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Artificial Intelligence-Based Condition Monitoring for Practical Electrical Drives

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Experimental Test Rig

Controller

Induction Motor
Helical Gearbox
Flexible Coupling
DC Generator (Load)

Condition Monitoring Methods for Electrical Drives

1. Motor Current Signature Analysis (MCSA)
2. Induction machine condition monitoring using notch-filtered motor current
3. Parameter estimation using Genetic Algorithm (GA)
4. Instantaneous Angular Speed (IAS)
   - Band-pass filtering.
   - Analytic representation (Hilbert transform).
   - Carrier frequency removal (frequency shifting).
   - Angle calculation and differentiation

SOMA Used for the Optimisation of Ambient Vibration Energy Harvesting

SOMA
- Self-Organizing Migrating Algorithm
- Optimisation using Artificial Intelligence

A_v Ambient Vibration
Mechanism
- Mechanical part (mass m, spring k, damper b_m)
- Electromagnetic Energy Converter (coils L and R_c)
- Electrical Load R_L

Optimisation can help in generating the maximum amount of electrical power

Next Steps
- Improve the quality factor of the model
- New harvester design for wireless application

Design of Expert System

Problem Identification and Analysis
System Specification
Development Tool Selection
Knowledge Based:
- Knowledge Acquisition
- Knowledge Representation
- Computer Code
Prototype System
Testing and Validation
Refinement
Implementation
Stop

Inspiriting tomorrow's professionals