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Artificial Intelligence-Based Condition Monitoring for Practical Electrical Drives

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Diagnostic Engineering Research Centre
Computing and Engineering

Experimental Test Rig

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

Implementation

Stop

Refinement