

# Active Vibration Control Graduate Design Competition 2008

*Organized by Smart Materials and Structures Laboratory, University of Houston*

The graduate student teams' objective of the Active Vibration Control Competition was to design a controller which would effectively and efficiently dampen the oscillations of a flexible beam with a piezoceramic sensor and a piezoceramic actuator in the presence of sensor noise, external excitation or mass uncertainty. The flexible beam setup was made possible by an NSF award (DUE 0442991). The



graduate students were given the option to design a single mode or multi-mode vibration controller, but only the first two modes were to be considered. The students were given access to the flexible beam, a TREK amplifier, a PC with Matlab/Simulink and a dSPACE data acquisition and real time control system to implement their controllers. The controller signal was sent to the piezoceramic actuators in order to counteract the beam's induced vibration. Each team was given one hour on the first day to obtain and analyze data from the piezoceramic sensor for system identification. The teams were given one hour on the second day to verify their controller design performance. On the third day, the teams were allowed 30 minutes to make final changes to their controllers before a committee of professors and researchers specialized in vibration control and smart structures evaluated the controller's performance. The judges ran the controllers under four conditions: 1) no uncertainty, no excitation and no noise; 2)

with mass uncertainty only; 3) with external excitation only; and 4) with sensor noise only. For this competition, the controllers were graded based on the control effectiveness and the control input. The control effectiveness evaluation was primarily based on the settling time (5% of the initial value), chattering effect, and overshoot. The control input evaluation was based on the normalized control input. Thanks go to TREK and dSPACE for donating the student awards. The awards were as follows:

First Prize: Dharma Theja Pasala with 86.78%

Second Prize: Luyu Li with 81.61% and Olmi Claudio with 74.97%

Third Prize: Waleed Barnawi with 74.27% and Mithun Singla with 69.64%



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