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**DEVELOPMENT OF IOT BASED INDUSTRIAL
CONTROL AND MONITORING SYSTEM FOR MAP 202**

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

by

AMIR ASYRAAF BIN MAYUDIN

B071610784

950821-14-5987

FACULTY OF ELECTRICAL AND ELECTRONIC ENGINEERING
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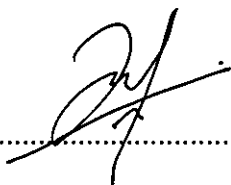
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No 19 Jalan Surada 8

Taman Desa Surada

Seksyen 8, 43650

Bdr Baru Bangi, Selangor

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Disahkan oleh penyelia:



Ts AHMAD NIZAM BIN MOHD

JAHARI @ MOHD JOHARI

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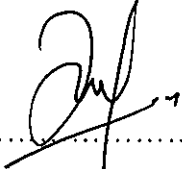
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Pensyarah
Jabatan Teknologi Kejuruteraan Elektronik dan Komputer
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Date: 20/12/2019

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

Signature: 

Supervisor : Ts AHMAD NIZAM BIN MOHD JAHARI
@ MOHD JOHARI

ABSTRAK

Dalam era globalisasi, industri telah didedahkan kepada Revolusi Perindustrian 4.0 (IR4) yang akan mengubah reka bentuk di masa depan. Gabungan ini melibatkan sistem siber-fizikal dan "Internet of Things" (IoT). Dalam projek ini, mesin industri iaitu MAP202 adalah dipilih untuk melaksanakan sistem kawalan dan pemantauan menggunakan aplikasi Penyeliaan, Kawalan dan Pengambilalihan Data (SCADA) dan IoT. Ia digunakan untuk dikawal dan dipantau sebagai langkah pelaksanaan situasi yang sebenar dalam industri pembuatan. Idea utama projek ini adalah untuk memantau menguna aplikasi IoT dgn NodeMCU dan membangunkan sistem kawalan dan pemantauan industri mengintegrasikan sistem semasa menggunakan SCADA. Secara amnya, sistem ini boleh mengawasi MAP202 tanpa wayar dan juga pendawaian PLC boleh dilakukan untuk pelbagai jenis peranti masukan atau keluaran. Untuk merancang operasi sistem berdasarkan pelaksanaan sebenar dalam pembuatan industri. Gambarajah tangga dengan empat keadaan pergerakan dibangunkan dengan menggunakan teknik Grafcet. Keadaan tersebut adalah dalam kedudukan sama ada dekat atau jauh pada MAP202. Selain itu, ciri tambahan akan ditambah seperti urutan penggera amaran alternatif untuk kedudukan penutup dengan menghidupkan vakum ON dan OFF. Oleh itu, . Selain itu, projek ini boleh dipantau dalam talian menerusi pelaksanaan Internet of Things (IoT) dengan NodeMCU. Projek ini juga diintegrasikan dengan sistem yang sedia ada menggunakan Microsoft Visual Basic sebagai sistem SCADA.

ABSTRACT

Today, industry has been exposed to Industrial Revolution 4.0 (IR4.0) which will change matters in the future. Its combination of cyber-physical systems and the Internet of Things (IoT). In this project, industrial machine namely as MAP202 is selected to implement the control and monitoring system using Supervisory, Control and Data Acquisition (SCADA) and IoT application.. It's been used for controlled and monitored as MAP202 is adapted from real implementation in industrial manufacturing. The main idea of this project is to monitor using IoT application with NodeMCU and develop an industrial control and monitoring system for integrate with the current system using SCADA. Generally, this system can supervise the MAP202 wirelessly and also the PLC wiring can be done to a different types of external input or output devices. In order to design the operation of the system based on real implementation in industrial manufacturing. Ladder diagram with four conditions of the movement are developed by using Grafcet technique. The condition is about checking the presence of the object and the decision making for the correct movements. They are also included alarm to indicate there is an error occurred during the operation. Moreover, this project can be monitored online through Internet of Things (IoT) implementation with NodeMCU. This project also integrates with existing system using Microsoft Visual Basic as a SCADA system.

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TABLE OF CONTENTS

	PAGE
TABLE OF CONTENTS	ix
LIST OF TABLES	xiv
LIST OF FIGURES	xv
LIST OF APPENDICES	xviii
CHAPTER 1 INTRODUCTION	1
1.1 Introduction	1
1.2 Background	1
1.3 Problem Statement	2
1.4 Objective	2
1.5 Scope	3
CHAPTER 2 LITERATURE REVIEW	4
2.1 Introduction	4
2.2 Previous Related Work	4
2.2.1 "IoT Based Model For Monitoring And Controlling Water Distribution"	
by J G Natividad & T D Palaoang	4

2.2.2	“IoT based Monitoring and Control System for Home Automation” by Pavithra. D & Ranjith Balakrishan	6
2.2.3	“Remote Monitoring and Controlling System For A Water Purification Plant” by D.N.P Thalakotuna, T.A.T Thilakaratne, Y.B.M.S Jayasinghe, T.H.K.M Silva & S.R. Munasinghe	7
2.2.4	“A Design of the IoT Gateway for Agricultural Greenhouse.” By Guohong Li, Wenjing Zhang & Yi Zhang	9
2.2.5	“Fire Monitoring and Control System” by K.M.Gaikwad, Ahmed Quadri, Shelar Akshada & Zagade Reshma	10
2.2.6	“Smart Traffic Control System Using PLC and SCADA” by Mohit Dev Srivastava, Purna, Shubhendu Sachin, Sumedha Sharma and Utkarsh Tyagi.	11
2.2.7	“Automated Cooking Machine using PLC and HMI” by Patel Reema and Kunwar Jay Kumar D.	12
2.2.8	“Automated Cooking Machine using PLC and HMI” by Patel Reema and Kunwar Jay Kumar D.	13
2.3	Summary Table	14
CHAPTER 3 METHODOLOGY		19
3.1	Introduction	19
3.2	Planning	21
3.2.1	Flowchart of general flow of PSM	22

3.2.2	Gantt Chart	23
3.3	Design	25
3.3.1	Block Diagram Of Iot Based Industrial Control And Monitoring For MAP202	25
3.4	The Specifications For The Software	26
3.4.1	CX-Programmer	26
3.4.2	Supervisory Control and Data Acquisition (SCADA)	27
3.4.3	Microsoft Visual Basic 6.0	28
3.5	The Specifications For The Hardware	29
3.5.1	MAP202	29
3.5.2	Air Checker PS1100-R06L and Vacuum Ejector	30
3.5.3	Dual Rod Cylinder	31
3.5.4	NodeMCU and OMRON MY2N Relay	32
3.5.5	Programmable Logic Control (PLC)	34
3.6	Implement	35
3.6.1	Implementation Of The Project	35
CHAPTER 4	RESULT AND DISCUSSION	36
4.1	Introduction	36
4.2	Software Implementation	36
4.2.1	Programming Language	36

4.2.2	Host Link Command for Visual Basic 6.0	37
4.2.3	RR(IR/SR Area Read)	38
4.2.4	WR(IR/SR Area Write)	39
4.2.5	Programming Software	40
4.2.6	Microsoft Visual Basic 6.0	41
4.3	RESULT	42
4.3.1	Ladder Diagram	42
4.3.2	Initialization Section	42
4.3.3	Step Section	43
4.3.4	Checking Section	43
4.3.5	Work Bits Section	44
4.3.6	Output Section	44
4.3.7	Timer	45
4.3.8	Grafcet	45
4.3.9	MAP202 Communicate Using IoT Application	48
4.3.10	Communication Using Microsoft Visual Basic 6.0 (VB6)	49
4.4	Data Analysis	52
4.4.1	Analysis Occurrence Happened In Every Condition	52
4.4.2	Timing Diagram	54

CHAPTER 5	CONCLUSION AND RECOMMENDATION	57
5.1	Conclusion	57
5.2	Recommendation	58
REFERENCE		59
APPENDIX		60

LIST OF TABLES

TABLE	TITLE	PAGE
Table 2.1	Summary Table regarding to previous related work	14
Table 3.1	Gantt Chart of Progress of Final Year	23

LIST OF FIGURES

FIGURE	TITLE	PAGE
Figure 2.1	System architecture	5
Figure 2.2	Architecture of proposed solution	6
Figure 2.3	System Overview[3]	7
Figure 2.4	Graphic Users Interfaces of client software[3]	8
Figure 2.5	Hardware design of the IoT gateway	9
Figure 2.6	Block Diagram	10
Figure 2.7	Flow chart for this system	11
Figure 2.8	Showing congestion and diversion in city[6]	11
Figure 2.9	Block diagram	12
Figure 2.10	A verification of their design. [8]	13
Figure 3.1	Major steps in methodology	19
Figure 3.2	Flowchart of general flow PSM	22
Figure 3.3	Block diagram of control and monitoring system	25
Figure 3.4	CX-Programmer software installer	26
Figure 3.5	An example of system that using SCADA	27

Figure 3.6	An example a system that using Visual Basic 6.0	28
Figure 3.7	MAP202	29
Figure 3.8	Air Supply	29
Figure 3.9	Air Checker with Vacuum Ejector	30
Figure 3.10	Horizontal Pneumatic Linear	31
Figure 3.11	Vertical Pneumatic Linear	31
Figure 3.12	NodeMCU	33
Figure 3.13	Omron My2n relay and sockets	33
Figure 3.14	One type of Omron module	34
Figure 4.1	The ladder diagram space in CX-Programmer	37
Figure 4.2	The Arduino Programming Layout	37
Figure 4.3	A programming of VB6 on MAP202 interfacing	38
Figure 4.4	WR Header Type For Controlling MAP202	39
Figure 4.5	Initial display	40
Figure 4.6	The libraries that are using together with SSID	41
Figure 4.7	Interface Of MAP202	41
Figure 4.8	Initialization Section	42
Figure 4.9	Step section	43
Figure 4.10	Checking Section	43
Figure 4.11	Work Bit Section	44
Figure 4.12	Output Section	44

Figure 4.13	Timer Section	45
Figure 4.14	Condition 1	46
Figure 4.15	Condition 2	46
Figure 4.16	Condition 3	47
Figure 4.17	Condition 4	47
Figure 4.18	Interface of Web Server	48
Figure 4.19	Respond From Web Server	49
Figure 4.20	Interface of VB6 in Rest Position	50
Figure 4.21	Respond After Start Push Button Is Pressed	51
Figure 4.22	Line Graph Condition 1	52
Figure 4.23	Line Graph Condition 2	52
Figure 4.24	Line Graph of Condition 3 and 4	53
Figure 4.25	Timing Diagram Condition 1 For Output And Sensors	55
Figure 4.26	Timing Diagram Condition 2 For Output And Sensors	56
Figure 4.27	Timing Diagram Condition 3&4 For Output And Sensors	56

LIST OF APPENDICES

APPENDIX	TITLE	PAGE
Appendix A	Ladder Diagram Of MAP202	60
Appendix B	Grafcet	70
Appendix C	Source Code Of NodeMCU	71

CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter will describe MAP202 control and monitoring system using Supervisory Control and Data Acquisition (SCADA) and the Internet of Things (IoT) in detail. The background, problem statement, objective and project scope are included in this chapter.

1.2 Background

Nowadays, industrial field has been exposed to Industrial Revolution 4.0 (IR4.0) which is expected to change the things in the future. Furthermore, automation and artificial intelligence are change agents in IR4.0. Now, the computers are connected and communicate with each other to take decisions without human participation. The combination of cyber physical system and the IoT to monitoring and control.

The Internet of Things (IoT) is a physical device or software tool that connects the cloud to controllers, sensors and smart devices. All data that moves to the cloud, or vice versa, passes through the internet, which can either be a committed equipment or programming program. Therefore, IoT are implemented in MAP202. Its carries out a simple assembly process by reproducing subsets of more complex processes found in industry.

Supervisory Control and Data Acquisition (SCADA) refers to an industrial computer system. SCADA is a category of software application program for process control, the gathering of data in real time from remote locations in order to control equipment and conditions. MAP202 used Microsoft Visual Basic 6.0 (VB) as SCADA system. VB6 is a software that combination of components organized visually on a shape, representing characteristics of those components and actions.

1.3 Problem Statement

The current MAP202 are located at laboratories of Faculty of Electrical and Electronic for the purpose of learning. MAP202 have only been used for controlled and monitored as MAP202 is adapted from real implementation in industrial manufacturing. MAP202 are usual monitored spontaneously while the process is in progress either through the ladder diagram. In order to make MAP202 meet an IR4.0 requirement, the machine need emphasized by a system monitored over the internet by using Internet of Things (IoT) and also to innovate a Supervisory Control and Data Acquisition (SCADA) system.

1.4 Objective

The objectives of this project are based on the above problem statement:

- I. To study MAP202 that relate to industrial manufacturing based on real implementation.
- II. To develop a SCADA system to monitoring and control process of MAP202.
- III. To develop a monitoring system of MAP202 over the internet.

1.5 Scope

This project will emphasis primarily on control and monitoring system of MAP202. In this study, grafcet technique, the ladder diagram of MAP202 are constructed with four condition using CX-Programmer. The condition is about checking the presence of the object and the decision making for the correct movements. They are also included alarm to indicate there is an error occurred during the operation. Moreover, this project can be monitored online through Internet of Things (IoT) implementation with NodeMCU. This project also integrates with existing system using Microsoft Visual Basic as a SCADA system. Hence, this system can supervise the MAP202 wirelessly.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

For this section, the point is to audit and concentrate various trials and tasks effectively done by different analysts or specialists significant to the field of study. It is also will show the relevant hardware used. Besides that, this system has been implemented to aim at improving research and avoiding unnecessary repetition of the problem area in this study. IoT technologies are becoming increasingly popular due to their ability to develop different applications and there are currently only small portions available in industry.

2.2 Previous Related Work

2.2.1 "IoT Based Model for Monitoring and Controlling Water Distribution" by J G Natividad & T D Palaoang

This project is proposed to use of IoT technologies to develop a smart water management system for community to monitor the status of various water tanks and pumping stations and water pressure. Also included in the proposed system is the control system to avoid overfilling tanks, pipe leakage due to overpressure.

This is due to certain difficulties in the spread line such as damage to the pipeline by overpressure or low water weights, in which water cannot be obtained by buyers situated on high ground or at a distance from water supply stations or tanks.

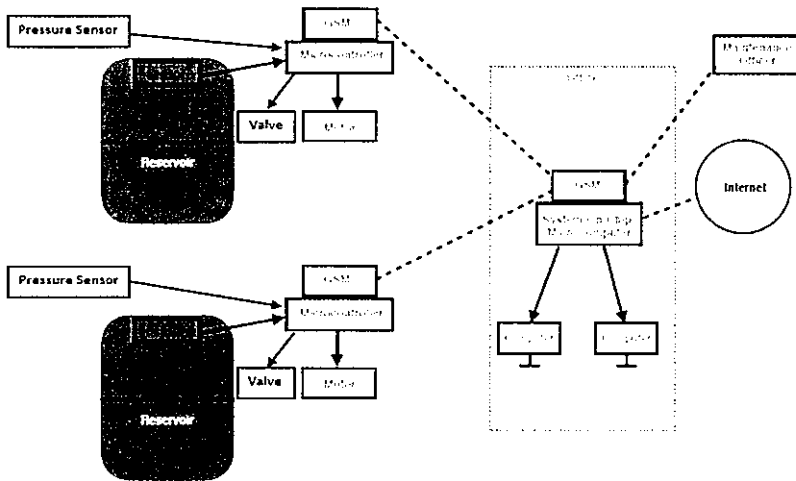


Figure 2.1 System architecture

Figure 2.1 above shown the communication with the computer of all sensors. In this research, serial communication for transmission and reception is carried out by transmitting one bit at a time. In addition, this is an IoT-based water distribution system monitoring and control model the following core units are composed of ultrasonic sensors, pressure sensors, motorized electric water, GSM, microscope Arduino, Raspberry Pi and solid-state relay.

2.2.2 “IoT based Monitoring and Control System for Home Automation” by Pavithra. D & Ranjith Balakrishan

This research is carried by Velammal Engineering College to study about IoT based Monitoring and Control System for Home Automation. The purpose of this project is to control domestic equipment via Smartphone with Wi-Fi as a communication protocol and raspberry pi as a server system., Providing extra consoles, protection and security with various decision from economical power use. Without human interference, the user can track and handle their home portals and various devices and turn TV on / off.

Home automation systems are designed and implemented to ensure that the majority of the home is managed and maintained by a cost-effective and open source home automation system. It is Use reliable wireless technology to connect different modules to the home automation system server and adds to the advance flexibility and the reconfiguration of the system. Wireless LAN (Local Space Network) connections between different sensors, hardware modules and servers.

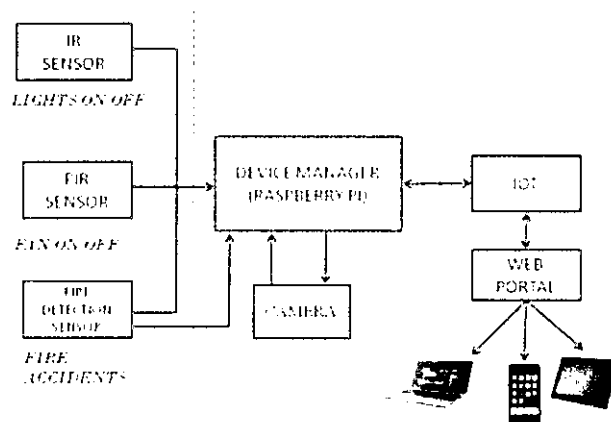


Figure 2.2 Architecture of proposed solution