263F Project Mid Term

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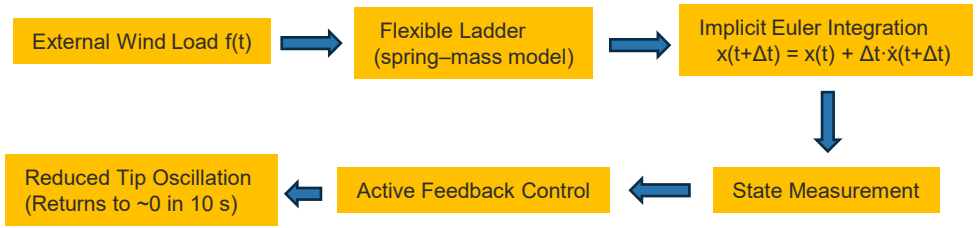
Active Oscillation Damping of a Fire-Rescue Turntable Ladder

Problem & Motivation

- Flexible aerial ladders suffer from excessive vibration under wind loads.
- Existing studies (Horváth 2020; Kharitonov 2007) focus on theoretical or high-cost control.
- Objective: develop a simplified real-time active damping model using limited feedback.

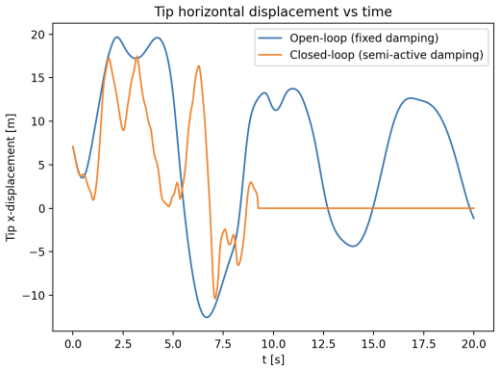
Method Overview

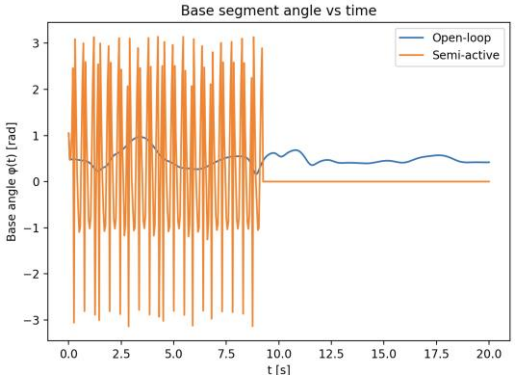


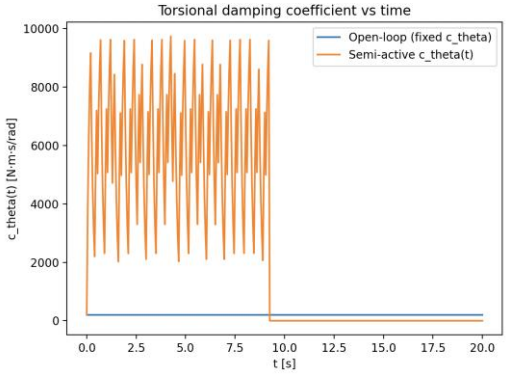
$$m_i\ddot{y}_i = k(y_{i+1} - 2y_i + y_{i-1}) + c(\dot{y}_{i+1} - 2\dot{y}_i + \dot{y}_{i-1})$$

$$u(t) = K\hat{x}(t)$$

Preliminary Results







Next Steps:

- Extend model to include vertical deflection and realistic wind load profiles.
- Perform parameter sweep to optimize feedback gain K.
- Quantitatively compare energy dissipation and settling time.
- Prepare final visualization and report (≤ 5 pages).

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Thank You