DATA LOGGER FOR IOT SYSTEM

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This report is submitted in partial fulfilment of the requirement for the

Bachelor of Computer Science (Computer Networking) with Honors.

FACULTY OF INFORMATION AND COMMUNICATION TECHONOLOGY UNIVRRSITI TEKNIKAL MALAYSIA MELAKA

DECLARATION

I hereby declare that this project report entitled

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Is written by me and is my own effort and that no part has been plagiarized without citations.

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SUPERVISOR : _____ Date : 10/9/2021

(Ts Dr. Norharyati Binti Harum)

DEDICATION

First of all, this dedication is for my creator, Allah S.W.T that give me strength to complete this project. This thesis itself is dedicated to my supervisor, Ts Dr. Norharyati Binti Harum that always assist me during the process of completing this project. To my beloved parents En. Zamri Bin Mohd Noor and Puan Surina Binti Kassim that always support me especially in term of emotion and moral. Last but not least, I would like to dedicate this project to the entire lecturer of Faculty of Information and Communication Technology and my classmate. Without them, this project cannot be completed in the time scheduled.

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ABSTRACT

Data Logger for IoT System is a product that will programmed using a specific sensor which will be implemented to company environment and will not use a lot of cost in term of installing the technology. Data Logger for IoT System allow multiple sensors to be connected for this project, this system used a sensor that can detect the current temperature and humidity around the area. It also equipped with gas sensor to detect any gas leakage on the surrounding. The problem statement states that data logger available on the market needs high installation and maintenance fees. Which caused a difficulty for small company to install a data logger on their company to monitor the condition of their premises. Based on the problem statement, Data Logger for IoT System is proposed to develop with the objectives to implement a lower cost data logger. Other than that, to integrate the system with the database for it to save the data. Furthermore, it is also designed to notify the user through phone if the temperature exceeds the set limit. To ensure the project can be successfully developed, the Prototyping Model has been used. The reason is, prototyping model are used for software development model that required of building the prototype, tested, and modified until it become an acceptable prototype for the end user to use. Result obtained from this project is, the system can collect data by using a specific sensor and saved the data into a database. Other than that, user will be notify if the data collected from the sensor exceeds the limit set. All the data that has been saved inside the database can be shown to the user by using a simple user interface.

ABSTRAK

Data Logger for IoT System adalah sebuah produk yang akan diprogramkan menggunakan sensor tertentu dan akan dilaksanakan untuk persekitaran syarikat dan tidak akan menggunakan kos yang tinggi bagi pemasangan teknologi tersebut. Data Logger for IoT System membolehkan beberapa sensor disambungkan ke peralatan tersebut, tetapi untuk projek ini, sistem ini hanya akan menggunakan sensor yang dapat mengesan suhu dan kelembapan bagi persekitaran kawasan tersebut. Selain daripada itu, sensor gas juga akan di sambungkan bagi mengesan sebarang kebocoran gas pada keadaan sekeliling. Pernyataan masalah menyatakan bahawa kebanyakan *data logger* yang tersedia ada di pasaran memerlukan kos yang tinggi bagi menampung kos pemasangan dan penyelenggaraan yang tinggi. Hal ini menyebabkan kesukaran bagi syarikat kecil untuk memasang *data logger* di syarikat mereka bagi tujuan memantau keaadan premis mereka. Berdasarkan penyataan masalah tersebut, Data Logger for IoT System diusulkan untuk membangunkan dengan objektif untuk melaksanakan *data logger* dengan kos yang rendah. Selain daripada itu, untuk mengintegrasikan sistem dengan pangkalan data bagi tujuan penyimpanan data. Di samping itu, ia juga dirancang untuk memberi tahu pengguna melalui tefon sekiranya suhu melebihi had yang telah ditetapkan. Bagi memastikan projek ini dapat dikembangkan dengan jayanya, Model Prototaip telah digunakan. Hal ini kerana, model prototaip merupakan model pengembangan perisian yang diperlukan untuk membangunkan prototaip, diuji, dan diubah sehingga menjadi prototaip yang dapat diterima oleh pengguna akhir. Hasil yang diperoleh daripada projek ini adalah, sistem ini dapat mengumpulkan data dengan menggunakan sensor tertentu dan menyimpan data tersebut ke dalam pangkalan data. Selain itu, pengguna akan diberitahu sekiranya data yang dikesan oleh sensor melebihi had yang telah ditetapkan. Semua data yang telah disimpan di dalam pangkalan data akan dipaparkan kepada pengguna dengan menggunakan antara muka pengguna yang sederhana.

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CHAPTER I

INTRODUCTION

1.1 Introduction

Room temperature and humidity is a normal term to indicate a temperature level within a closed space at which humans can live with a more comfortable. Most of the time, room temperature can be used to indicated by general human comfort, though climate may acclimatize people to higher or lower temperatures. Other than that, multiple equipment used for the company are sensitive to the temperature and humidity on the surroundings. It will affect the performance and the life span of the equipment. Other than that, a save working space for the worker to work on also important thing to consider inside every building. Because of that, Data Logger for IoT System is needed to solve the problem of unexpected turn of event to the equipment and worker inside the company.

Most of the Data logger used by the company nowadays have a lot of problem which still need to be improved. For example, the data logger itself only record the data by collecting the data from the sensor and store it inside the database. Other than that, the cost needed to build one data logger used now quite expensive such as HOBO U20L-04. The price for the whole system is up to RM2667.50. While for the cheap system, the number of sensors that can be connected to the system is limited such as LogTag data logger. Due to that, it causes a lot of difficulty for a small company to install a data logger on their premises.

Data Logger for IoT System is a product that will programmed using a specific sensor to monitor and control room temperature and humidity together with the gas presence around the equipment. This program will detect the surrounding temperature and humidity reading and also gas presence from the surroundings and saved it inside the database. All of the recorded data can be shown to the user by using a simple type of interface so the user can read the data and alert about the condition of their company. Other than that, the system will alert the user if there any abnormalities happen to the temperature and humidity around the equipment. The system also will

send an alert notification to the user if the presence of the is high and not save to the human. By doing that, an early measure can be done by the user and the record can be analyze back for the future use.

1.2 Problem Statement

Some of the industries have rising concerns for the demand to store specific production materials within a particular temperature range. Nowadays, some of the industries do not have incomprehensive data logger to monitor the surrounding for their equipment. The main reason behind it is due to the high cost to develop and installation fee for the data logger.

Table 1.1: Problem Statement

PS	Problem Statement
PS1	Existing data logger is expensive with very limited features.

1.3 Project Question

Project questions is used to identify the question of the existing temperature and electric current usage control system. Based on the research, we can conclude that there are few weaknesses of the current temperature and electric current usage control system.

Table 1.2: Summary of Project Question

PQ	Project Question
PQ1	What type of data logger exist in factory?
PQ2	How to save the collected data, notify the user, and display the data to user?
PQ3	How will the data logger perform?

1.4 Objective

Objectives provide structure and clarity of expectation for the project. Thus, the project aim had been stated below:

Table 1.3: Summary of Project Objective

PO	Project Objective
PO1	To identify characteristic of existing data logger in factory
PO2	To develop a data logger that integrated with database, smart notification, and dashboard for IoT System
PO3	To validate the performance of the developed data logger

1.5 Project Scope

1. The project would detect the temperature and humidity changes within the premise.
2. The system will save collected data from the sensor into a database.
3. Data Logger for IoT System will notify the user using Telegram if the temperature and humidity exceed the limit set.

1.6 Project Contribution

Project contribution defines the expected output from this project. This part can be referred to the objectives of this project. Therefore, the project contribution had been stated below.

Table.2.4: Summary of Project Contribution

PC	Project Contribution
PC1	Use Node Red as a software system to program the data logger.
PC2	Hardware system using a cheap microprocessor that enable to connect with multiple sensors.
PC2	Data logger that can save data from sensor into a database and have interface for user to view the data.

1.7 Conclusion

For the conclusion, this chapter helps to understand the project background and also the objective that should be accomplish and problems happened before begun the project. Based on the related topic and subtopic in this chapter, which is the problem statement, project objective, and expected output that this study wants to purpose a new approach of manufacturing monitoring system.

Additionally, this project will record all the reading from the sensor, and it will be uploaded into the database. This study is expected to be able to ease the user in order to monitor the temperature and humidity inside their premise in the best way.

This project also provides a contribution on how the tools can be used as easy as a plug-and-play in the real environment perhaps for the big network inside the industries. In the next chapter, the discussion will be focusing on the literature review that will cover about the model approached and related work about the framework, enhancing the framework and system integration.

CHAPTER II

LITERATURE REVIEW

2.1 Introduction

This chapter will discuss about the problem and solution regarding Data Logger for IoT System, to have a better understanding about the concept and technique needed to be implemented in this project. Other than that, this chapter will contain previous data logger monitoring system design by many types of engineers in the past that would be studied together with their thoughts on the project would be properly recorded. Their multiple type of design and implementation methodologies and techniques will also be documented in attempt to reach a comparison between the past and the current project timeline.

In this modern era, there were a lot of IoT device available for a company owner to improve their production and management. North Star BlueScope Steel that keeps track health of the worker and environmental temperature to avoid any accident to occur during work (O'Connor, 2016). Unfortunately, very little manufacturing company implement data logger system to monitor their company. Although the company used data logger as a monitoring system, the system itself is expensive and can result in a loss of funds. Therefore, the main reason for this data logger for manufacturing system invented is to create a low-cost data logger while at the same time it can work successfully.

2.2 Related Work / Previous Work

2.2.1 A Model for Working Environment Monitoring in Smart Manufacturing

Due to the new development in Industry 4.0 which is the expansion of smart and easy manufacturing systems that will allow mass production. According to Kadir et al., Industry 4.0 research is new and mainly focused on technical and technological aspects, while ignoring the human factor. Reason behind that is most of the current systems are run by human workers that may cause disturbance and cannot running smoothly. Latest trends in Industry 4.0 put a lot of requests on the workforce because they need to build up their organization, communication, cognitive, and physical skills in to order to work efficiently and safely in the new digitalized industrial era. The paper presented a model to monitor the working environment in in smart manufacturing and designed with idea to include in developing technologies and contemporary methods in complex building.

2.2.2 Improved Internet of Things (IoT) Monitoring System for Growth Optimization of Brassica Chinensis

Marimoto and Hashimoto stated that there are multiple climatic parameters need to be considered such as humidity, temperature, and light parameters in order for the plant to grow with consistent quality inside the plant factory. The WSN nodes which consist of multiple sensor such as temperature, humidity, light sensor, and actuator. The WSN nodes is connected to Zigbee or WIFI module that can send data over the air to a local gateway or router for it to transfer to the cloud server. The purpose of the WSN nodes was to sample the data and perform environmental control mechanism in real time.

2.2.3 A New Data Logger based on Raspberry-pi for Arctic Notostraca Locomotion Investigations

Based on the study by V. Pasqualli et al., an infrared sensor device is used and controlled by a Raspberry-Pi which act as a controller of the measurements and data logger. Infrared barriers are mounted in the aquarium for it to detect the locomotor activity of the animal. The electric

pulsed will be generated when the animal passes through the barrier then go through a conditioning circuit that adapt it to the input range of the Raspberry-Pi. The signals are stored and will be processed based on the requirement needed.

2.2.4 Design and Implementation of a Low-cost Sensor Network to Monitor Environmental and Agronomic Variables in a Plant Factory

An Arduino Mega 2560 Rev3 was used in this low-cost system that act as a datalogger and also multiple sensors is used such as temperature, humidity, canopy surface temperature, air velocity, photosynthetic photon flux density, PH, electric conductivity, dissolved oxygen and nutrient solution temperature sensor. Additional hardware was used to measure the real time and recorded inside the system. All of the collected data was sent by using Bluetooth device that connected to the Arduino serial port.

2.2.5 Design and Validation of a Low-cost Indoor Environment Quality Data Logger

The data logger design in this research is to support on the research seeking for a better understand the links between resident satisfaction and indoor environment quality inside an apartment. Frontczak et al. describe that the heat, visual, sound and air- quality environments contribute to a satisfying and safe indoor environment for the residents. The device itself consist of Arduino Mega 2560 micro-controller board and multiple sensor that connected to the controller.

2.2.6 IoT Based Real Time Energy Monitoring System Raspberry Pi

The proposed IoT based energy monitoring system consists of existing energy meters that commonly used in the industry, Raspberry Pi, cloud, and visualization systems. The cloud is consisting of database, data web service, control application, and monitoring application. Energy meter that has been used are Schneider and Elmeasure. The meter itself capable of reading different electrical parameters such as power, energy, and real power reactive power. The microcontroller used is Raspberry Pi that has been installed with Node.js and other various libraries.

2.2.7 Intelligent Manufacturing Production Line Data Monitoring System for Industrial Internet of Things

Based on this paper written by Wei Chen (2020), this paper suggests a reference architecture for smart factories by referring existing product of IoT application in industrial workshops. The studies itself said that the company management and real manufacture process need a monitoring system that anti-interferences, can functioning in a real-time and has a rapid deployment capability. The client or server mode needs to be implemented in order to pass the data. The server will process data that received from the client and send the result back to the client.

2.2.8 Deep Learning Techniques for Energy Forecasting and Condition Monitoring in the Manufacturing Sector

V.J Mawson and B.R Hughes (2020) stated that two deep learning based neural network models is used to monitor and make a prediction about the hourly energy and workshop environmental condition. All of the data from the building obtained from pre-installed energy data collection system located at the manufacturing facility in order to validate the model. Other sub-metered data used for individual components such as energy consumption of lighting and HVAC (heating, ventilation, and air condition) was not available because it only collects energy data on a building level.

2.2.9 A Cloud-Monitoring Service for Manufacturing Environments

The proposed architecture by Ricardo Toro et al. is gather relevant data from one or multiple equipment and show it to the user by using cloud-based service application. It used two-layer-network architecture named as sensing layer and a cloud layer. The sensing layer consist of nodes gathering sensor data which connected to the manufacturing system. While the cloud layer consists of a network of data consumers together with other manufacturing application. There were two types of nodes used which is slave node that collect data while the other node is the master node that received data from the slave node.