UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DESIGN OF INTERNET OF THINGS (IOT) FOR DOF ROBOTIC ARM

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

by

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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 Electronic Engineering Technology with Honours. The member of the supervisory is as follow:

Signature: …….

Supervisor: AHMAD SAYUTHI BIN MOHAMAD SHORKI

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Co-supervisor: CO SUPERVISOR NAME ()

ABSTRAK

Internet perkara atau lebih tinggi yang disebut sebagai IoT boleh menjadi sistem peranti pengkomputeran retikulasi, mesin mekanik dan digital yang dibekalkan dengan pengenal khas dan kemampuan untuk memindahkan pengetahuan melalui rangkaian sambil tidak memerlukan interaksi antara manusia ke manusia atau manusia ke komputer riba. IoT dapat menjadi platform yang berkembang dan telah diterapkan pada beberapa proses mekanik untuk memperluas potensi dan untuk mempelopori penciptaan bahkan masa depan. Projek ini akan menumpukan pada pengembangan lengan robot menggunakan kerangka teknologi IoT. Tujuan projek ini adalah untuk lebih memahami produk dan meneroka lebih jauh kemampuan produk. Lengan robot terdiri daripada 6 motor servo yang dipasang menggunakan wayar jumper ke modul nodeMCU. NodeMCU menggunakan Blynk untuk menerima data dari peranti mudah alih.

ABSTRACT

Internet of things or higher referred to as IoT could be a system of reticulate computing devices, mechanical and digital machines supplied with distinctive identifiers and hit ability to transfer knowledge over a network while not requiring human to human or human to laptop interaction. IoT could be a growing platform and has been applied to several mechanical process to extend potency and to pioneer the creation even future. This project will concentrate on the development of robotic arm using the IoT technology framework. The aim of this project is to better understand the product and to further explore the product's capabilities. The robotic arm consists 6 servo motor which are attached using jumper wires to the nodeMCU module. The nodeMCU uses Blynk to receive data from a mobile device.

DEDICATION

The thesis dedicated to my mother, who taught me that the best kind of knowledge to have is that which is learn from its own sake. It is also dedicated to my brothers, who taught me that even the largest task can be accomplish if it is done one step at the time.

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INTRODUCTION

1.1 Background

We face a daily reality such that we go through a great deal of progressive changes and advancement measure like how once upon a time people utilized steam motor trains for transportation purposes and gradually the train frameworks and innovation developed from utilizing steam motor trains to electric trains and afterward at last the trains were electronic. Change is inescapable as on the grounds that we need to advance as expected on the off chance that we wish to see a superior and more development future.

This system is known as the internet of things, or IoT. The IoT is a system of integrated computing systems, mechanical and digital machines that, without the need for human intervention, can relay data. You can clearly see the application of this invention all over the world. Usually, the robotic arm is a common robotic machine used in industrial applications such as automation. The robotic arm provides much more accuracy in the execution of typical procedure than the manual work done by human's arm. A robotic arm can be more effectively programmed and controlled to perform different task. A robotic arm is used to execute automatically one or more than one task with speed and accuracy. Robotic arm could be classified into many different applications such as welding, spray painting, and assembling. use this Robotic arm that is control using an application on our smart phones. Through the usage of this application, we will be able to command the arm to turn left or right or to extend the arm out or to retract the arm. 6 DOF Robotic arm are control by IoT.

1.2 Problem statement

In industry traditional method has been used for years. It introduces many problems as the current traditional solution need more manpower and it is not effective enough, this is because humans are easily become fatigue. On the other hand, cost of manpower is higher. In the case of bigger plantation area, huge number of manpower is needed, with inefficient ways of management. To overcome this problem, current manpower solution, need to be changed to a different method. The different method should be effective enough and the easiest method is to use machinery and robotic product. It is very useful for us the robotic approach as it can be programmed to suit the industrial process.

1.3 Objective

The objectives of this study are:

1. To develop IoT for DOF robotic arm.
2. To design a project to ease the process by using the knowledge of internet of things (IoT) system.
3. To maintain the speed of production which can maintain a satisfying production rate.

1.4 Scope of project

This project use Arduino Uno, servo motor, Internet of things (IoT) to operate this project. All these components will combine their functions such as control the 6-servo motor movement to pick the things. This project is designed to ease the process by using the knowledge of control system. This project can help the person or industry when they lack manpower. This project is designed to meet the following scope:

1.4.1 The Arduino will function to operate the movement of servo motor.

1.4.2 The IoT use for controlling the 6-servo motor with Arduino support.

1.5 Organization

This project is based around the advancement of technology to reduce manpower and ease the industry production output using robotic arm. there is five chapters that are composed in this report. In chapter one, the internet of things (IoT) and arm robotic are introduced clearly and the objectives, problem statement and scopes are clearly pointed in this chapter. In chapter two, the literature review of the previous study is identified and there are few control systems were discussed in this chapter. Then, in chapter three, every component was used in this project will be clearly mentioned. In chapter four, the results of the project will be analysed. In chapter five, the conclusion and recommendation regarding upgrade of the project.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The goal of this chapter is to review previous studies that have been substantially linked with the IoT robotic arm. the research, meanwhile, illustrates the development and work of the IoT robotic arm that is operated remotely via a smartphone application. Based on the research, how the robotic arm (servo motors) is attached to a NodeMCU board programmed well by Arduino IDE application and operated by an application known as Blynk which is support for iOS and android. Then, it is the help to controls the robotic arm's motion. The researchers also speak about how the ties are created and how element or program is connected to each other to build the structure that is meant to be built.

2.2 Degree of Freedom

Degrees of freedom are common, specified modes in a context of mechanics in which a mechanical device or system can move. The number of degrees of freedom equals the total number of independent displacements or motion aspects. A computer can work in two or three dimensions but is free of more than three degrees. The term is widely used for defining the robot's movement capabilities. Consider a robot arm that was built to function like a human arm. Shoulder motion may occur as pitch (up and down) or yaw (right and left). Elbow movement may only occur as pitch. Wrist movement may occur in pitch or yaw form. Wrist and shoulder rotation (roll) may also be possible. A robot arm like that has 5 to 7 degrees of freedom. If a complex robot has two arms it doubles the total number of degrees of freedom. In an android, the end effectors, legs, and head have additional degrees of freedom.

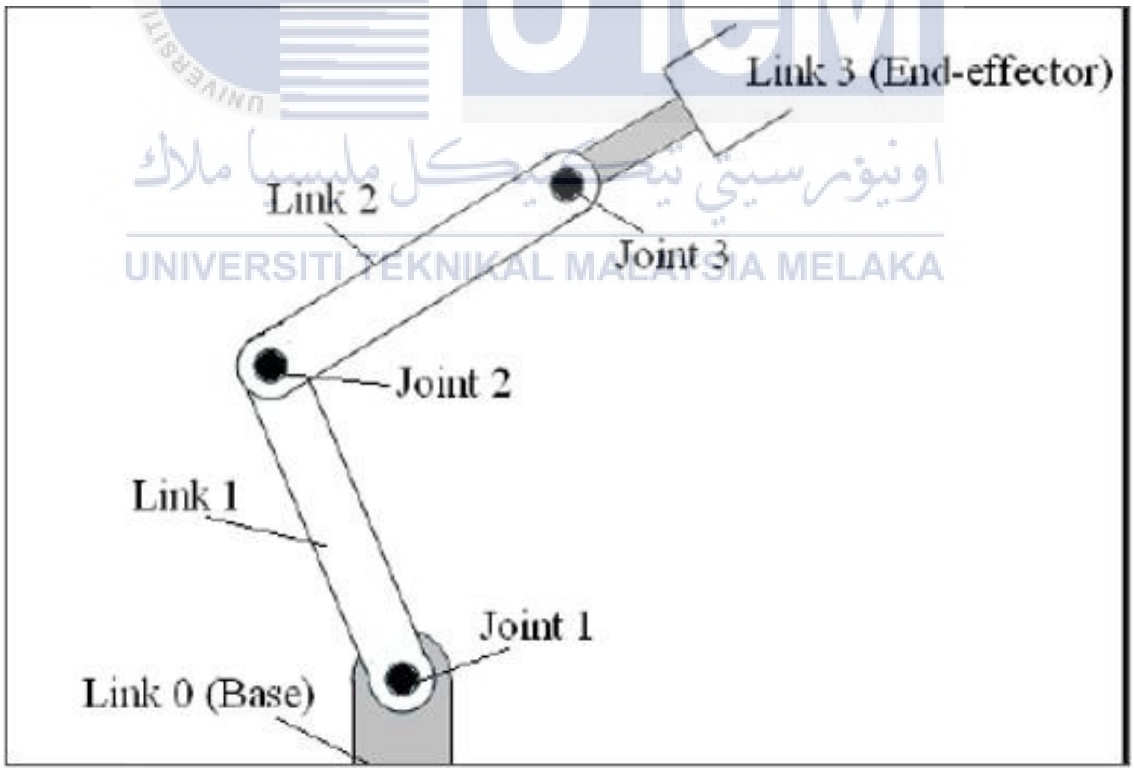

Figure 2.2.1: Robot Manipulator

2.3 Control Techniques

There are many control techniques that can be used to set robot manipulator. There are three control method that can be used which are Fuzzy Logic Controller and Proportional-Integral Derivative. Controller effectiveness are measured based on minimizing steady state error, damping vibration, and dealing the unpredictable disturbance.

PID is widely used in the industry. One of the sets back of using the controller are that they are not capable to extract correct tracking control efficiency because of the nonlinearity of manipulator. A large amount of time used to calibrate the PID parameter.

Fuzzy supervisor functions on the way that the Fuzzy logic controller and increase a different degree of control to the current system. Its defined as a mixture of FLC and PID that are structured to overcome problem in tuning PID using FLC as an adaptive controller.

2.4 Robot controller

Examination needs to be performed for project controller. For example, Kinematics analysis. The examination done to understand the movements of all part of robot. It is seen as an important step for robotics control and design. Its broken into two parts, one forward analysis and another as inverse analysis. Denavit-Hartenberg (D-H) method is used for the mathematical model of industrial robot and automations. It is six degree of freedom PUMA robot are suitable solutions for position of kinematics. Transformation from cartesian space into common are translated as kinematic problem.

Explanation method uses a specific geometry of robot finding answer of arm position of multiple ways if focused. Fuzzy logic controller was applied to solve very similar multiple problems which has unexplained movement path and input signal. This can be seen through solid paperwork that system based on fuzzy was found to be more sufficient, while increasing the speed and stability of system.

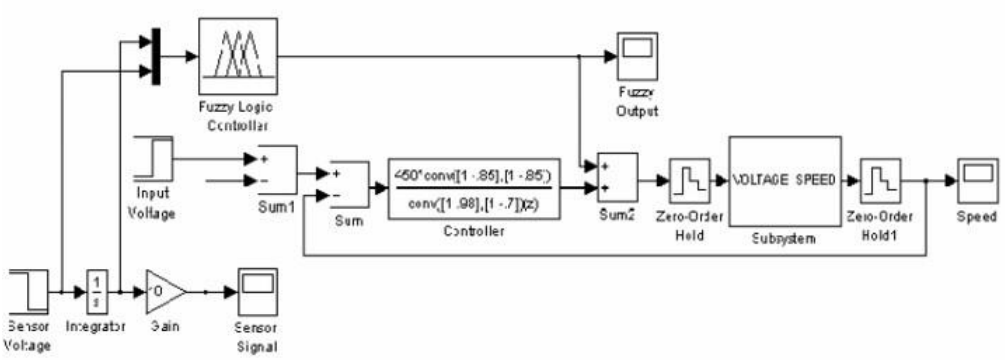

Figure 2.4.1: Robotic movement system with fuzzy logic controller

2.5 PID controller

This PID controller is a controller is used for industries. It is mostly used for automatic process control application. It calculates constantly error value. There are three modes which are proportional, integral, and derivative.

These PID control provide a way to control a method to differentiate the parameter. PID playing a great role in industrial implementation. PID was invented in 1910. PID controller in 1942 became important and famous news in control theory because of easy approach of implementation ability and its simplicity.

Furthermore, PID control is affordable. Finally, it proves that PID system robust and reliable for all system parameters that are tuned properly. PID control methods are used to operate and enhance system in specific detail and every PID parameters have set of rules to simulate the characters of its controlled system.

2.6 IOT based Robotic Arm using NodeMCU “by IoT Design Pro

on research demonstrating how, using servo motors and a nodeMCU board, and how able to create an IoT-based robotic arm. the relation of schematic circuit, important components are identified very well in this research. The researcher also describes the systems features and functions. Also, how the information is transmitted from the guidance given by the smartphone device using the Blynk application to the action of the 6-servo motor’s robotic arm.

First, how the Blynk program is designed and used. As previously stated, Blynk is an IoT framework that allows the user to easily create data tracking and control projects using and android or IoS device. It is simple to build project dashboards where widgets can be inserted to monitor microcontrollers and so on. The Blynk installation process is as follows, where the Blynk program is first installed on the mobile device and there is a quick login. First, we may opt to have a new project underway.

Figure 2.6.1: Blynk Project selection screen

To allow wireless connection, make sure the device is selected as nodeMCU and the connection style should be Wi-Fi

Figure 2.6.2: Blynk new project set up screen.

A mail will be sent to the register email address after pressing build, where a few links are sent and an auth token code. For the NodeMCU library and some sketch generators, etc., these connections are to obtain access to the project, use the token code. also explains how attaches four sliders to the widgets that reflect the 6 servo motors that power the robotic arm movement.