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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)

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**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

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**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

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**Design of Expert System**

Start

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

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