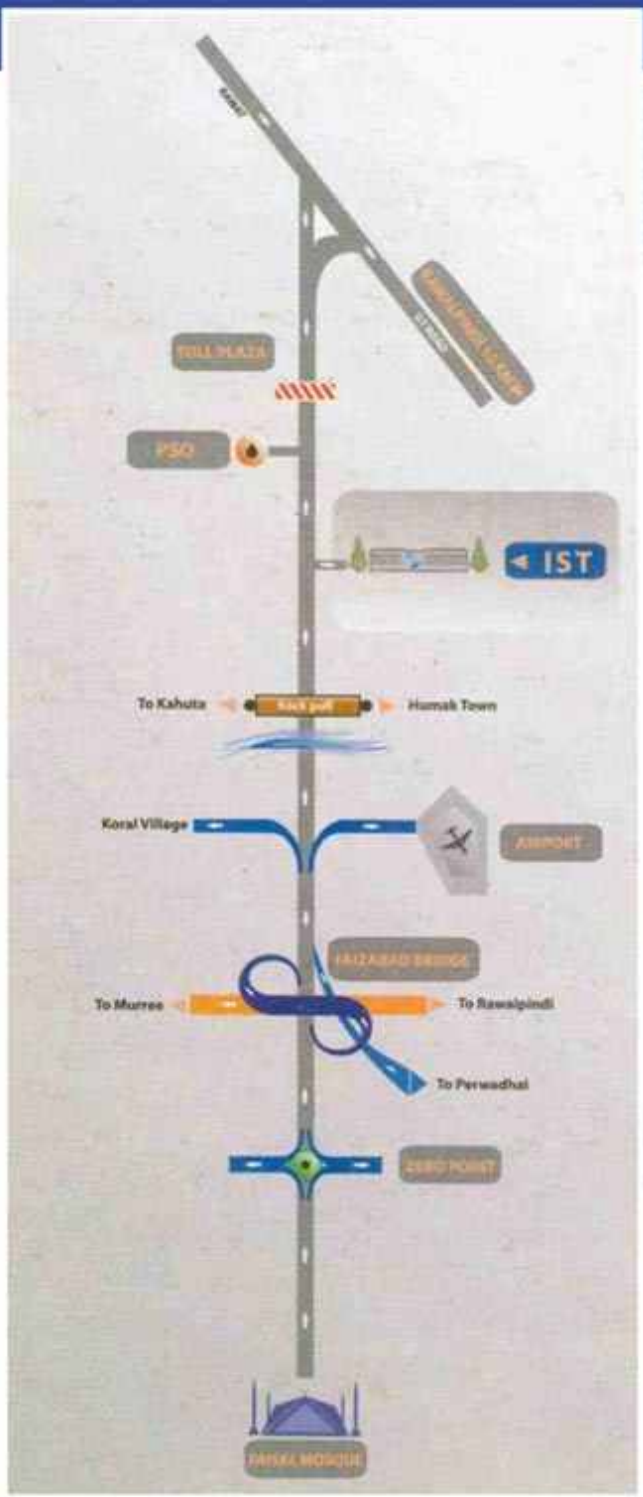

INSTITUTE OF SPACE TECHNOLOGY

Fuzzy Mapping of Human Expertise of Ultrasonic NDE with Applications to Gas Pipelines Defect Inspection

Seminar by

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Description

In this seminar, an expert system will be presented to classify the defects in metallic underground or submerged gas pipelines using acoustic techniques with non-destructive evaluation (NDE) protocols. This system maps the human experts' decision making behavior through a novel perception-based kernel. The kernel has its roots in multidimensional fuzzy set theory to map the relative weights given to various features; mathematical or heuristic, and is then mapped to the decision surface to deduce the existence and severity of the defect. A procedure for experiments is outlined to collect features and waveforms using known defects and calculating additional features using statistical and parametric modeling techniques, such as deconvolution algorithms using H∞'bO deconvolution, HOS-based modeling, and subspace deconvolution, etc... As a mapping step, human experts are interviewed and shown these waveforms and all the related information and an opinion was sought as to whether they think there is a defect. If so, then how severe it is. The collected experimental data is modeled using state of the art deconvolution algorithm developed by the presenter, the H∞'bO deconvolution, In addition to these features, human expert heuristics will be demonstrated to translate into relative weighted memberships transforming the human heuristics into quantitative representations. With each feature set, a classifier tag is associated that assigns a class number to that defect. The classifier tag is then used to classify any new data using the Fuzzy classifier. In the event that the classification fails, the system decides it to be a new defect type and would require user intervention using a GUI interface to update the database with this new feature set.

Objectives

1. To familiarize the attendees with the basics of Ultrasonic NDT/NDE.
2. Introduce the type of defects that occur commonly in the real world.
3. Translating Human heuristics into numbers for defect classification.
4. Introduce the Fuzzy Inference System.
5. Examples and case study
6. Bringing up the level of engineering skills in the area so that it may be applied to real life applications.

Who may attend?

NDT Professionals, Engineers from Mechanical, Materials, Electrical, Civil, and System disciplines, Graduate students in the areas of Signal Processing, Soft computing, Pattern Recognition, etc.

About the Speaker

Dr. Uvais Qidwai received his Ph.D. from University of Massachusetts-Dartmo uth in 2001 from the Electrical and Computer Engineering Department. He worked at the Electrical Engineering and Computer Science Department at Tulane University in New Orleans, USA as Assistant Professor, and in-charge of the Robotics lab from June 2001 till June 2005. He joined the Computer Science and Engineering Department at Qatar University in Fall 2005 as Assistant Professor. His present interests in research include Image Enhancement & Understanding for Machine Vision Applications, Fuzzy Computations, Signal Processing and Interfacing, Expert System for Testing Pipelines, and intelligent algorithms for Medical Informatics. He has participated in several Government and Industry funded projects in USA, Saudi Arabia, and Pakistan and has published over 50 papers in reputable Journals and Conferences.

Schedule

Date	August 20, 2007
Venue	Institute of Space Technology Islamabad Highway, Islamabad
Timing	2:30 pm (3 hours duration)