

Task Title: Neural Network Applications to NDE

I. Objectives: The objective of this task is to apply artificial neural network methods, algorithms and code for thermography, acoustic emission and resonance ultrasound NDE data processing.

II. Center Point of Contact:

James L. Walker II
MSFC/ED32/Nondestructive Evaluation Team
256-961-1784, 256-544-0212 (fax)
james.l.walker@msfc.nasa.gov

Technical Methodology/Approach: The primary goal of this task is to investigate, and where appropriate, develop artificial neural network methods for NDE data processing. Three specific NDE disciplines including thermography, acoustic emission and resonance ultrasound will be analyzed to determine how artificial neural networks could potentially help in the interpretation and enhancement of their data sets. The focus for the thermographic analysis will be on image enhancement. Here, by utilizing techniques in pattern recognition, code will be developed for better defining defect boundaries and depth. Past work has shown that there exists a potential to predict failure loads for both metallic and composite structures with acoustic emission data. This task will update that work and attempt to develop more robust network algorithms. Finally, neural networks will be applied to the interpretation of the resonance ultrasound response of structures to better differentiate defect signatures from background material noise.

IV. Customers: As this is an enabling technology project potential customers will be all nondestructive evaluation users who perform thermography, acoustic emission or ultrasonic inspections.

V. Metrics: Development of fundamental algorithms and basic code for implementation of artificial neural networks to NDE. Application of artificial neural network code to NDE data processing

VI. Products: Neural network methodologies, algorithms and code for specific NDE methods.

VII. Schedule/Milestones:

- Research established neural network methodologies 1/02 – 6/02
- Procure neural network software and developmental program language 2/02 – 5/02
- Develop algorithms for NDE methods 5/02 - 12/02
- Procure and fabricate test samples 11/01 – 4/03
- Develop code for NDE methods 11/03 – 6/03
- Perform tests to validate code 5/03 – 12/03
- Prepare final report 11/03 – 12/03