NASA SBIR/STTR Technologies

Ultrasonic Guided Wave Simulation Toolbox for Virtual Inspection of Composites

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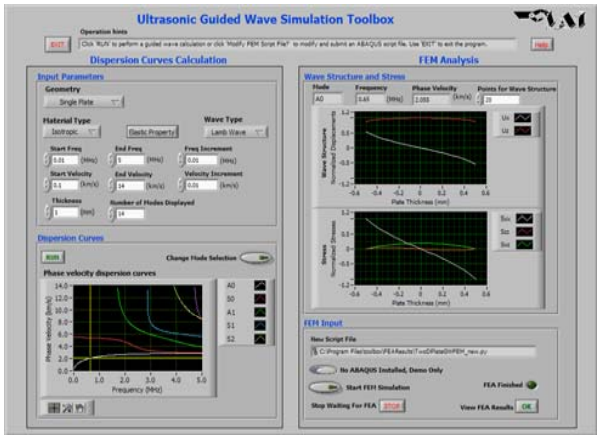
Guided wave simulation toolbox



Identification and Significance of Innovation

We proposes to develop a "virtual inspection" simulation software toolbox specifically for ultrasonic guided waves. It will be able to help evaluate ultrasonic guided wave NDE method for its feasibility of inspecting critical system components, and would model the changes in material properties as indicators of material aging and then quantifying the levels of detectability of these material properties with the guided wave NDE technique.

Expected TRL Range at the end of Contract (1-9): 4

Technical Objectives and Work Plan

- Design an overall architecture for the simulation software, with consideration on user-friendly interface and easy expansion/maintenance of software
- Develop dispersion curve calculation module for composites
- Develop a finite element analysis procedure for guided waves impinging into a defect in composite, extract the simulated signal signature corresponds to the defect
- Initial piezoelectric sensor modeling on the composite, study the feasibility of FEM simulation on sensor response
- Integration of the software toolbox for composite, test and debug the code.
- Document the software and test results; provide a Phase II development plan

NASA and Non-NASA Applications

Non-NASA applications Computational NDE methodologies for Constellation Program to develop the CEV, CLV, and follow-on spacecraft and habitat structures
Non-NASA applications A software toolbox that will greatly benefit the NDE community for enhancing the structural safety while reducing the maintenance costs. NDE and structural health monitoring for both military and commercial systems such as aircraft, automobiles, bridges, home appliances, nuclear reactors, etc.

Firm Contacts

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