CHAPTER 1

INTRODUCTION

1.1 Background

Nowadays, as our life is getting more advances in technology, most of the technologies use power electronics to function. A so-called boost converter is including as one of the power electronic device. Due to the growing importance of the boost converter in technology, a detail study of boost converter is necessary to make an improvement for future technology. A good boost converter can make the technology more efficient in usage.

The key in controlling a DC-DC boost converter is the switching process that needs to be monitor frequently and perfectly. To gain a good output result, the switching process must be in a high switching frequency. Due to high switching frequency, it is hard to see the switching process, hence it need to be controlled by some appropriate controller such proportional integral derivative (PID) controller, hysteresis controller and others controller.
This project introduces three methods of controller to control the DC-DC boost converter, i.e., proportional integral derivative (PID) controller, two-level hysteresis controller (normally just called hysteresis controller) and three-level hysteresis controller. All controllers will be compared the transient response during start-up, steady-state and load changes. Each controller has the advantage and disadvantage that will be discussed in performance analysis.

1.2 Problem Statement

As mention earlier, it is important to have appropriate controller. The performance of boost converter is greatly depends on it switching process. In DC-DC boost converter, the switching process is operated in high switching state and it is hard to control the process. To encounter this problem, an appropriate controller needs to be designed so that the desired output voltage can be controlled appropriately and efficiently.

Furthermore, it is difficult to obtain a good transient response in boost converter due to the very nonlinear appeared in the circuit operation. The boost converter circuit needs to operate on continuous current mode (CCM) because the output has to produce a constant set voltage in both on-state and off-state of power switches. A perfect tuning of controller must obtain to produce a good transient response.
1.3 Objectives

In this project, three main objectives have been formed as follow;

i. To develop PID, two-level hysteresis and three-level hysteresis controllers for controlling boost converter.

ii. To do the comparison result between three different controller.

iii. To optimize the performance of the boost converter output voltage

1.4 Scope of Project

Scopes of the project are:

i. Study the boost converter topology, PID controller, hysteresis controller and three-level controller.

ii. Simulate the circuit and controller using MATLAB Simulink.

iii. Analyze the performance of all three different controllers in term of transient response and load changes.