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A Novel and Performance Aware Approach for Induction Motor Parameter Recognition Using PSO

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ABSTRACT

The fastgrowing computational control of personalcomputers (PC) permitted researchers to device several optimizationalgorithms and proves their efficiency. Many algorithmshave been established by researchers that mimicusual phenomena. (PSO) Particle Swarm Optimization is amongst these nature inspired algorithms.PSO optimization is applied to catch out the preeminent model parameter that reducesthe sum square faultamong the measured and the simulated flux.Simulation outcomeprove the ability of the projectedpractice to capture the precise values of the machine parameter. In the paper PSO is implemented to get outfive parameters (Armature Circuit Resistance, Armature Circuit Inductance, Moment of Inertia, Flux and Viscous damping coefficient) of the three stage induction motor.

Keywords: Wavelet Transform, Probabilistic Neural Network, Motor Current Signature Analysis, Particle Swarm Optimization

1. INTRODUCTION

For robustness, their simplicity and low cost the induction machines are generallyused.Motor is avital element in the industry. Lot of money and effort are required torepair or exchange a motor in case of motor damage. Studies havebeen conceded out about the letdown diagnosis of motors. Investigation has been made while long before to identify a mistakethat happen in electrical machines [1].We will consider the faults that are electric and mechanical; thiskind of errorsmake known in the noise spectrum, which have precise frequencies. It is well-knownfact that because of the motors' faultsinduction motor dimensions will get change. That's why theseparameters have to be observed and, in mandate to avoid breakdowns [2]. Frequency component of the spectrum willmodifywhen mechanical piece of the motor either wears orbreaks up.In a revolving machine each

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fault createsvibrations and noise with distinguishingfeatures.To achieve the fault recognition and analysis these characteristicscan be calculated andrelated with reference ones [2].

This paper treats bearing and gear failure. In the anomalous gearbox,a tooth of the in-between gear is broken [3]. By equatingthe statistics of the standard and unusual gear, the gear let down is executed [10]. And by comparing spectra for strong and fault rotor bars, bearing failure is executed [2].

Particle Swarm Optimization was encouraged by the talent of a group of birds or a school of fish to exploit on theircollective information in discovery food or escapingpredators. Every swarm fellow or particle has a minor memory thatallows it to recall the best location it set up so far and itsgoodness. Particles are influenced by their personalknowledge (bestfound location) and their neighbors' practices (best found location by the neighbors).

2. RELATED WORK

Leite, D. F et al.talksabout an induction motor errordiscovery and analysis system. The scheme is built on monitoringof important electrical signals linked with an (EANN) evolutionaryartificial neural network model. Stator windings interturnsshort-circuit have been effectivelyidentified by the system.A real-encoding genetic algorithm hasbeen recommended to develop architectures and weights of neuralnetworks.M. Iorgulescu et al. noise of electric motors is examined in order to find information for the findingof faults.Huge clamor range contrasts between sound engine and engines with various flaws are watched. The flaws dissected are terrible bearing in the three stage acceptance engine and softened bars up single stage enlistment engine. The high-recurrence phantom examination of clamor gives a technique to distinguish faults.KhalafSalloumGaeid et al. detail or short winding and open winding are taken as a contextualinvestigation to demonstrate the viability of the wavelet

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systems for blame diagnosis.Ravi C. Bhavsar et al. incorporates an exhaustive audit of various kinds of shortcomings happen in enlistment engine and furthermore call attention to the most recent patterns in condition checking technology.KhadimMoinSiddiqui et al. a far reaching study of enlistment machine issues, symptomatic strategies and future viewpoints in the wellbeing observing of acceptance engine has been discussed.Malik AbadulrazzaqAlsaedi et al. principle reason for this article is to update the primary choices in the identification of issues in enlistment machines and contrast their commitments concurring with the data they require for the analysis, the number and significance of the flaws that can be recognized, the speed to expect a blame and the precision in the determination. S. Karmakar et al.development of enlistment engine has been discussed.Then a survey of acceptance engine blame has been exhibited. Deficiencies like rotor broken bar, mass unbalance, detail or blames, single staging, creeping, bearing flaws, and so forth are talked about alongside circumstances and end results. K.C. DeekshitKompella et al. presents a way to deal with distinguish the bearing issues experienced by acceptance machine utilizing engine current signatureanalysis (MCSA). The blame seriousness is evaluated by computing flaw ordering parameter of wavelet coefficients.K.C. DeekshitKompella et al. Engine ebb and flow signature examination (MCSA) has turned out to be famous for identification and confinement of these flaws and has pulled in grouping of numerous specialists. In this detail or current is observed by methods for recurrence ghostly subtraction utilizing different wavelet changes to stifle predominant components.Pu Shi et al. The wavelet change (WT) procedure is incorporated with the neural system model to remove rotor blame highlights.

Firstly, the multi determination examination strategy of WT and the particle swarm

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enhancement (PSO) hypothesis are utilized to separate the highlights of the misshaped flag. At that point, the probabilistic neural system (PNN) arranges these removed highlights to distinguish the rotor deserts compose. The proposed approach can lessen an incredible amount of the twisted flag highlights without losing its unique property

3. PROPOSED WORK

A novelmethod for inductionmotor parameter recognition using PSO is implemented.Recognitionof Parameter of the induction machine involves Armature Circuit Resistance, Armature Circuit Inductance, Moment of Inertia, Flux and Viscous damping coefficient. PSO based identification algorithm is used to get out appropriate parameter valuesthat can minimize the integrated absolute error among therecorded waveform and that generated by a motor model usingthe identified parameters.

Table 3.1: Five Parameters to be identified

Ra	Armature Circuit Resistance [Ohm]
La	Armature Circuit Inductance [H]
Jz	Moment of inertia [kg*m^2]
psi	Flux
Ct	Viscous damping coefficient [Nm/rad/sec]

Fitness = ISE(flux)

Integral (of) Square(d) Error [performance index]

Flux = (Ua-Ra*I)/W

Ua: Rated Armature Voltage [V]

Ra: Armature Circuit Resistance [Ohm]

I: Rated Current [A]

W: Rated Speed [rad/sec]

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4. RESULTS

Bearing Fault

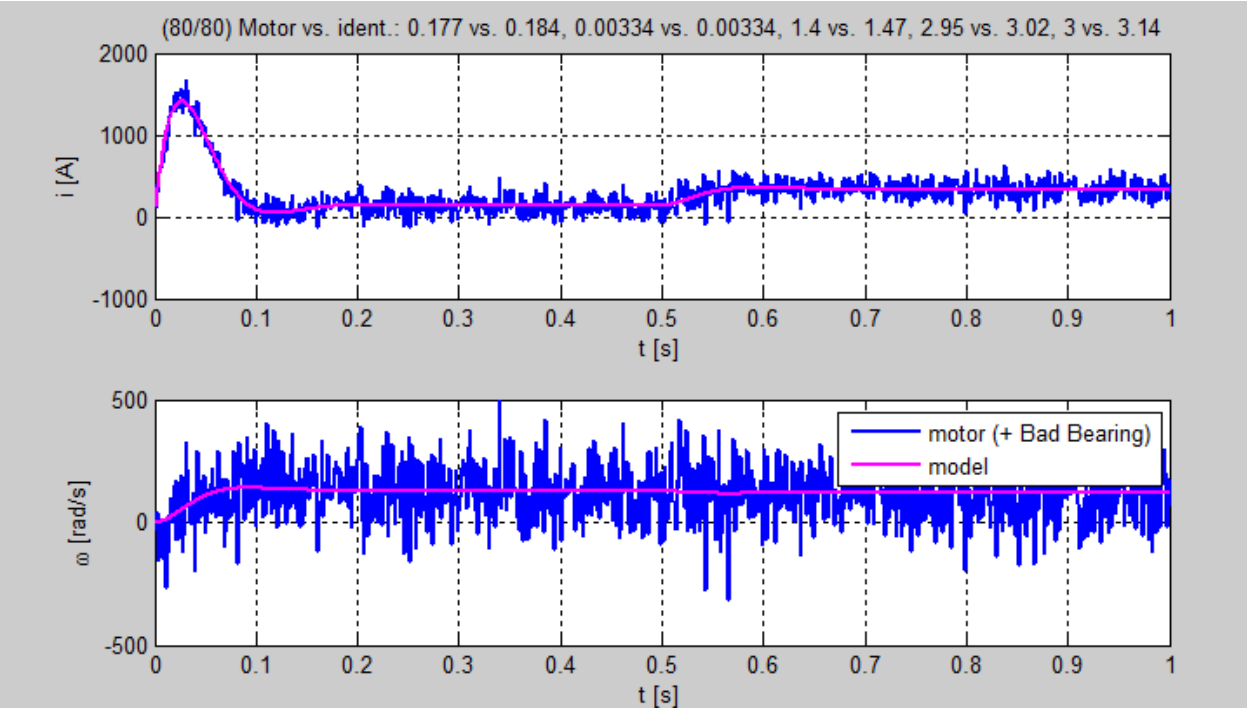

Figure 4.1. Bearing Fault

Errors: 3.8242% -0.12472% 5.1067% 2.4261% 4.8178%

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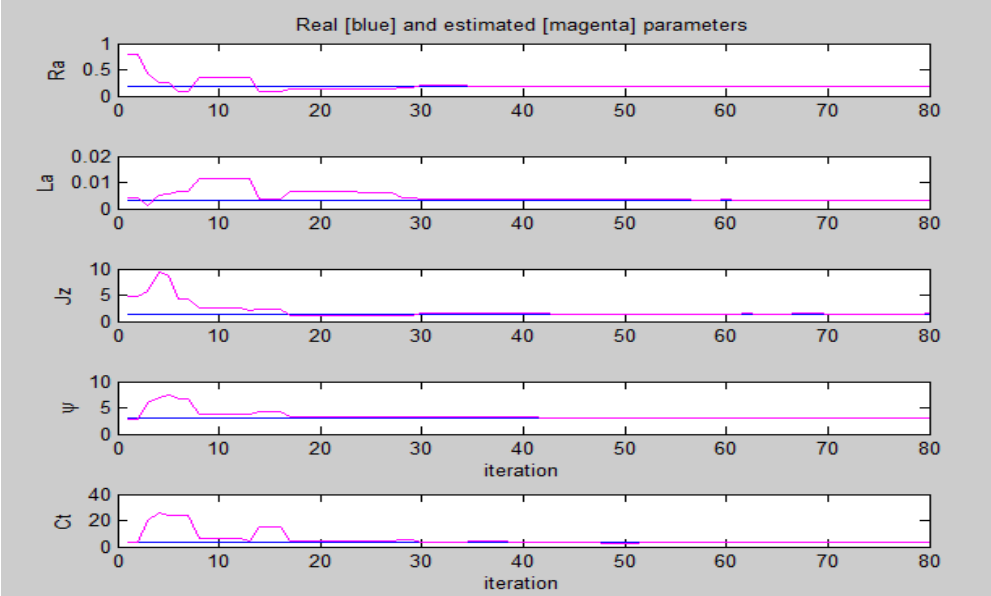

Figure 4.2: Estimated Parameters

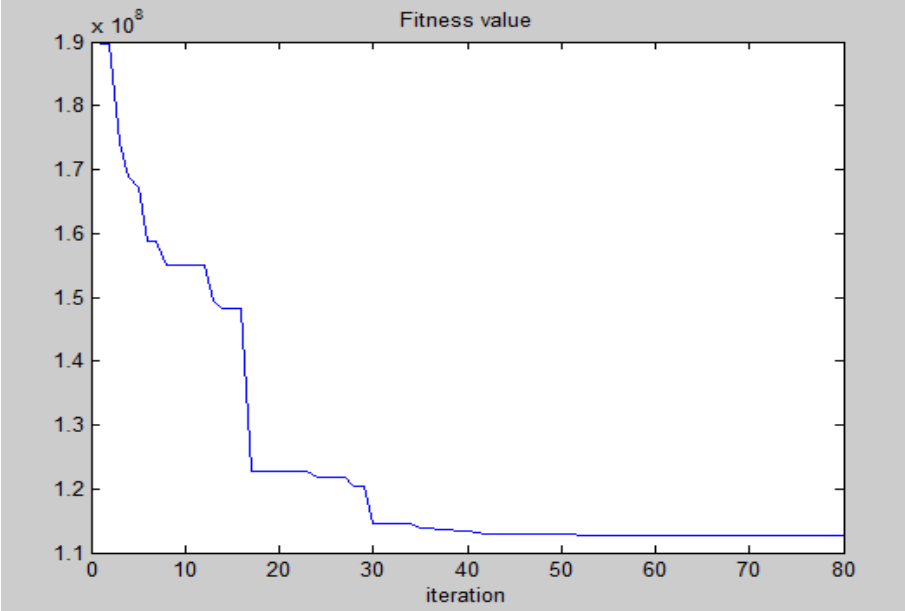

Figure 4.3: Fitness Value

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Abnormal Gear Teeth

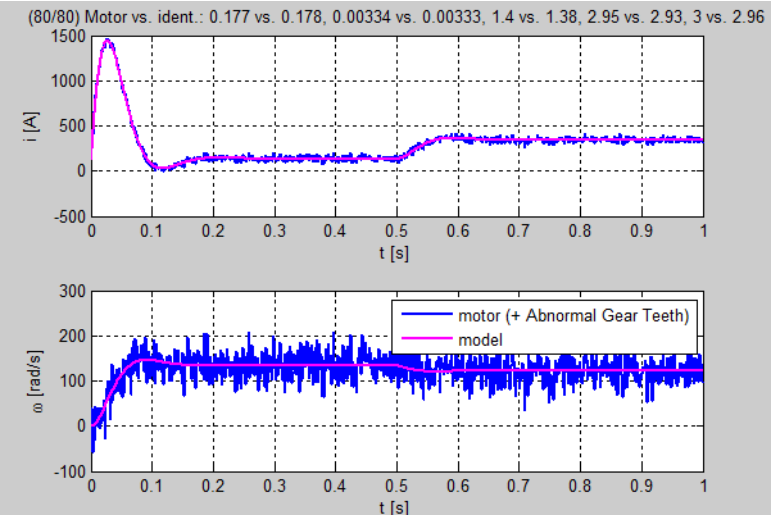

Figure 4.4. Evaluation of Perspectives

Errors: 0.30671% -0.17683% -1.3513% -0.67548% -1.3553%

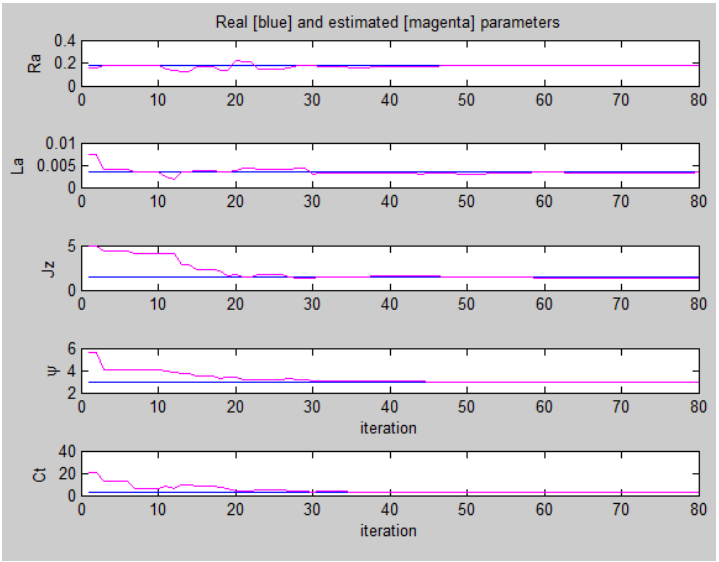

Figure 4.5: Estimated Parameters

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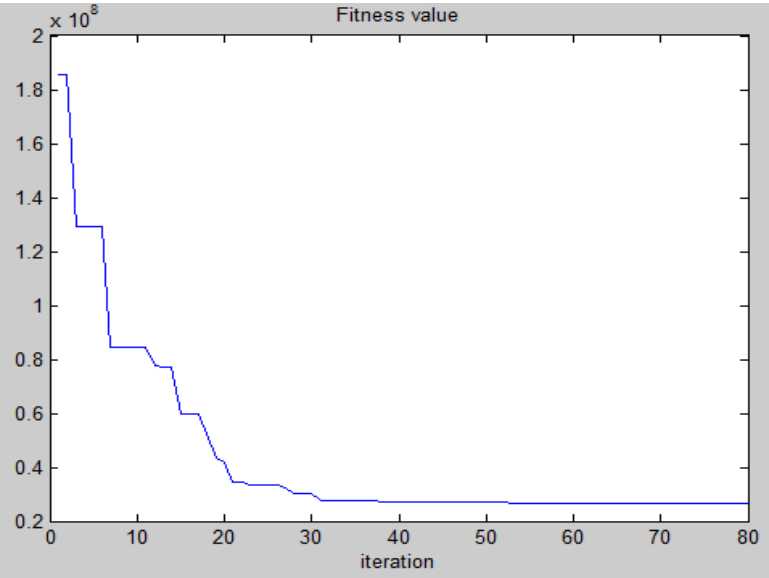

Figure 4.6: Fitness Value Evaluation

5. CONCLUSION

The PSO algorithm is implemented to guessthe real parameters of an induction motor which aregiven in Table 3.1. FitnessfunctionIntegral (of) Square (d) Error [flux], which estimates the fitness of the solution passed toit by solving the differential equations centered on the parametersof this solution using Matlab and gathersthe error which is the variance between the projected flux and the measured flux.

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