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AEROSPACE AND MECHANICAL ENGINEERING

SEMINAR ANNOUNCEMENT

SPEAKER: Scott E. Black
Boeing: Integrated Defense System
St. Louis, Missouri

TOPIC: Automated Non-Destructive Inspection (NDI) Challenges for Large Composite Structures (787 Program Example)

DATE: Tuesday, April 15, 2008

TIME: 3:30 p.m.

PLACE: 138 DeBartolo Hall

Abstract

The Boeing Automated Systems Group is currently designing production inspection systems for several large components on the 787 program (Wichita, Australia, Italy). As composite surfaces increase in size, the mechanical, motion, signal processing, and data storage requirements have increased exponentially. With the proposed manufacturing approach for the 787 program, full composite fuselage sections and cockpit areas will require single piece inspection. The challenge is to provide an integrated solution which encapsulates surface mapping, motion profiling, error correction, and high speed waveform acquisition / analysis capabilities necessary to scan and evaluate large composite surfaces. Detecting anomalies within contoured structures requires the ability to develop and execute a set of complex signal processing algorithms simultaneous with the real-time control of the mechanical system. Existing architectures typically require a significant amount of post processing time following the completion of the production scan. The Boeing Automated Systems Group has developed an integrated solution which leverages Boeing control and analysis techniques with the Microsoft Embedded NT operating system, Ardence Real-Time Extension (RTX), National Instrument (NI), Acqiris, and the Matlab development environment. The following development strategies utilize common tools and eliminate the incompatibilities between GUI and embedded applications.

To further improve production throughput rates, the Automated Systems Group has developed an ultrasonic array interface that significantly reduces inspection time by collecting, analyzing, and displaying sixty four channels of waveform data simultaneously. During the development phase, several multi-waveform acquisition and analysis concepts were integrated and validated on test articles. Enhanced waveform servers are being developed which will support real-time multi-channel acquisition and analysis of digitized ultrasonic signals. GUI interfaces enable signal processing algorithms to be developed by the evaluator and integrated into the production process. The resulting technology is currently being incorporated into the large scale Automated Ultrasonic Scanning System (AUSS) and is currently being be used in production on the 787 program.

The Automated Systems group is also developing control architectures which support multi-integrated mechanical system configurations. This enables mechanical gantry systems to interface with robotic subsystems necessary to inspect the inside of the 787 fuselage.