Real-Time Performance Evaluation Of A Genetic-Algorithm-Based Fuzzy

Logic Controller For IPM Motor Drives

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Summary

This paper presents a novel speed control scheme using a genetic-based fuzzy logic controller (GFLC) for an interior permanent-magnet synchronous motor (IPMSM) drive. The proposed GFLC is developed to have less computational burden, which makes it suitable for real-time implementation. The parameters for the GFLC are tuned by genetic algorithm (GA). The complete drive incorporating the GFLC is successfully implemented in real-time using a digital signal processor board DS 1102 for a laboratory 1-hp interior permanent magnet motor. The efficacy of the proposed GFLC-based IPMSM drive is verified by simulation as well as experimental results at various operating conditions. A performance comparison with a conventional proportional-integral controller is also provided to show the superiority of the proposed controller. The proposed GFLC is found to be robust for high-performance industrial drive applications.

References:
1. *DSPACE GMBH, 1996, DIG SIGN PROC CONTR
2. *MATHWORKS INC, 1997, MATL SIM US GUID
3. BLASCHKE F, 1972, SIEMENS REV, V39, P217
4. BOLOGNANI S, 1996, IEEE T IND APPL, V32, P1063
5. BOLOGNANI S, 1998, IEEE T FUZZY SYST, V6, P173
6. CERRUTO E, 1997, IEEE T POWER ELECTR, V12, P1028
7. EMAMI MR, 1998, IEEE T FUZZY SYST, V6, P346
8. ERENAY K, 1998, P INT C EL MACH IST, P1231

9.   GOLDBERG DE, 1989, GENETIC ALGORITHMS S
10.   HERRERA F, 1998, ARTIF INTELL REV, V12, P265
11.   RAHMAN MA, 2003, IEEE T IND APPL, V30, P408
12.   SINGH B, 1998, IEEE IND APPLIC SOC, P571
13.   SLEMON GR, 1992, ELECT MACHINES DRIVE, P503
14.   UDDIN MN, 2000, J ADV COMPUTATIONAL, V4, P212
15.   UDDIN MN, 2002, IEEE T IND APPL, V38, P1219, DOI 10.1109/TIA.2002.802990
16.   UDDIN MN, 2004, IEEE T IND APPL, V40, P68, DOI 10.1109/TIA.2003.821797
17.   YI SY, 1998, IEEE T FUZZY SYST, V6, P216
18.   ZADEH LA, 1973, IEEE T SYST MAN CYB, V3, P28

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