CHAPTER 3

METHODOLOGY

3.1 INTRODUCTION

This chapter expressed regarding the methods and techniques in order to accomplish the objectives of this project. Furthermore, this chapter also discusses the process flow of the project which is about the solar cell power optimisation system with the relevant steps. The explanations of the software development and hardware development with the electrical circuit diagrams also included in this chapter.

3.2 FLOW CHART OF THE PROJECT

First of all, create and design the fuzzy rules for the solar cell power optimisation. The software development used to create the fuzzy rules is the Fuzzy Logic Toolbox in MATLAB/SIMULINK. However, MATLAB was only used for optimised the membership function of the fuzzy logic controller by using hit and trial method. The Arduino language code was written for the implementation of FLC in hardware. After that, design the complete electrical circuit of the system.

The software development used for the circuit design is the ISIS Proteus and Pspice. Some parts of the electrical circuits had undergone simulation in that software. The next step is constructing the hardware of the electrical circuit. Some part of the circuit had undergone testing. After that upload the fuzzy logic Arduino language code in the ATmega328 microcontroller present in the Arduino board and connect the solar panel with the complete electrical circuit. Finally, test the prototype and improve it if needed.
Figure 3.1: Flowchart of the project.

START

Create and design the fuzzy logic controller (FLC) rules

Design and simulate the electrical circuit using ISIS Proteus software

The electrical circuit run?

YES

Construct the hardware of the electrical circuit

Implement FLC into the Arduino Uno Board

Design and construct the stand for solar panel

Connect the complete circuit with the solar panel

Test the project and measure the output generated

Connect and test the complete circuit to the aquarium pump

END

NO
3.3 FLOW CHART OF THE SYSTEM

3.3.1 Flow Chart of the Fuzzy Logic Controller

START

Initialize the system

NO

Is ADC data for Arduino ready?

YES

Read the ADC value

Get output voltage and current

Get output voltage and current

Calculate power

Calculate error and change of error

Fuzzification

Rule evaluation and aggregation

Defuzzification

Data Base

Input of membership function

Fuzzy rule list and process of unification

Output of membership function