International Journal of Power Electronics and Drive System (IJPEDS)
Vol.2, No.1, March 2012, pp. 35~42
ISSN: 2088-8694

Voltage Tracking of a DC-DC Flyback Converter Using Neural Network Control

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Article Info

Article history:

Received Nov 8th, 2011
Revised Feb 27th, 2012
Accepted Mar 12th, 2012

Keyword:

Algorithm
Back propragation
Control
Flyback converter
Neural network

ABSTRACT

This paper proposes a neural network control voltage tracking scheme of a DC-DC Flyback converter. In this technique, a back propagation learning algorithm is employed. The controller is designed to improve performance of the Flyback converter during transient and steady state operations. Furthermore, to investigate the effectiveness of the proposed controller, some operations such as starting-up and reference voltage variations are verified. The numerical simulation results show that the proposed controller has a better performance compare to the conventional PI-Controller method.

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1. INTRODUCTION

In recent pass, DC power supplies are extensively utilized in many areas compromising of simple electronic devices such as notebook computers, till even more advance application such as electric vehicle and also the aerospace applications. Hence, the DC- DC converter is widely used by convert a DC voltage to a different DC voltage level in order to provide the DC voltage source level requirements of the load to the DC power supply, In addition, the DC-DC converter is also an important application for the power conditioning of the alternative electrical energy such as photovoltaic, wind generator and fuel cell system. Due to these reasons, the DC-DC converter application will head to a more potential market in the future.

Basically, the DC-DC converter consists of the power semiconductor devices which are operated as electronic switches and classified as switched-mode DC-DC converters or normally refers as Switched mode power supply [SMPS]. Operation of the switching devices causes the inherently nonlinear characteristic of the Flyback converters. Due to this unwanted nonlinear characteristics, the converters requires a controller with a high degree of dynamic response. Recently, the research on the switching control techniques has been highlighted in order to achieve a high-quality power system. Pulsewidth modulation (PWM) is the most frequently consider method among the various switching control method [1].

In the past decade, the controller for the PWM switching control is restraining to Proportional-Integral-Differential (PID) controller. This controller often applied to the converters because of their simplicity. However, implementations of this control method to the nonlinear plants such as the power converters will undergo from dynamic response of the converter output voltage regulation. In general, PID controller produces long rise time when the overshoot in output voltage decreases [2].