Available Online at www.ijcsmc.com

International Journal of Computer Science and Mobile Computing

A Monthly Journal of Computer Science and Information Technology

ISSN 2320–088X
IMPACT FACTOR: 5.258

IJCSMC, Vol. 5, Issue. 5, May 2016, pg.803 – 807

Modelling and Control of DC Motor using Neural Networks

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Abstract: The DC motor is widely used in the industrial process. In this paper, modelling of DC motor is proposed based neural networks to improve the performance of the system as results to modify the whole control system. The proposed method is implemented via neural networks. The simulation results demonstrate that the proposed method is more effectiveness and high accuracy as compared with traditional method.

Key words: DC brushless motor, PID controller, neural networks.

Introduction: DC motor is known as electronically commutated motor which supplied by DC source. The brushless DC motor BLDC have many difficulties problem in terms of modelling and control due to multi input nature and nonlinear dynamic. The torque creation of BLDC motor are caused by three main sources [1,2]. Also, BLDC can operate at high speed [3,4] as compared with traditional DC motor. In BLDC motor, there is no brushes and commutator which make it the finest choice for high performance in industrial applications [5]. In this paper, neural network is used in the modelling of BLDC motor to optimize the results and to solve the problems caused by PID controller.

Proposed method:

In this proposed method, the neural network is used instead of PID controller to remove the oscillation that caused by PID controller. Figure1 shows proposed method of modelling and

control of brushless DC motor via neural network. in this figure, the two inputs to neural are and the output is rotor speed. The construction of neural network is shown in figure 2. In this construction the number of inputs are 2, the number of hidden layer are 25, and the number of output is one.

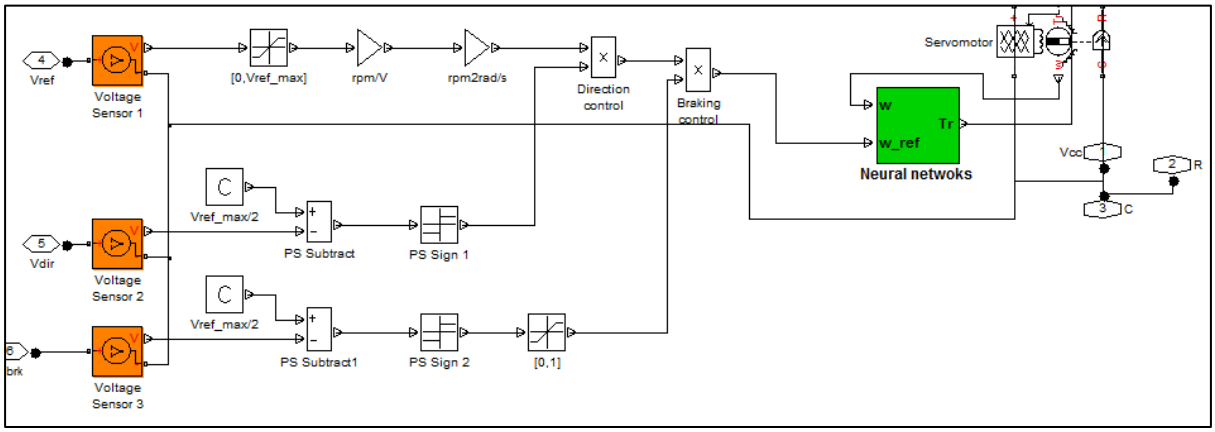

Figure 1:The proposed method based on neural networks.

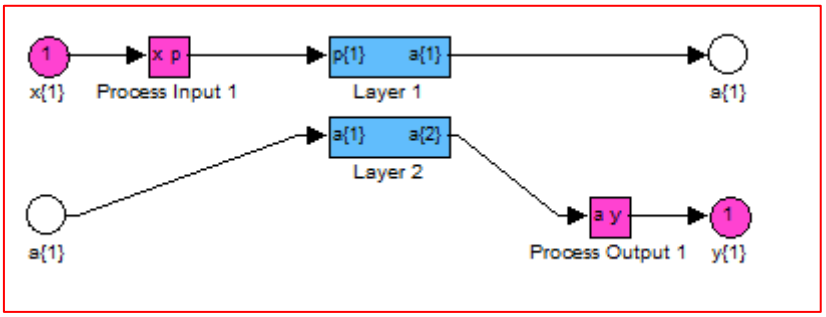

Figure 2 :the construction of neural networks.

Simulation results:

From figure 3, it can be noted that the speed in the proposed method based on neural network is fast response and low oscillation with free of distortion as compared with conventional method which based on PID controller. In addition, the results of the electrical power, mechanical power, and efficiency in the proposed method are better than conventional method as shown in figures 4. 5,6 respectively.

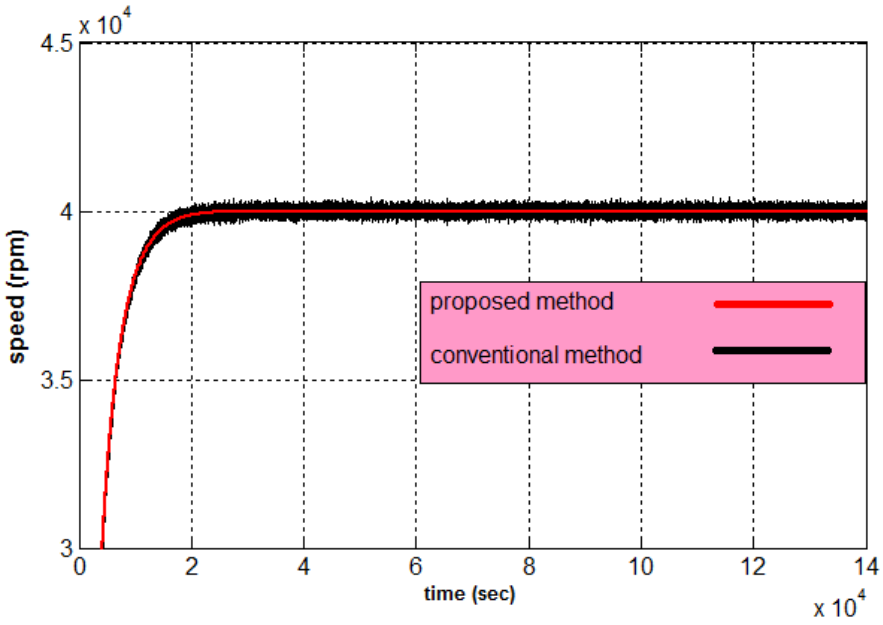

Figure 3: comparison of rotor speed

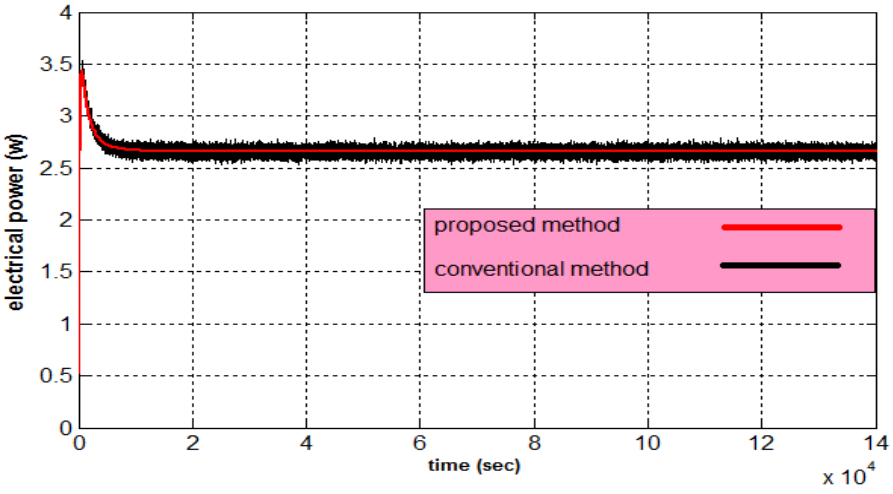

Figure 4: comparison of electrical power

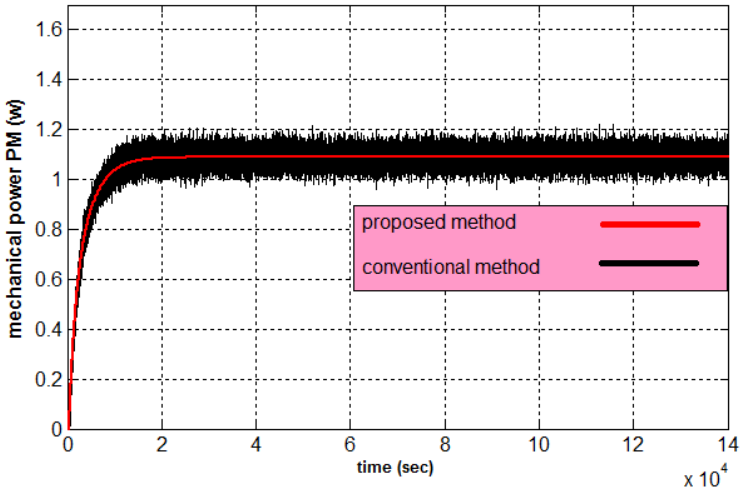

Figure 5: comparison of mechanical power

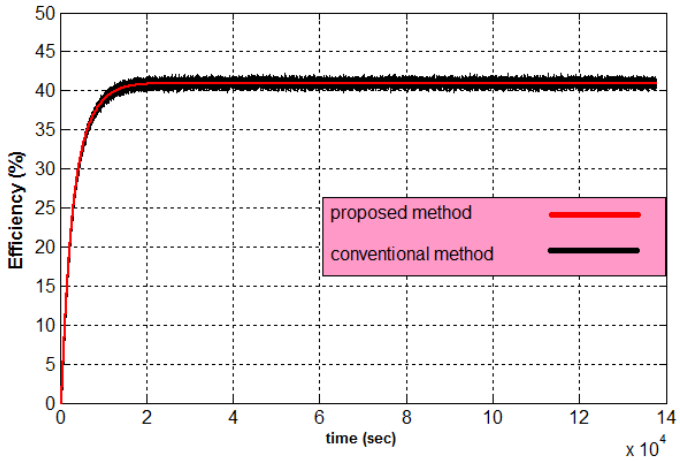

Figure 6: comparison of efficiency

Conclusion:

In this proposed method, the neural networks is used to eliminate the problem caused by PID controller. Therefore, the oscillation of results by using PID controller is oblivious. In contrast, in the proposed results, the oscillation is trivial. Finally, the simulation results in the proposed method are smooth, fast response, and low ripple as compared with traditional method.

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