GTIIT MECHANICAL ENGINEERING Msc SEMINAR (30 min.)

Thursday, November 26, 2026 at 10:00-10:30 Israel time (16:00-16:30 China time)

GTIIT classroom: E509, North Campus

Online: https://gtiit.zoom.us/j/95419715666?pwd=Qu5Fnk2f09GCkPA8hrjXmJbey3qTjC.1

Learning Aggregate System Dynamics and Supervisory Switching for Active Vibration Control under Disturbance

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Learning system dynamics from measured data offers a practical basis for vibration control, but unmeasured disturbances can disrupt the response on which a learned policy relies. This paper presents an active vibration control framework that uses a shared dynamics model for policy training and online supervision. A data-driven dynamics model (DDM) predicts the aggregate input–output behavior from a finite history of measurements and commands. Adaptive-range residual proximal policy optimization (AR-PPO) learns control actions that augment active disturbance rejection control, gradually expanding the residual action range during training. During operation, a prediction residual threshold triggers temporary model predictive control; a recovery criterion then restores AR-PPO. Experiments use an electromagnetically actuated structure with 2 degrees of freedom. The full DDM reduces mean recursive prediction error by 77.2% relative to the memoryless baseline in model-selection experiments. Across 25 sinusoidal excitation conditions, AR-PPO reduces mean velocity and acceleration root mean square (RMS) responses by 40.7% and 45.0% relative to active disturbance rejection control. Under 9 unmeasured input pulse conditions, supervisory switching reduces event-window RMS displacement, velocity and acceleration by 31.1%, 43.5% and 25.2% relative to standalone AR-PPO. The resulting framework combines effective nominal vibration attenuation with automatic intervention and recovery under disturbed conditions.

Note: the seminar will be given in English