

Reduce platform movement

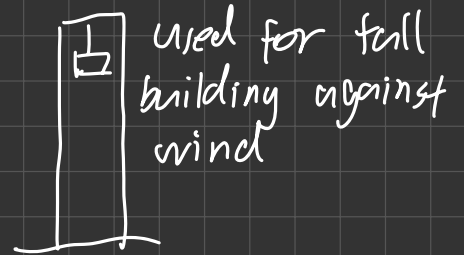
negative damping (Recall [Review Model])

MIMO : blades pitches individually

tuned mass-damper

but expensive and complex

Better rotor speed regulation



Goal of this paper: Proposes a state-feedback model-based predictive control to minimize the platform oscillations and rotor / generator speed regulations.

- linear state space model

- Quadratic cost function-based MPC solver compute output.

Compare with GS-PI, LQI

Inputs $\begin{bmatrix} \beta : \text{blade pitch angle} \\ T_g : \text{generator torque} \\ \gamma : \text{nacelle yaw} \end{bmatrix}$

The simplified non-linear model : $x' = f(x, \overset{\text{Inputs}}{u}, \underset{\substack{\downarrow \\ \text{platform} \\ \text{DOF and} \\ \text{velocity}}}{v}, \underset{\substack{\checkmark \\ \text{wind and wave} \\ \text{disturbances}}}{w})$

Linearizing Non-linear model at x_0 in Region III (Strong wind)

$$\delta x' = A \delta x + B \delta u + B_v \delta v + B_w \delta w.$$

This control is for region III, strong wind, $P_{aero} > P_{gen}$, presence rotor / generator regulation

Generated power

$$P = T_g \times \omega_g \times \eta \leftarrow \text{generator efficiency}$$

Recall physics

$$W = T \cdot \theta$$

$$P = \frac{W}{t} = T \cdot \frac{\theta}{t} = T \cdot \omega$$

Consider surge, sway, roll, pitch

[Recall in [Nova! Non-linear], only considered surge, pitch)
Because this control aimed to minimizing pltfm motion,
we consider more DOFs.

MPL is a discrete-time control method

Advantages: The incorporation of input-output actuator

Avoid rapid rate of change

[In [2], they set up constraints to avoid it)