REMOTE pH MONITORING SYSTEM USING IOT NODE

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PROJEK SARJANA MUDA II

Tajuk Projek : Remote Chemical pH Monitoring Using IoT Node

Sesi Pengajian :

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DECLARATION

I hereby declare that the work in this Final Year Project Report is my own except for quotations and summaries which have been duly acknowledged.

Signature : _____

Date : _____

Name : MUNIRAH BT MOHD FUAD

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SUPERVISOR'S DECLARATION

I hereby declare that I have checked this report and in my opinion, this report is adequate in terms of scope and quality for the Final Year Project course of Bachelor Degree in Electronic Engineering (Industrial Electronic) (UTeM).

Signature :_____

Date : _____

Name of Supervisor : ENGR. KHAIRUL MUZZAMMIL BIN SAIPULAH

For Beloved mom and dad

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ABSTRACT

Remote chemical pH monitoring using Internet of thing (IoT) node is a system that provides pH reading of chemicals from the cloud or Internet and can be monitored from anywhere and everywhere using smartphone or web page. The pH data is transmitted to the Internet using IoT node device that interpreted the analog pH sensor output to readable data. This system is designed to replace manual pH level monitoring operation that used human power to collect pH readings. The system consists of an IoT node device, a web page and an Android mobile application. The IoT node device is equipped with microcontroller and a Wi-Fi module. The microcontroller will process the sensor data and transmit the pH data to an IoT server every 30s via Wi-Fi module. Every 30s the web page will update the pH data in form of chart and table. The Android application is linked to the web page server so every update to web page will update the Android application too. This automated system can reduce human error and negligence that result in false and inconsistent reading. Furthermore, the web application is equipped with Microsoft Excel data export so that all the data can be saved and viewed in local computer for private record. With this system, a consistent worldwide-access remote pH monitoring is no longer a fantasy.

ABSTRAK

Pemantauan pH bahan kimia menggunakan *Internet of thing (IoT)* adalah sistem yang menyediakan bacaan pH bahan kimia daripada internet dan membolehkan bacaan pH diawasi dari mana-mana saja menggunakan telefon pintar atau laman web. Bacaan pH dihantar ke alat peranti IoT nod yang memanipulasikan bacaan analog pH daripada sensor kepada sebuah bentuk bacaan yang mudah difahami. Sistem ini dihasilkan untuk menggantikan system seliaan tahap pH secara manual yang melibatkan penggunaan tenaga kerja manusia. Sistem ini mengandungi alat peranti IoT nod, sebuah laman web dan sebuah aplikasi telefon pintar (Android). Peranti IoT nod yang digunakan mempunyai mikropengawal serta modul WI-FI. Dimana, mikropengawal digunakan untuk memprosses data daripada sensor dan dihantar kepada server IoT setiap 30s melalui modul Wi-Fi. Seterusnya, laman web akan memperbaharui data pH yang ditunjukkan menggunakan carta dan jadual setiap 30s. Manakala aplikasi Android pula dihubungkan dengan server laman web bagi memastikan setiap pembaharuan pada lama web dapat dilihat didalam aplikasi telefon juga. Aplikasi secara automatik ini dapat mengurangkan kecuaian dan kesilapan yang sering dibuat manusia yang boleh mengakibatkan kesilapan pengambilan data atau pengambilan data secara tidak konsisten. Tambahan pula, aplikasi laman web yang dihasilkan juga dilengkapi data eksport ke Microsoft Excel yang membolehkan data pH disimpan dan dilihat melalui computer peribadi untuk simpanan persendirian. Dengan system ini, nescaya pemantauan pH yang mempunyai akses di seluruh dunia secara konsisten bukan lagi sebuah mimpi.

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CHAPTER 1

INTRODUCTION

This chapter will provide an overview about this project where there will be an explanation about the objective, problem statement, scope of project and surface introduction about what will be happen throughout this project development until the project accomplish.

1.1 INTRODUCTION

The idea of developing this project is due to the demand of the car assembly industry which is the car painting department. The car painting process involves a lot of

liquid where one of them is DI water. DI water is basically a distill water with PH natural, 7. The Distill water is used to wash car body before the coating process begins. It is important to monitor the PH value of this water due to car body sensitivity. Car body which is made from metal cannot be exposed to the water that consists of unnatural element to avoid from corrosion and increase car body durability.

The Wireless PH measuring system for DI water will make the PH monitoring process become easier than ever because the system will replace the man power into automated system that will help monitor the PH and provide data collection. Therefor this system will help reduce cost by eliminating the man power and reduce paper consumption used by worker to record the PH reading before key in into the computer.

The wireless monitoring system that automatically updates pH level data in website and mobile application is much more suitable than manual pH monitoring using manpower. The fact that the pH data can be monitor anywhere and everywhere will make engineer life easier. The particular area only need to be attended when needed which will reduce time consumes and people can work efficiently.

1.2 Internet of Thing

Internet of Thing (IoT) is defined in many different ways depend on the how people think about it. Mostly, people will define IoT as billions of connections (sort of "universal global neural network" in the cloud) that will encompass every aspect of our lives [7]. 'Things' in Internet of Things can also be define as an active component in business, information and social processes where they have the ability to communicate among themselves and with the environment and then exchanging data and information

sensed about the environment. While still react automatically to the real world events and influencing it by running processes that produce actions and provide services with or without direct human contact.

Since internet is one of the most important and powerful invention over human history, IoT will surely be next evolution of the internet. Considering the ability of IoT to gather, analyze and distribute data that can be manipulate into information, knowledge and ultimately, wisdom. This taught will surely make IoT important to human daily life in the future.

IoT history started by a group that was working in the field of networked radio frequency (RFID) and emerging sensing technologies at the Massachusetts Institute of Technology (MIT) back in 1999. These institutions were then chosen by the Auto-ID Center to design the architecture for IoT.

1.2.1 Internet of Thing Today

The potential of IoT today and in the future was explain by Kevin Ashton, cofounder and the executive director of the Auto-ID Center at MIT by saying that:

> *"Today computers -- and, therefore, the Internet -- are almost wholly dependent on human beings for information. Nearly all of the roughly 50 petabytes (a petabyte is 1,024 terabytes) of data available on the Internet were first captured and created by human beings by typing, pressing a record button, taking a digital picture or scanning a bar code.*

The problem is, people have limited time, attention and accuracy -- all of which means they are not very good at capturing data about things in the real world. If we had computers that knew everything there was to know about things -- using data they gathered without any help from us -- we would be able to track and count everything and greatly reduce waste, loss and cost. We would know when things needed replacing, repairing or recalling and whether they were fresh or past their best."- Kevin Ashton, Cofounder and executive of Auto-ID Centre

Move along with this development of IoT, Majority of the governments in Europe, Asia and America consider IoT as an area of innovation and growth. Although larger players in some application areas still not recognize the potential, many of them pay high attention; accelerate the technology by giving new terms for IoT and adding a lot of new feature to it. Furthermore, end-users in business and private domain have recently acquired a significant competence in dealing with smart device and networked application.

A lot of potential in IoT technology sees by many people lead to abundant of business opportunity. This is because IoT can be relates with almost everything that human can think of such as machine, object, environment, human, animal, infrastructure and etc. As long as the things that come in mind are either readable, recognizable, locatable, addressable or controllable can be one of the 'things' in IoT. There is also no limit of field for IoT to be in, this is because IoT can be applied to big industries, small industries, medical, scientist, researcher, tourism, or even household and many more.

As the IoT continues to develop, estimated potential were sees through it by a combination with related technology approach and concepts such as cloud computing, future internet, big data, robotics and sematic.

1.3 OBJECTIVES

The objectives of this project are:

1. To develop IOT node and set up IOT server.
2. To develop Web App.
3. To develop mobile application.
4. To read pH digitally in IOT node device and communicate them with IOT server and relay the data in the server to Web App and Mobile App.

1.4 PROBLEM STATEMENTS

The problem statement is a brief but concise description of the problem and tells the resistance encountered by a researcher. The problem statement is the statement made after identifying the problem and solutions to the problems are being studied. This project addresses limitation in the current Wireless PH monitoring system as follows:

1. The current water PH monitoring system does not have software that is specific to store data in excel document as demand by the industry.
2. The other water wireless monitoring system did not use the protocol that can synchronous with the internal network provided. Therefore it is costly to setup other networking only to install the system.
3. The current PH measuring system only read the PH and expressed the PH value into digital display but did not record the reading and did not save any data read.
4. The current procedure in PH monitoring system used by the company was using man power and paper to record the reading where the used of man power and paper can be cause waste to the company that still using the old procedure.

1.5 SCOPE OF WORKS

The Scope of project is where the work involved in this project development being explained. Basically to develop the framework, 3 major works will be done throughout the process. Firstly, the network development for the wireless system features. Second, the software development for easy data excess features. Finally the hardware communication process to make communication between the boards.

Noted that this project is developing only in the laboratory and only prototype will be produced at the end of this project development.

Network:

The project is using wireless system, therefore, for this framework project, Wi-Fi connection is applied to communicate between the IoT node and the internet to transmit data to IoT server.

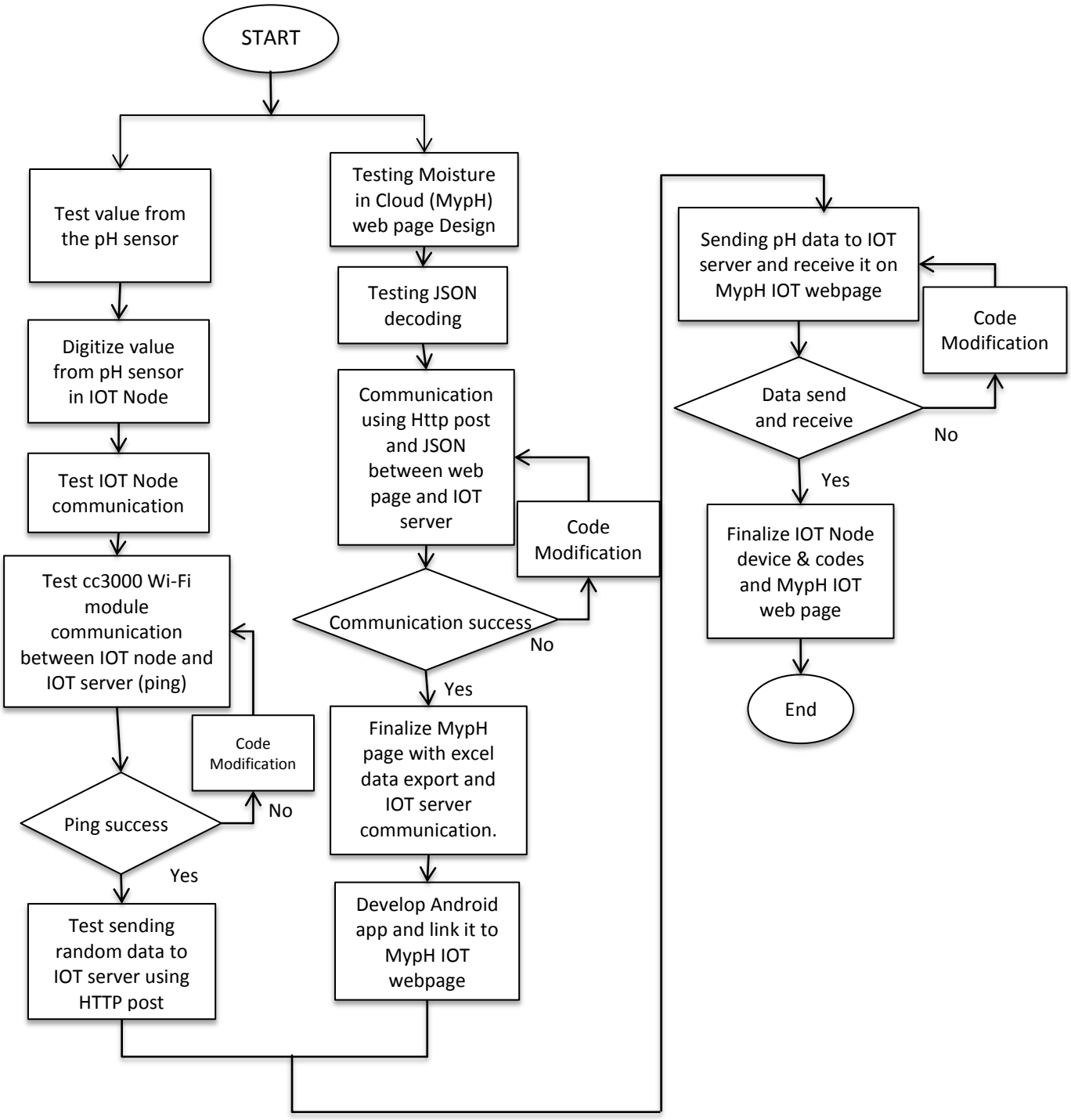
Software:

For this project, there is software development for the data storage application. First, the development of website that equipped with data export to Microsoft Excel. Second, the development of mobile application (Android) for easy monitoring via smart phone was done.

Hardware:

This project basically doesn't have any hardware development. The hardware used in this project development is a readymade circuit board. The boards that will be used in this project is WIDO board (IoT node device).

1.5.1 Flow chart for project development:



Flowchart 1: Project Flow Chart

REPORT OUTLINES

This report is consists of six chapter. The brief summation of each chapter is stated below.

Chapter I: Introduction

This chapter will cover on the introduction of this project. Plus these chapters also provide readers the objective of the project, problem statements, scope of work and the report outline.

Chapter II: Literature Review

In this chapter it will cover about the literature review of the component used in the project and some review of the software used to complete the project.

Chapter III: Project Methodology

Detail explanations about how the project work and the method on how to complete the project work.

Chapter IV: Results and Discussion

This chapter will review about the output achieve from the project and several snapshot of the project. Plus, detail explanations about the project.

Chapter V: Conclusion and recommendations

The summary of the entire objectives and the program achievement will be provided in this chapter.