CV- Tariq M Khan

CONTACT

Tariq M Khan, PhD
Assistant Professor
Department of Electrical and Power Engineering
PNEC, NUST, Pakistan
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HEC approved PhD Supervisor

RESEARCH INTERESTS

Nondestructive testing, Structural health monitoring, Sensors instrumentation, biomedical imaging, Material characterization, Inverse problems, Signal and Image Processing, Computational Modeling, Algorithm development

ACADEMIC QUALIFICATIONS

Ph.D Electrical Engineering, Dec. 2009
Michigan State University, East Lansing, MI, USA

- GPA: 3.80/4
- Dissertation: Sequential Monte Carlo algorithms for solving NDE inverse problems
- Advisor: Dr. Pradeep Ramuhalli

M.S Electrical Engineering, Jun. 2006
National University of Science and Technology, PAKISTAN

- GPA: 4/4
- Thesis: Optimization algorithms for array signal processing
- Gold-medalist for securing first position

B.S Electrical Engineering, Jun. 1999
National University of Science and Technology, PAKISTAN

- With honors
- Design project: Conversion of old paper tape reader to microcontroller based system

RESEARCH EXPERIENCE

Post Doctoral Student (Research Associate) Jan. 2010 – Jan 2012
Non-Destructive Evaluation Laboratory, Michigan State University, East Lansing, MI
Major Professors: Lalita Udpa and Satish Udpa

- Automated analysis of eddy current data for NDE of steam generator tubes sponsored by Electric Power Research Institute (EPRI), Atomic Energy Canada Limited (AECL) and Electric de France (EDF)
  (Designed and implemented signal detection, feature extraction and classification algorithms for eddy current inspection data for Steam Generator tubes in nuclear reactors)

- Modeling of eddy current inspection using bobbin probe, RPC & Array probe for SG Tubes using Finite element modeling, a project sponsored by EPRI
- X-ray tomography for imaging cracks in fuel rods used in nuclear reactor. Designed and implemented statistical reconstruction algorithms for real time tomography. This allows rapid inspection of fuel pellets enclosed in the cladding tubes.
- Design and development of Monte Carlo based Prognostic algorithms
- Crack detection using lamb wave and acoustic emission techniques, a project sponsored by US Department of Energy (DOE)
- Wireless transmission of lamb wave data using TinyOS based motes sponsored by US Department of Energy (DOE)
- Detection and classification of flaws in weld regions using ultrasonic data, a project sponsored by Pacific Northwest National Laboratory. Used HHT based features to classify flaws
- Evaluation of Steam Generator Eddy Current Data Analysis Algorithms Software by NRC/ ANL.
- Writing papers, proposals, project reports and presenting work at peer-reviewed conferences, conducting project meetings
- Leading a team of 15 Graduate/undergraduate students in different non-destructive evaluation projects

Graduate Research Assistant Sept. 2006 - Dec. 2009
Non-Destructive Evaluation Laboratory, Michigan State University, East Lansing, MI

- Automated analysis of eddy current data for NDE of steam generator tubes sponsored by EPRI

(Designed and implemented signal detection, feature extraction and classification algorithms for eddy current inspection data for Steam Generator tubes in nuclear reactors)

- Development of sequential Monte Carlo based algorithms to solve low frequency electromagnetic inverse problems
- Development for flaw profiling algorithms using Aerospace NDT data (sponsors: US Air Force Research Lab)
- Acoustic noise source reconstruction by near field acoustic holography of turbo-machinery sponsored by NASA
- Development of forward and inverse electromagnetic Scattering algorithms (FEM,FTDT, MOM)
- Writing papers, proposals, project reports and presenting work at peer-reviewed conferences

Projects in progress

Project Title	Duration	Total Amount Of Grant	Funding Agency
Development of Flaw Diagnosis/ Dimensioning/ Prognostics Algorithms for the improvement of in-country Aerospace NDT Capabilities	36 months	Rs 8,744,758	ICT R&D

Projects in pipeline

Following proposals are in review process:

1. "Development of automated analysis of steam generator non-destructive testing (Eddy current) data for damage detection and flaw profiling" detailed proposal submitted to IAEA (International Atomic Energy Association) through Ministry of Science and Technology (MoST) Pakistan
2. Non-destructive testing of armor plates used in military vehicles detailed proposal submitted to MVRDE (Military Vehicle Research and Development Establishment)
3. "Structural health monitoring of bridges using Ground Penetrating Radar (GPR) Proposal" to HEC and USAID
4. "Development of signal processing algorithms for phased array ultrasonic testing (PAUT) data to improve non-destructive testing capability for nuclear, petrochemical, defense and aerospace industries" submitted to HEC NRPU program
5. "X-ray Dose reduction in Computed tomography (CT) scans through development and subsequent implementation of advanced reconstruction and post processing algorithms" submitted to Pakistan Science Foundation (PSF)

Teaching Experience

EL-441 Analysis of Stochastic systems in Summer 2012 in NUST
Teaching Assistant for ECE 366 Introduction to signal processing and ECE 446 Biomedical signal processing at Michigan State University
Teaching Assistant for MTH 234 Vector Calculus at Michigan State University

Books/ Book Chapters

Title	ISBN
A Sequential Monte Carlo Based Recursive Technique for Solving NDE Inverse Problems	1243716460, 9781243716460
Electromagnetic Nondestructive Evaluation (XIII): Chapter: Sequential Monte Carlo based data fusion for characterization of corrosion on aging aircrafts	1607505533, 9781607505532

JOURNALS PUBLICATIONS
(PEER-REVIEWED)

1. **T. Khan**, P. Ramuhalli, Particle filter based multi-sensor fusion for solving low frequency electromagnetic NDE inverse problems, IEEE Trans. of Measurement and Instrumentation Vol: 60 No:6, June 2011, pp. 2142 – 2153.
2. P. Lekeaka-Takunju, **T. Khan**, G. Harmon, S. S. Udpa, L. Udpa, X-ray Tomography Inspection of Nuclear Fuel Rods using Limited Number of Projections, Material Evaluation, Vol. 69, No. 4, April 2011, pp 495-500.
3. **T. Khan**, P. Ramuhalli, S. T. Raveendra, W. Zhang, De-noising and regularization in NAH for turbo-machinery noise source reconstruction, (invited paper), Noise Control Engineering Journal Vol. 58, No. 1, Oct. 2010, pp. 91-103.
4. P. Lekeaka-Takunju, **T. Khan**, C. Bardel, J. Kim, K, Kryzwosz, S. S. Udpa, L. Udpa, Assessment of Nuclear Fuel pellets using X-ray Computed Tomography, International Journal of Applied Electromagnetic and Mechanics, Vol. 33, No.3-4, Oct. 2010, pp. 1267-1272
5. **T. Khan**, P. Ramuhalli, Sequential Monte Carlo Methods for Electromagnetic NDE Inverse Problems-Evaluation and Comparison of Measurement Models, IEEE Trans. Magnetics, Vol. 45, No. 3, March 2009, pp. 1566-1569.
6. **T. Khan**, P. Ramuhalli, A recursive Bayesian Estimation Method for Solving electromagnetic NDE Inverse Problems, IEEE Trans. Magnetics, Vol. 44, No.7, July 2008, pp. 1845-1855.
7. P. Lekeaka**, T. Khan, S**. S. Udpa, L. Udpa, Tikhonov Inversion Technique in X-ray Computed Tomography of Nuclear fuel rods, IEEE transaction on Nuclear Science (Under Review)
8. Pre-processing methods for eddy current data analysis using Hilbert-Huang Transform G Yang, T Khan, L Zhang, G Dib, J Xin, L Udpa, S Majumdar, S Udpa, J Kim International Journal of Applied Electromagnetics and Mechanics 39 (1), 389-395, 2012

CONFERENCE PRESENTATIONS/PUBLICATIONS
(PEER-REVIEWED)

1. **T. Khan**, A. Tayebi, L. Udpa, S. Udpa, Detection and Characterization of Vibration Induced Flaws in Nuclear Steam Generator Tubes, presented at 8th international conference on flow dynamics, Japan, Nov 2011.
2. G. Yang, **T. Khan**, L. Udpa, S. Udpa, J. Kim, Pre-processing methods for eddy current data analysis using Hilbert-Huang Transform, presented at 15th international symposium on electromagnetic and mechanics, Italy, Sep 2011.
3. **T. Khan**, S. Majumdar, L. Udpa, P. Ramuhalli, S. Crawford, A. Diaz, M. Anderson, , Review of progress in QNDE at Burlington, Vermont, July 2011
4. **T. Khan**, L. Udpa, S. Udpa, **Particle filter** based prognosis study for predicting remaining useful life for steam generator tubing, Proceedings of IEEE PHM conference at Denver, Colorado, June 2011
5. **T. Khan**, L. Udpa, S. Udpa, Experimental noise injection in simulated model signals, To appear in AIP Proc. Review of Progress in QNDE, 2010, San Diego CA, USA.
6. G. Dib, L. Mhamdi, **T. Khan**, L. Udpa, N. Lajnef, J. Hong, S. Udpa, P.Ramuhalli, K. Balasubramaniam, Wireless NDE sensor system for continuous

monitoring, To appear in AIP Proc. Review of Progress in QNDE, 2010, San Diego, CA , USA.
7. P. Lekeaka**, T. Khan**, G. Harmon, S. S. Udpa, L. Udpa, X-ray Inspection of Nuclear Fuel Pellets Using Computed Tomography, Proceedings of Digital Imaging XIII Conference, July 2010, Pages 77-81, ISBN: 978-1-57117-209-9
8. K.Kopke, J. Breman, **T. Khan**, J. Powell, L. Udpa, R. Haut, Prediction of ankle joint torques using Artificial Neural networks, Proceedings of 28th International Conference on Biomechanics in sports, July 2010
9. P. Lekeaka, **T. Khan**, C. Bardel, S. Udpa and L. Udpa, Assessment of Nuclear Fuel Pellets Using X-Ray Tomography, presented at ISEM2009, China, Sept. 2009.
10. **T. Khan**, P. Ramuhalli, Application of sequential Monte Carlo based data fusion for characterization of corrosion on aging air crafts structures, AIP conference proceedings, vol. 1096, pp. 711-718, Mar 2009
11. **T. Khan**, P. Ramuhalli, S. Dass, Confidence metrics for particle filter based data fusion, presented at Inverse Problems Symposium, East Lansing, MI, June 2009.
12. **T. Khan**, P. Ramuhalli, S. T. Raveendra, W. Zhang, Model order reduction using basis expansions for near field acoustic holography, Proc. of SAE Noise and Vibration Conference at Illinois, USA, May 2009.
13. **T. Khan**, P. Ramuhalli, Particle filter based multi-sensor fusion for flaw shape reconstruction in steam generator NDE, Proc. of IEEE Sensors Applications Symposium at New Orleans, USA,
Feb 2009.
14. **T. Khan**, P. Ramuhalli, S. T. Raveendra, W. Zhang, Near field acoustic holography for acoustic noise source identification in turbo machinery, Proc. of IEEE Sensors Applications Symposium at New Orleans, USA, Feb 2009.
15. **T. Khan**, P. Ramuhalli, S. T. Raveendra, W. Zhang, De-noising and regularization in NAH for turbo-machinery noise source reconstruction, Proc. NOISECON'08, July 2008.
16. **T. Khan**, P. Ramuhalli, Particle filter based multi-sensor fusion for solving electromagnetic NDE inverse problems, Proc. Review of Progress in QNDE, 2009.
17. **T. Khan**, P. Ramuhalli, Sequential Monte Carlo methods for solving electromagnetic NDE inverse problems, Presented at 13th Biennial IEEE Conf. Electromag. Field Comp. 2008 (IEEE CEFC2008), Athens, Greece, May 11th-15th, 2008.
18. **T. Khan**, P. Ramuhalli, Online Bayesian estimation for solving electromagnetic NDE inverse problems, Review of Progress in QNDE, (Ed. D. O. Thompson and D. E. Chimenti), Vol. 975, pp. 625-632, 2008.
19. **T. Khan**, P. Ramuhalli, A Bayesian technique for solving electromagnetic NDE inverse problems, Conference record of Inverse Problems Symposium, East Lansing, MI, June 2007.
20. **T. Khan**, L Udpa, A. Alsinan, “Evaluation of NRC/ANL NDT Data Analysis Algorithms” EPRI USA SGMP tech report 2011.

21. **T. Khan**, Lalita Udpa, Naiguang Lei, Guang Yang, “Simulation Model for Eddy Current SG Inspection” 30th Steam Generator Non destructive Evaluation Workshop, EPRI, USA 2011
22. **T.Khan,** Lalita Udpa, Gerges Dib, Lu Zhang, “Automated Analysis System for Characterizing Eddy Current SG Inspection Data” 30th Steam Generator Non destructive Evaluation Workshop, EPRI, USA 2011

AWARDS & HONORS

1. Winner of Michigan State university Graduate School Dissertation fellowship award in Fall 2009
2. IEEE Student Ambassador for 2009 awarded by IEEE
3.Winner of National University of Science and Technology (NUST) Pakistan, scholarship for PhD studies (Aug '06-Aug '08).
4.Invited Speaker and Panelist in NDE session in IEEE PHM conference 2012

PROFESSIONAL ACTIVITIES

Acted as a reviewer for the following Journals:

- Journal of Nondestructive Testing and Evaluation
- IEEE transaction on instrumentation and measurement
- IEEE transaction on Magnetics
- Research in Nondestructive testing
- Materials Evaluation

TECHNICAL SKILLS AND EXPERTISE

Software:

- Matlab, Simulink, Lab view (data acquisition)
- C/C++
- Assembly/Microprocessors coding
- XML/HTML/JAVA and PHP coding
- R/SPLUS
- COMSOL/FEMLAB and ABAQUS
- Eddynet
- Omniscan
- Strong ability to learn computer languages

Hardware:

- Working knowledge for electric/electronic/microwave measuring equipment
- Handling experience of 320 KVp X-ray machine