, sistem ini direka untuk mengawal tahap cecair dalam tangki dan membuat pemberitahuan melalui WIFI. Dengan menggunakan sensor ultrasonik untuk mengesan paras cecair, Ia akan membuat projek ini tanpa wayar ataupun tanpa sebarang sentuhan cecair. Sistem ini menggunakan Raspberry Pie B + sebagai mikrokontroler untuk mengawal pam air secara automatik dan pemberitahuan secara berturutan. Pam air dikawal berdasarkan kod pengaturcaraan yang diprogramkan di Raspberry. Projek ini menggunakan sensor ultrasonik untuk mengesan tahap cecair. Pertama, sensor mengesan tahap cecair jika paras cecair rendah, sistem akan menghantar pemberitahuan kepada admin dan operasi akan mula beroperasi. Apabila tahap cecair mencapai tinggi atau penuh, operasi akan berhenti dan menghantar pemberitahuan kepada admin, system ini dijalankan secara automatik.

DEDICATION

For my beloved parents

ABDUL HAMID BIN ABDUL RAHMAN

NURMIDA IDRIS

And my sibling for supporting me

Special thanks to my supervisor

ENCIK FAKHRULLAH BIN IDRIS

For guiding me

And thankful to my friends especially

ISMATUL IDDA BINTI SHARIFUDDIN

For helping and supporting me to finish this final year project

ACKNOWLEDGEMENTS

In the name of Allah S.W.T the most generous and merciful I would like the be thankful for the blessing and giving me the strength to able complete this final year project. In my deepest heart, would like to express my appreciation to all those who provided me the possibility to finish this bachelor's final year project especially gratitude to my loving parent Abdul Hamid B. Abdul Rahman and Nurmida Idris. Thank you for the support and encouragement. They are always advising me to performing the best in my field that I involved. Not to forget to all my siblings. I also would like to extend my appreciation to all those who contributed time, concern and effort to lend a helping allowing me to gain invaluable knowledge.

I also would like to thank my beloved Supervisor Fakhrullah Bin Idris for all his comments, constructive criticism, suggestion, encouragement and always gave insightful comments on my works were taken seriously to make me understand the world of engineering. Their supports have led me to practice and learn more and more from them to finish my Project Sarjana Muda I.

Lastly, I will practice what I learned for the future. The knowledge and experience achieved when to complete this report is encouragement and patient.

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LIST OF SYMBOLS

D, d	-	Diameter
F	-	Force
g	-	Gravity = 9.81 m/s
I	-	Moment of inertia
1	-	Length
m	-	Mass
N	-	Rotational velocity
P	-	Pressure
Q	-	Volumetric flow-rate
r	-	Radius
T	-	Torque
Re	-	Reynold number
V	-	Velocity
w	-	Angular velocity
x	-	Displacement
z	-	Height
q	-	Angle

LIST OF ABBREVIATIONS

PCA	Principal Component Analysis

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CHAPTER 1

INTRODUCTION

1.1 Project Background

In advance of electronic technology, people have made it an easier and faster to improvise something in a within a short time. Most people always use technology to complete the work and help daily job at home or a specific area. This project "Liquid Level Controller System Without Contact" is used the technology in electronic, the evolution in electronic that will be applied in this project is by Raspberry Pi B+. At the same time, some circuit and software are used, such as Python used to functions this project.

Nowadays, most of the liquid that uses in daily or industrial have been controlled by using floater to control its level whether it's in a tank or any liquid container. Almost of that will make an error in levelling it while it's also will not able to control the timing of pumping liquid, starts pump automatically and create information properly to convey. This project will make the levelling and storing the liquid inconvenience way for any user who uses this technology. Some component and equipment that will use in this project, such as the HC-SR04 Ultrasonic sensor and controlled by Raspberry Pi B+, which act as a microcontroller for the project.

By using the HC-SR04 Ultrasonic sensor, it will measure the level of liquid than by using Raspberry Pie as the controller that equipped with WI-FI module make the user

convey anything to the system through by displaying data through android application. The function of this project is detecting the level of liquid by using an ultrasonic module. By recognizing the forward reflection, the ultrasound module measures the range of fluid levels (in cm). The pump automatically starts if the level is below a specified point. Furthermore, the data will show the transmitter sign via the WI-FI to make it easier for the user to know what it wants.. The main concept of this project is using a microcontroller whose serial port is interfaced with this ultrasonic module. The Tx sensor sends a level-reflected the ultrasonic signal and the Rx ultrasonic sensor is received. This ultrasonic level controller includes an ultrasonic module that detects an accurate range by reflecting it. This project will help the user to save and level the liquid.

1.2 Problem Statement

In the industrial process, the control of the liquid level in tanks and the flux among tanks is a fundamental problem. The process industries require liquids to be pumped, stored in tanks, then pumped to another tank. As an example, the toilet tank in our house is also a liquid level control system. The float arm attached to the input valve of the water tank can be drained into the water tank until the float reaches a point. Which closes the valve and the tank flow must be controlled, due to its continuous operation, preventing water levels to the highest standards. There are many other design theories for controllers that can be used to manage the fluid level in tanks. Proportional integral derivative control is one of a kind of control strategies used to control the liquid level and flow.

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1.3 Objective

i. To study and understand the operation of the liquid level control system that involves HC-SR04 Ultrasonic Sensor and Raspberry Pi B+

ii. To design and develop the controller system using HC-SR04 Ultrasonic Sensor for levelling liquid

iii. To analyse the measurement of precision by using HC-SR04 Ultrasonic Sensor

1.4 Scope of Project

The liquid level controller system is for any user whether it's industrial or personal to make it control liquid levelling. This system is placed in many areas such as industrial factory, home or anywhere that use the liquid. The purpose of this project is to help to control the liquid levelling. At the same time, this system also will notify the user whether the tank is full or occur ap problem such as leaking or overflowing.

This system only used one sensor, which is a HC-SR04 Ultrasonic sensor and controlled by the Raspberry Pi B+. By taking measures of the fluid level in cm, this sensor function detects the amount of fluid and detects the reflection that proceeds. This sensor is detected about 10cm to 20m range on an object below the sensor. This sensor also able to realize the ambient light, measure the colour and can identify the proximity. This sensor will send the signal to the Raspberry Pi B+. When the level falls beneath the setpoint, the pump starts automatically after receiving the reflection signal.