AUTOMATIC FISH FEEDER CONTROLLED BY PROGRAMMABLE LOGIC CONTROLLER (PLC)

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This Report is submitted in Partial Fulfillment of Requirements for The Degree of Bachelor in Electrical Engineering (Power Electronic and Drive)

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"I hereby declared that I have read through this report and found that it has comply the partial fulfillment for awarding the degree of Bachelor of Mechatronic Engineering"

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"I hereby declared that this report is a result of my own work except for the excerpts that have been cited clearly in the references."

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Date : 13TH MAY 2009

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ABSTRACT

This Final Year Project (FYP) presents an investigation into the application of fish feeder system in the Small Medium Industry (SMI). This system utilizes robot as a medium to dispense food for livestock. The robot moves from one pond to another, controlled by Programmable Logic Controller (PLC) using CX Programmer V6 software. The aim of the project is to fabricate a prototype which operates automatically and systematically. To fabricate the prototype, aluminum is used as the main material for project frame. This project consists of three parts which are the main tank, robot and circuit box. In addition, the system used involves three processes which are the setting, filling and feeding process. In this project, four circuits type are being used. They are the infrared circuit, radio frequency circuit, forward reverse circuit and power supply circuit. Apart from that, this project also focuses on software development using CX Programmer V6 to control the entire feeding process. The result from the project's research shows that the robot's movement to the feeder process could be recorded in terms of time and robot's movement condition. Based on the result, methods to reduce interference were identified. Suggestions for future work are also included.

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ABSTRAK

Projek ini membentangkan kajian terhadap penggunaan sistem pemberian makanan di dalam industri. Sistem ini menggunakan robot sebagai alat untuk memberi makanan kepada ternakan. Robot ini bergerak dari kolam ke kolam yang lain untuk memberi makanan dimana ianya dikawal oleh "Programmable Logic Controller (PLC)" dan menggunakan pengisian "CX Programmer V6". Matlamat projek ini adalah untuk menghasilkan satu prototaip pemberian makanan yang beroperasi secara automatik dan sistematik. Untuk menghasilkan prototaip ini, aluminium merupakan bahan utama sebagai rangka projek dimana terbahagi kepada tiga bahagian iaitu tangki utama, robot dan kotak litar. Sistem ini mempunyai tiga proses utama iaitu proses penyusunan, pengisian dan pemberian makanan. Dalam projek ini, terdapat empat jenis litar yang digunakan iaitu litar infrared, litar frekuasi radio, litar "forward-reverse" dan litar bekalan kuasa. Projek ini juga memberi penekanan kepada penggunaan pengisian "CX Programmer V6" bagi mengawal keseluruhan perjalanan proses pemberian makanan kepada ternakan. Keputusan yang diperolehi dari hasil pelaksanaan projek ini menunjukkan pergerakan robot untuk proses pemberian makanan dapat diuji dengan mencatat masa dan keadaan pergerakan robot. Oleh itu, cara untuk mengurangkan gangguan dikenalpasti berdasarkan daripada keputusan yang diperolehi. Penyelidikan lanjutan turut dicadangkan.

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CHAPTER I

INTRODUCTION

1.1 Introduction

In today's world of globalization, many technologies are invented to ease human's life. These include deep technology areas of agriculture and agro-based industries such as fisheries, aquaculture breeding and others. The government had prioritized these areas to produce this sector as a leader in national economic growth.

Currently, all the countries in the world are experiencing food crisis, which leads to price hike for almost all goods and services. Therefore, technologies in agriculture including farming are becoming more important as our source of food. Many entrepreneurs need outside help apart from their own energy, because it does not involve high cost, although produce low productivity. Based on the studies of innovation, creativity and knowledge are channeled into this matter. This innovation will be translated in the implementation of Final Year Project (FYP) known as "Automatic Fish Feeder Controlled by Programmable Logic Controller (PLC)". This machine uses mechanical system application, electrical, and electronics that functions to supply food for the livestock pond such as fish, prawn and leech systematically plus automatically.

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1.2 Problem Statement

Apart from hiring employees, livestock fish in pond entrepreneurs distribute food themselves to the livestock manually according accurate time. Automatic fish feeder has already been utilized in some industries involving high budget and difficult to be handled. To surmount this problem, "Automatic Fish Feeder Controlled By PLC" was created to solve the problem in industry. This system operates automatically and systematically following the time stated by the entrepreneur. This machine is very easy to handle and the mechanical form can be change depending to the entrepreneur pond stated.

1.3 Project Objectives

The specified objectives of this FYP are:

1. To investigate an automatic fish feeder in industrial application
2. To design and build a prototype of food feeder for fishes automatically and systematically
3. To provide system in industrial application due to Small Medium Industry (SMI) control by hardware and software using PLC
4. To integrate between software and hardware
5. To analyze the effectiveness of robot movement's for automatic fish feeder system

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1.4 Project Scopes

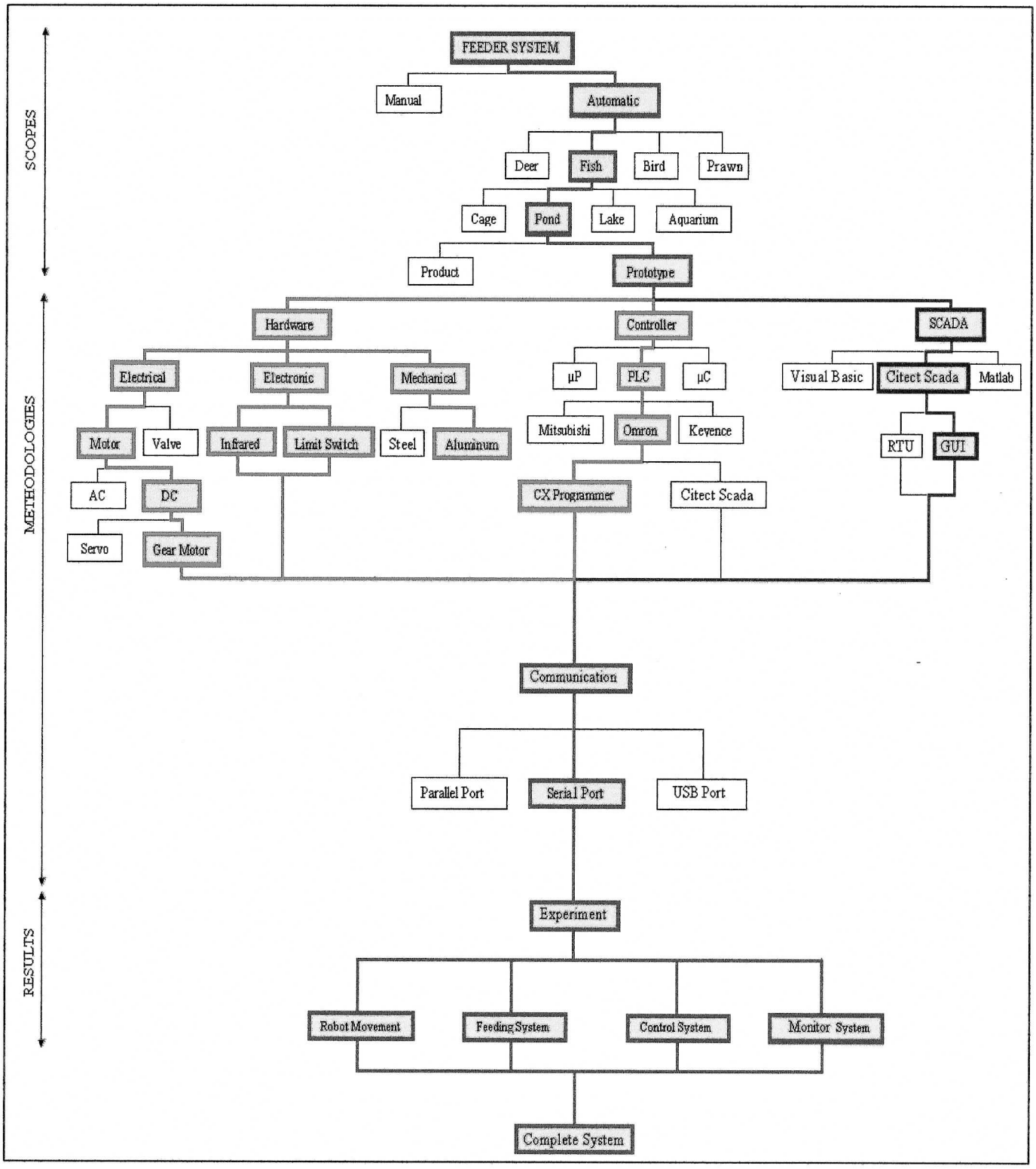

Figure 1.1: Project Work Flow

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Figure 1.1 shows the flowchart of the system of Automatic Fish Feeder. This system is divided into two parts, which is the Developed Automatic Fish Feeder Controlled by Programmable Logic Controller (PLC) part and the second one is the Developed Supervisory Control and Data Acquisition (Scada) System for Automatic Fish Feeder. This FYP report will focus in Developed Automatic Fish Feeder Controlled by Programmable Logic Controller (PLC). For this system, it will design a prototype of Automatic Fish Feeder for feeding four livestock fishponds. This system has two important parts namely hardware implementation and software implementation. The hardware implementation has two parts, which are the mechanical part and the electrical part. In the mechanical part, the material used to build the framework is aluminum. For the electrical part, it is divided into two components, which is the electric component and the electronic component. In the electric component, DC motors are used to forward and reverse in order to open/close the valves at robot feeder, main tank and movement of robot feeder. For electronic component, the sensors used are infrared Transmitter (Tx) Receiver (Rx) and limit switch.

For the software implementation, several softwares are available but Programmable Logic Controller (PLC) is used as a controller and CX Programmer V6 as programmer in the system. This software will be used to create a program called ladder diagram to control the system. This Automatic Fish Feeder is an automatic and systematic system in the process of food feeding and filling.

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1.5 FYP Outline

Chapter one presents an introduction; problem statement of the project; a specific objectives of the project ; and the FYP outline.

Chapter two cover the literature review. In this chapter introduction of fish feeder machine, several types of fish feeder machine in industries, previous product will be discussed.

Chapter three covers the methodology of the project. In this chapter the structure or block diagram of the project will be shown. Basic Structure of the Fish Feeder System Process ; Designing mechanical part of the fish feeder system ; Designing electrical part of the fish feeder system ; Designing software of the fish feeder system and overall process will be also discussed in this chapter.

Chapter four presents the result and analysis for both experiments.

Lastly, chapter five discussed the conclusion and stated suggestions for future work.

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CHAPTER II

LITERATURE REVIEW

This chapter will discuss about sources or articles related to the project. There have been many sources or researches done before which give details for this project. This chapter is very important for achieving the objective of the project. In this chapter, several types of fish feeder machine in industries will be discussed.

2.1 Introduction of the Fish Feeder Machine

Fish Feeder Machine is the device used to feed the fishes automatically. The design of this machine usually includes an application of the mechanical and electrical system, where it has a food tank, and valve to control the food. Usually the operating control system uses electronic circuit. Livestock pond entrepreneurs in aquaculture such as fish, prawns and others usually use this machine.

Visits to livestock aquaculture lakes in Pusat Pembiakan Ikan, Pengkalan Gelap, Setiu and Pusat Pembiakan Ikan, Jeti Kampung Jenang, Marang in the state of Terengganu, revealed that majority of entrepreneurs hire employees to feed fish in ponds. Through interviews, most entrepreneurs think that feeding fishes using automatic method is easier, although involves high cost. In fact, some entrepreneurs do not even know about the existence of the machines.

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Besides that, the book entitled "Fish Rearing and Breeding " written by Marcel Huet, pointed out that there were many aquaculture livestock entrepreneurs overseas who had already use machine since early of the 1990s. Among the venues listed are Linkebeek Fish Cultivation Station in Belgium, Nimbus Hatching Centre, Sacramento, California in United States, Canizzano Fish Pond, Venice in Italy, Breeding Banghken Fish Breeding Station, Bangkok in Thailand and Brander's Fish Ponds in Denmark. However, in our country, these machines are still considered new and made use only by entrepreneurs with large capital [3].

Willing book titled "Seashore Aquaculture" written by Lokman Shamsudin mentions that the machine fish feeder commonly used food pellet type of food only because it easy to be distributed [4].

Besides that, the book "Basics of Aquaculture", a product of Universiti Pertanian Malaysia, mentions that random methods will cause leftover foods and further cause oxygen content shortage that will disturb fish growth [5].

2.2 Previous Product

Nowadays, entrepreneurs have implemented feeding system technologies for utilization. Thus, there are some researches done about the types of feeding machine used as a guideline in developing the machine for this project. Below are the latest technologies that people out there use for their feeding machine.

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2.2.1 Arvo-Tec T Drum 2000 Feeder

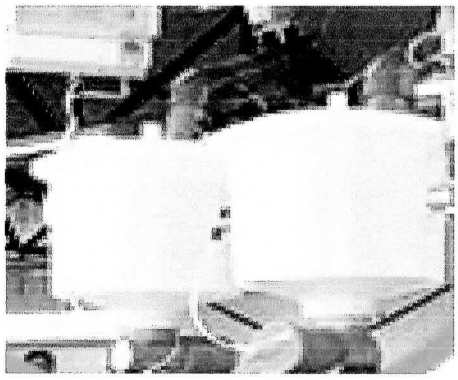

Figure 2.1: Arvo-Tec Robot

The Arvo-Tec Robot Feeder System is a fully automatic feed distribution system designed to improve labour and feed efficiency. The system comes complete with hoppers and the same accurate dosing technology as the T Drum 2000 Feeder. The unit moves along a rail above the tanks, supplying local feeder units or feeding the fish in the tanks directly.

Feeding can either be done at a stop or while on the move to dispense the feed across the tank. The robot can feed up to four types of pellets and granules with filling performed manually or automatically via a filling station. The feeding program is controlled by a microprocessor mounted on the robot, which can be connected to a PC for monitoring and control by a centrally managed Network Control System [6].

The system of Arvo-Tec Robot is controlled by a microprocessor, which can be connected on the computer to show display and controlled by a system network centre management. This robot uses battery power supply 24 Volt direct current and speed 16 minute per 100 meters. The advantages of this robot are it is effective because only use one robot to doing feeding process where this robot can move to dispense the feed across the tank. The disadvantages on this robot are it high cost of manufacturing and difficult to operate.

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2.2.2 Moultrie Feed Caster Pro

Figure 2.2: Moultrie Feed Caster Pro

This Economical Fish Feeder by Moultrie features a narrow directional casting of feed out to 20 feet and a microcontroller will controls the feeding program. The programmable timer can feed up to six times per day. The external control box keeps the timer and battery accessible. Plastic feed barrel holds up to 100 pounds of fish pellets. Barrel mounts to any 4x4 or 6x6 posts. This Moultrie Feed Caster Pro operates on a six-volt battery. The advantages of this machine are it very easy to operate and low cost manufacturing. The disadvantages of this machine it only suitable to use for large and wide pond [7].

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