Probabilistic pipe strength and toughness estimation through information fusion with Bayesian updating

Sonam Dahire, Akita Kardile, Yongming Liu
School of Engineering for Matter, Transport, and Energy, Arizona State University, Tempe, Arizona 85281
Xiaodong Shi, Yiming Deng
Department of Electrical and Computer Engineering, Michigan State University, East Lansing, MI 48824

Main Objective
This project was awarded to Arizona State University in order to develop a novel Bayesian network tool for information fusion from multimodality diagnosis results to allow for accurate prediction of probabilistic pipe strength and toughness, thereby accounting for the inhomogeneity and uncertainties in the system, not addressed with the present techniques of detection.

Expected Results or Results to Date

- A fast SNMMI system using novel continuous scanning method; five to ten times fast, superior imaging resolution preserved.
- The circuit design and antenna for multi-channel scanning; portable for future field testing.
- Scanning images deconvolution; improved images quality by removing the effect of the PSF.
- Experimental analysis conducted on two samples from GTI (Pipe grade: X50-X60), in the thickness direction.
- Microstructure change observed for one sample with very little change in volume fraction for both samples. Tensile and Hardness test predicted a certain trend in both samples.
- A Bayesian Network prediction model designed in c WINBUGS with features; reduced uncertainty, node sensitivity and possibility to update all the nodes in the system.
- A stochastic 3-D reconstruction model constructed for isolatable portions of one of the pipe samples.

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References

Public Project Page
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https://primis.phmsa.dot.gov/matrix/PrjHome.rdm?prj=627