ADAPTIVE NEURAL CONTROL
for Vibration Suppression

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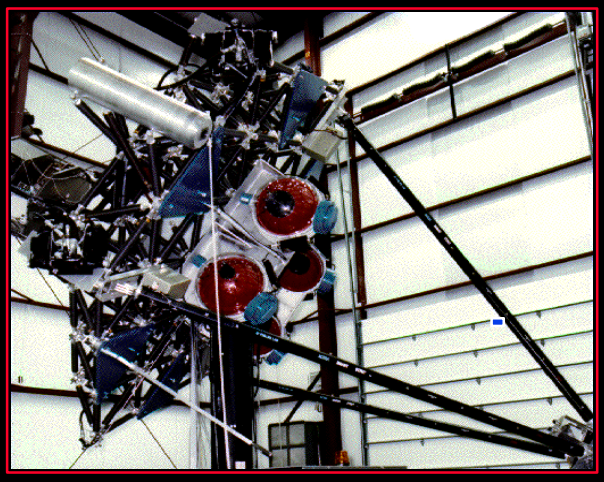
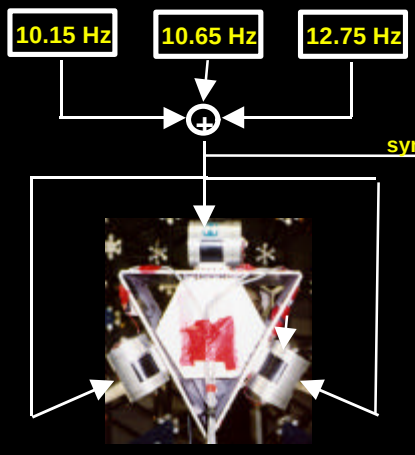
TECHNOLOGY DEFICIENCIES

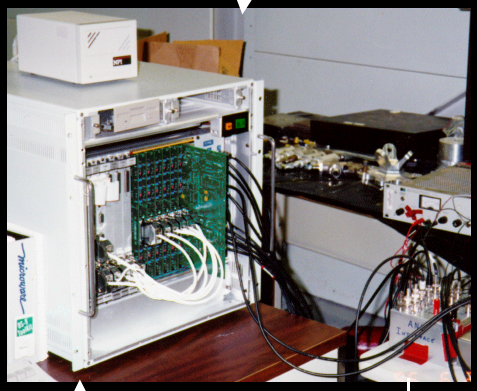
- CURRENT CONTROL LAWS MANDATE A HIGH FIDELITY DYNAMIC MODEL THAT IS TIME-CONSUMING AND COMPUTATIONALLY EXPENSIVE TO VALIDATE
- CURRENT CONTROL LAWS ARE UNABLE TO ADDRESS TIME-CRITICAL CONTROL RECOVERY DUE TO UNEXPECTED CATASTROPHIC FAILURES OF STRUCTURAL MEMBERS

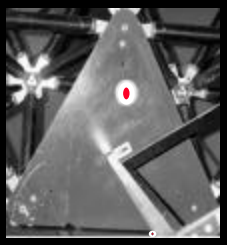


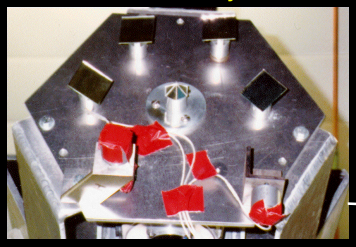
TECHNICAL OBJECTIVES

- DEMONSTRATION OF A COST-EFFECTIVE, ROBUST AND EMERGING ALTERNATIVE (ANC) TO MODEL-DEPENDENT CONTROL APPROACH
- DEVELOPMENT OF AN AUTONOMOUS CONTROL SYSTEM EQUIPPED WITH ON-BOARD HEALTH MONITORING AND REAL-TIME CONTROL RECONFIGURATION
- PROVIDE NUMERICAL SIMULATION AND EXPERIMENTAL VERIFICATION ON REALISTIC STRUCTURAL CONTROL FACILITIES
- PURSUE STATE-OF-THE-ART PARALLEL HARDWARE IMPLEMENTATION IN A SELF-CONTAINED PACKAGE MOUNTABLE TO A CSI TESTBED
- SPACE-QUALIFIABLE ACTIVE NOISE AND VIBRATION CONTROLLER READY FOR FLIGHT EXPERIMENTS



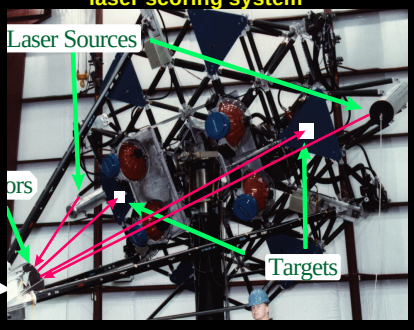


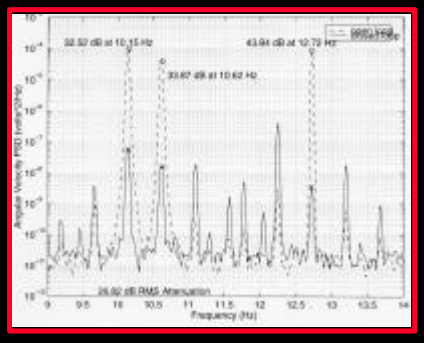




MOTION SENSOR AMPLIFIER

ACESA ELECTRONICS





CLOSED-LOOP PSDs

- KALMAN filter learning algorithm
- converge in approximately 7 min
- vibration attenuation: 33dB at 10.15 Hz, 34dB at 10.65 Hz, 44dB at 12.75 Hz; RMS attenuation across 9-14 Hz band was 27dB

CLOSED-LOOP PSDs

- actuators 3 and 6 off (out of 6 actuators)
- re-converge in approximately 7 min
- vibration attenuation: 25dB at 10.15 Hz, 28 dB at 10.65 Hz, 53dB at 12.75Hz, 10dB at spur (12.25Hz)