A novel neural network intelligent controller for vector controlled induction motor drive

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Abstract

In this paper, a novel neural network intelligent controller is proposed for the vector controlled induction motor. Fuzzy logic controller is interfaced with the three phase induction motor initially. Effectiveness of this fuzzy logic controller with the three phase induction motor is analysed under disturbance environment. It is identified that fuzzy logic controller is not up to the mark in terms of speed tracking. Therefore, neural network based intelligent controller is interfaced with the three phase induction motor. Performance of this proposed neural network controller is analysed in the disturbance environment. At the end, comparison chart is made to know the effectiveness of the proposed neural network controller with the fuzzy logic controller. This comparison chart is delineated for the various control system parameter aspects. It is recognised that the proposed neural network controller works well in the presence of the disturbances. Moreover, this neural network controller operates adroitly for all the necessary working conditions.

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Keywords: Neural network controller, Fuzzy logic controller, Load torque, Membership function.

1. Introduction

Most of the industry uses three phase induction motor for the various processes, since it can be operated in the variable speeds. Moreover, performance of the three-phase induction motor under various speeds is an issue when an improper controller is connected. Especially in the disturbance environment, conventional controller is not suitable for controlling the three-phase induction motor. Therefore, this study aims to propose a robust controller for the three-phase induction motor. In order to identify the robust controller for the three-phase induction motor initially three phase induction motor is controlled by fuzzy logic controller under disturbance environment such as voltage sag and voltage swell. Performance of the neural network controller is estimated in terms of settling error. Then three phase induction motor is controlled by neural network controller under disturbance environment such as voltage sag and voltage swell.
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1. Introduction

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2. Methodology

2.1 Fuzzy logic controller for the three phase induction motor

Fuzzy logic controller for the three-phase induction motor is shown in fig (a). Along with, sub system of the fuzzy logic controller is shown in fig (b). In this fuzzy logic controller, number of member function is selected based on the requirement of the desired speed. For this fuzzy logic controller, actual speed and reference speed are given as inputs via multiplexer. The actual speed and reference speed is compared here. Besides electric torque is formed,

Nomenclature

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phis_d</td>
<td>stator flux in d-axis</td>
</tr>
<tr>
<td>Vr_d</td>
<td>Rotor voltage in d-axis</td>
</tr>
<tr>
<td>Phis_q</td>
<td>stator flux in q-axis</td>
</tr>
<tr>
<td>Vr_q</td>
<td>Rotor voltage in q-axis</td>
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