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Landsman Converter Based Particle Swarm Optimization Technique

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Abstract

This paper proposes a novel control technique for landsman converter using particle swarm optimization. The controller parameters are optimized by pso algorithm, the proposed algorithm is compared with PID controller and the comparative results are presented. Simulation results shows the dynamic performance of pso controller. Landsman converter reduction in output voltage ripple in the order of mV along with reduced settling time as compared to the conventional PID controller. The simulated results are executed in MATLAB/SIMULINK.

Keywords*: PID controller, Landsman converter, MATLAB/SIMULINK*

1. Introduction

Boost converters are required when the output voltage must be greater than its input voltage. these converters are largely used in solar power applications, vehicle battery charging, and fuel cell power converting systems, when these operated in the openloop mode,it attains poor voltage regulation and worst dynamic response. A Control Algorithm for Voltage regulation and boost converter are explained by [1] [2]. Hence, we are moving with a closed-loop controller to achieve good transient and dynamic response and output voltage regulation. This landsman converter gives smooth transient response and good dynamic voltage output reduced ripple with reduced settling time. Boost Converter Controller Design Based on Particle Swarm Optimization and Hybrid Fuzzy Logic Based A Particle Swarm Optimization Controller are discussed by [3-4].

In conventional DC-DC voltage converters leads to of heavy voltage ripples at output. In order to control this, ripple conventional carried out these methods used are Equivalent Series Resistant (ESR) Capacitor, adding an inductance-capacitance (LC) filter although these methods have poor transient but difficult to achieve Continuous Conduction Mode(CCM) Some control techniques for DC-DC converter are voltage control techniques, sliding mode converter and loop bandwidth control for the reduction of output voltage ripples. Solar photovoltaic array fed water pump driven and Trajectory Control Using Particle Swarm Optimization are described by [5-6].

It is clear that these systems with CCM which produces good transient response using pso we are achieving CCM andreduced voltage output ripple. Investigations on structural, optical, morphological and electrical properties are discussed by [7]. The parameter are estimated in time domain series . The converter is represented in MATLAB simulink model.

2. Proposed System

In this paper the novel technique is particle swarm optimization algorithm is presented in the controller to select the angle of landman converter switches to reduce the output voltage ripple which is represented by the block diagram in following Figure 1.

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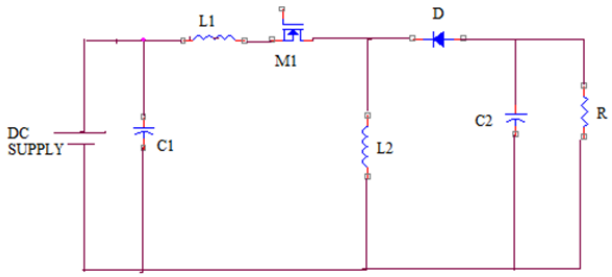

Figure 1. Landsman Converter

The proposed system Landsman converter, particle swarm optimization (PSO) algorithm. The reference signal (Vref) compares with output voltage (Vo) using comparator and generates an error signal (e). The error signal is given into PSO controller and output of pso given is a duty cycle (d) which is given into the PWM generator to produce the switching pulseto drives the converter.

2.1 Operating principle of Landsman converter

The Landsman converter is designed to employ in CCM

Mode I – when switch is ON

When the switch is on, VC1, reverse biases the diode, the voltage across capacitorC1, resulting in a circuit configuration shown in Fig. 2a.. Since VC1 is larger than the output voltage Vdc, C1 discharges through the switch, transferring energy to the inductor L and the output. The input feeds energy to the input inductor L1. The inductor current iL flows through the switch hence, vc1 decreases and iL increases, as shown in Figure 2c.

Mode II – when switch is OFF

When the switch is off, a circuit configuration as shown in Figure 2b. the inductor current iL flows through the diode. Diode is forward biased. On the other hand, C1 is charged through the diode by energy from both the input and L1.The inductor L transfers its stored energy to output through the diode. Hence, vc1 increases and iL decreases, as shown in Figure 2c.

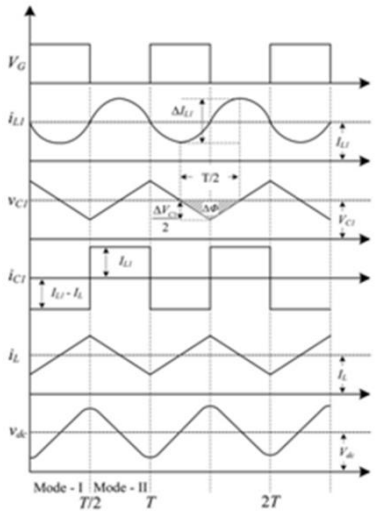

Figure 2. Operation of the Landsman converter

3. Simulation Results
3.1. Pso Results

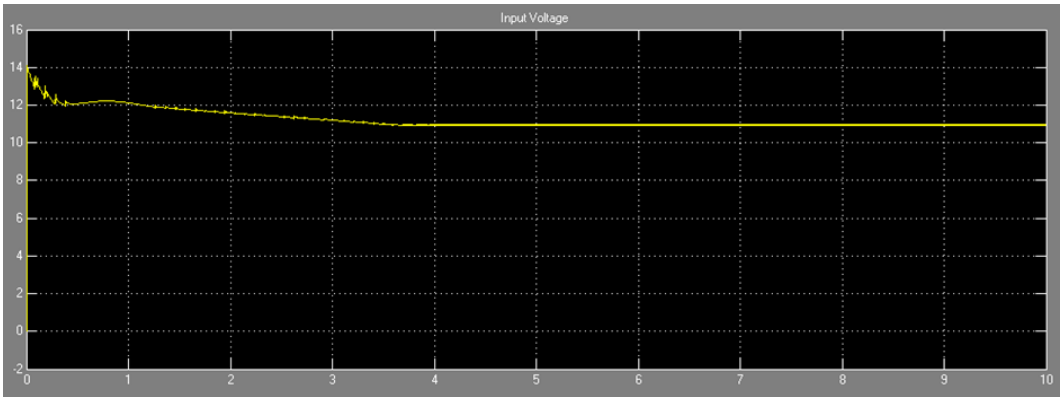

Figure 3. Input voltage of Landsman Converter with PSO

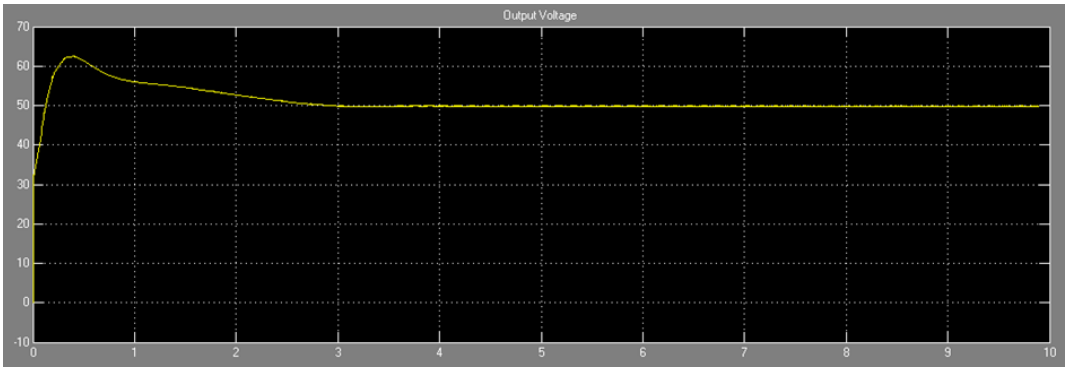

Figure 4. Output voltage of Landsman Converter with PSO

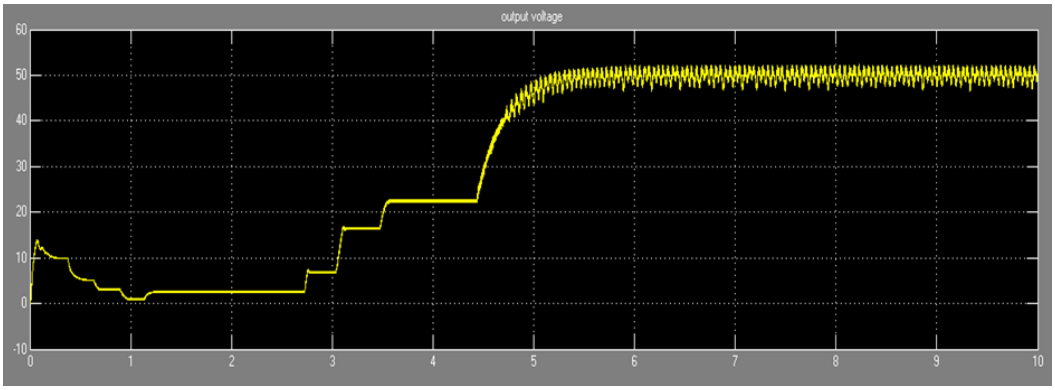

Figure 5. Output voltage of Landsman Converter with PID

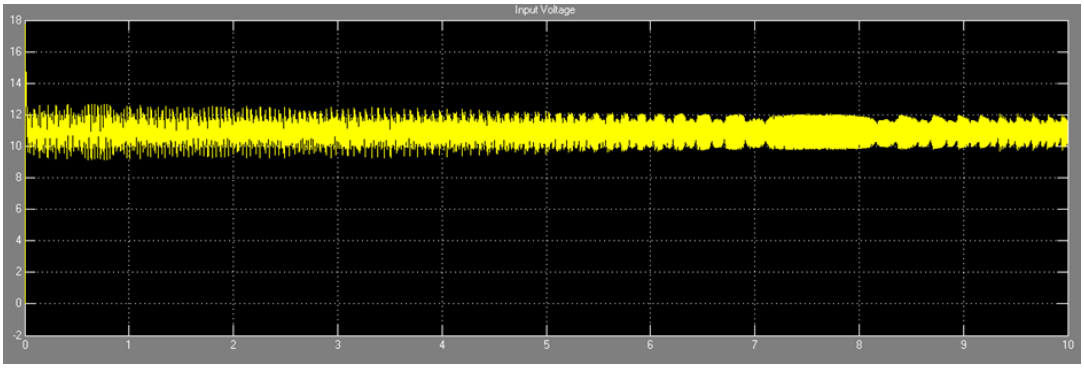

Figure 6. Input voltage of Landsman Converter with PID

4. Conclusion

In this paper, presented the design of a pso controller for a Landman converter operating in CCM . This novel optimization method was designed to Dynamic closedloop controller the objective function of the developed PSO algorithm, is a small-signal model conventional the PID controller for the DC-DC boost the good responses of the DC-DC boost converter operating in CCM were obtained. By comparing the results, output voltage ripples settling time, peak overshoot from the step response curves which are obtained under the variations in both command input and load resistance), it can be concluded that the dynamic and effectiveness of the controller tuned by PSO algorithm (compared to the conventional method) is much more superior over a wide range of operating conditions. The PSO technique shows that the converter response is better than that for the pid technique and the pso gains have been determined with very short time and with a accurate manner.

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