UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF MONITORING SYSTEM FOR MANUFACTURING PROCESS USING IOT

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

by

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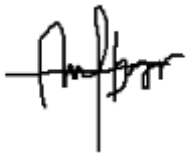

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APPROVAL

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

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ABSTRAK

Inovasi dalam bidang teknologi pada masa kini telah memberi impak yang besar kepada sektor kilang seperti sistem pemantauan. Sistem pemantauan yang memanfaatkan internet perkara (IoT) sangatlah penting kerana ianya sangat berguna pada apa pun yang penting. IoT juga akan pertimbangkan kebimbangan keseluruhan kitaran hidup kita dari aspek keselamatan dan juga keselamatan peranti IoT. Kertas ini menggambarkan teknik untuk pengembangan sistem pemantauan untuk proses pembuatan dengan menggunakan IoT. Teknologi utama yang digunakan adalah teknik reka bentuk untuk sensor node ke sistem pemantauan. Sistem ini akan paparkan taraf lampu menara di mesin sama ada hijau, kuning, ataupun merah didalam 'Node-Red' dan 'MQTT'. Sistem ini mengandungi 'IoT Gateway' sebagai teknik utama untuk project ini di mana ia menyediakan komunikasi di antara mesin dan 'MQTT'. Dengan menggunakan sistem ini, data-data di dalam mesin yang sedang beroperasi adalah data yang sangat penting kerana secara khususnya ia adalah satu data yang mengandungi sistem yang akan menentukan keadaan sesuatu produk dan keadaan mesin tersebut. Ia juga boleh mengurangkan masa yang diambil oleh jurutera dan juruteknik.

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ABSTRACT

Technological innovations today have a huge impact on the manufacturing sector such as monitoring systems. Monitoring systems that utilize IOT are very important because they are very useful for anything important. IoT will also consider the overall concern of our life cycle in terms of security as well as the safety of IoT devices. This paper describes techniques for development of monitoring system for manufacturing process using IoT. The main technology used is the design technique for sensor nodes to the monitoring system. The system will display the tower lamp status in either green, yellow or red in Node-Red and MQTT. This system contains IoT Gateway as the main techniques for this project where it provides communication between machine and MQTT. By using this system, the data in the machine that is operating in the data is very important because in particular it is the data that contains the system that will determine the state of the product and the state of the machine. It can also reduce the time taken by engineers and technicians.

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DEDICATION

To my beloved family, thank you for supporting me and I would like to dedicate this paper to all my family.

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First of all, I would like to express my gratitude to Almighty Allah to enabling me to complete this report on 'Development of Monitoring System for Manufacturing Process by IOT'. Thank to my family and my friends for theirs understanding and support for my project.

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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

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LIST OF ABBREVIATIONS

IR	Industrial Revolution
MQTT	Message Queue Telemetry Transport
IoT	Internet of Things
PPM	Plan Preventive Maintenance
PP	Process Parameter
PV	Process Variable
ACC	Adaptive Control Constraints
ACO	Adaptive Control Optimization
GAC	Geometry Adaptive Control

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CHAPTER 1

INTRODUCTION

1.1 Project Background

In the new era of IR 4.0, the organization in developing countries had faced the most challenging issue in an information management. Educational institution have changed from the point of view according to the landscape of innovation in this era. IR 4.0 make human gadget interface more everyday which were absolutely controlled through artificial intelligence and digital physical framework. Educational development and talent had made destiny getting to know extra customized, hyper, intelligent, portable, international and digital which makes a specialty of innovation.

In this project, target consumer is the industries. The reason at the back of this project is to develop a monitoring system for manufacturing process that to monitor the flow of data collection. In other word, it can monitor the system by using application. By using the IOT Gateway (node red and MQTT) concept, it can help consumer to detect and analyzed which is can monitor the system either in a good condition or bad condition even though if it's outside the production lines.

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As widely known approximately the IOT gateway are rising as a key element of bringing the next generation devices. The integrate protocols for networking, it could manipulate storage and edge analytics on the statistics and facilitate information waft securely between part gadgets and clouds. The combination of wireless sensor networks and mobile conversation network or internet, has performed the crucial role to control the wireless sensor network in IOT gateway.

1.2 Problem Statement

The industrial almost had the issues regarding to machine problem. According to this case, the problem occurs on how the performance of the machine along the productions line. It's been realized that the clear majority is a data collection that supposed to collect every week by referring to the plan preventive maintenance (PPM). It is also cannot know the exact problem from the machine when shutdown. In this case, some manufacturers still collecting data manually in a very large amount. Many cases concerned about leaning out costs and decreasing things like downtime where it is required some extent.

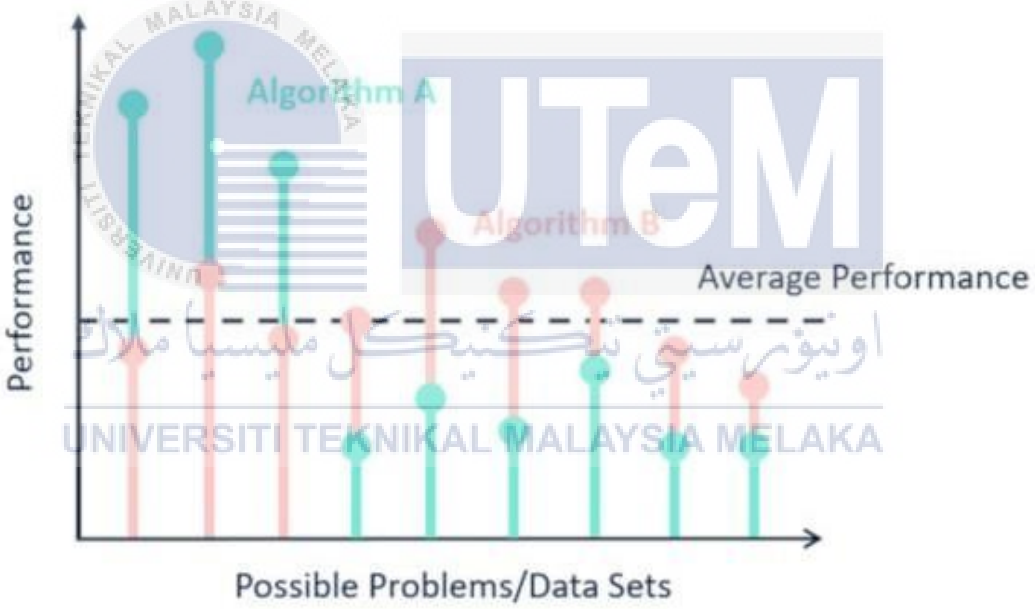

Figure 1.1: The performance according to the data collection

This task is worthy profitable nowadays due to the fact an industrial want to proceeds with maintains for used in all machines at productions line. A part of automated machines based totally on monitoring system using Arduino that were to an amazing quantity unexplored capacity to detect the problem.

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1.3 Objective

This project that is the development of monitoring system for manufacturing process become created making use of the most significant to offer more area to the manufacturing. Although, there are a few goal as shown: -

1. To collect the real time data from the process machine by using Node-RED
2. To develop the process for the monitoring system

1.4 Scope of Work

The primary awareness of this project was the develop of monitoring system for manufacturing process by using IOT. The system will be using software technology by application node red and MQTT as an assist for data collection. IOT gateway is the main for transferring the data from the machine to the application node red and MQTT. The proposed system is limited only to collecting the data and know the work progress when the machine is process. The project can be used in all existing industrial.

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1.5 Project Significance

In this undertaking significance area, the motive is to apprehend the huge variety of users with the capacity. The development of this project contrasts and others which all the hardware is more lowly priced and easier to use. To wrap matters up, focus of this project is in any respect users which approximately their machine is work well with the aid of detection that may be identified.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This segment facilities on speculation and records diagnosed with the extent of this project. Apart from that, facts and approach applied as part of past research are checked on. As indicated through the project about development monitoring system application making use of IOT gateway with associated area server application, are diagnosed with this part. Numerous skip inquiries about composed the monitoring system.

2.2 Overview of Development Monitoring System for Manufacturing Process by using IOT

Development of monitoring systems for manufacturing processes is becoming in recent time a driving force for improvement and sustainability of manufacturing industries. The machine tactics can going up the reliability and controllability of the ac systems. There have a few researches results during the last years in monitoring systems for machine processes, data collection and ac systems. Due to the environmental impact, policies and regulations, the manufacturer is important regarding efficiency and sustainability for produced the quality. Consequently, for great importance for implementing online optimization for ac into production lines, it is not solely underneath scope tool condition, however conjointly under prism of creating the producing additional economical and more property.

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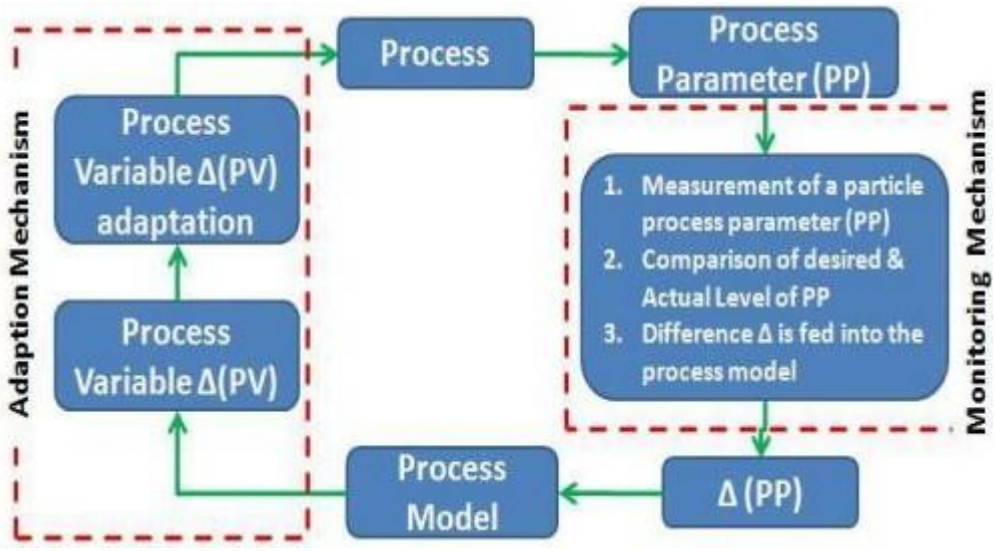

Figure 2.2.1: process – monitor – control loop

There have divide into 3 fundamental categories which is Adaptive Control with Constraints (ACC), Adaptive Control with Optimization (ACO), and Geometry Adaptive Control (GAC). The ACC systems are applied where within the material has been used have to be eliminated to maximized through protection of the reducing forces at highest possible fee, so for the devices no longer be in risk of breaking down. ACO systems, the system were pick the setting for the optimizing of an overall performance index which is manufacturing time, unit cost, etc. For adjusting reducing variables for maximization of the material removal, subject to parameter constraints, surface roughness and even more. In the GAC systems, this step is a method to optimization problem ruled by need for product quality, measurement accuracy and to maintained surface finish.

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2.3 Previous Research Study

2.3.1 Industrial Revolution (IR 1.0)

In early 18th century, 1st Industrial Revolution (IR 1.0) has been created the power of using steam power and mechanization of production. The mechanized model (steam power) performed 8 time the extent at the equal time, earlier than produced the thread on easy spinning wheels. The best step forward for growing human productivity became used for industrial purposes. IR 1.0 used a steam-engines could be generated the high power compared to weaving looms by muscle for generated power. In 100 years later, human and goods could move exceptional distances in fewer hours where its miles growing the steamship or steam- powered locomotive with the intention to be brought approximately further large changes.

Figure 2.3.1.1: steam engines that generated power

Above is a steam engine where it is performed mechanical work using steam as its operating flu (Levinthal, 2001)id. The system works by way of used pressure produced through steam strain to push a piston from side to side interior a cylinder.