Real-time Guidance for Pilot-assist Rotorcraft Shipboard Landing using MPPI

👤 **Vinodhini** Comandur
   J. V. R. Prasad

BACKGROUND

- Rotorcraft shipboard landing – one of the most challenging flight regimes for helicopters
- High pilot workload and fatigue due to random sea motion, turbulence effects due to airwake interactions, and poor visibility at night and during rough weather conditions
- Past studies use MPC, an explicit optimization method, which cannot solve a stochastic optimization problem (such as this) quickly without sacrificing solution fidelity
- <u>Goal</u>: To develop a real-time guidance solution that reduces pilot workload and identify key performance metrics for optimal shipboard landing

METHODOLOGY

1. Formulated a trajectory tracking optimization problem using Model Predictive Path Integral (**MPPI**) approach, an implicit stochastic optimization method
2. Integrated the scheme to a rotorcraft simulator for projecting relevant information as cue to the pilot
3. Performed parametric sensitivity studies
4. Determined metrics for pilot workload evaluation
5. Conducted online evaluations of the guidance and cueing schemes with human pilots in the rotorcraft simulator
6. Currently incorporating cue reinitialization and ship airwake into the simulator
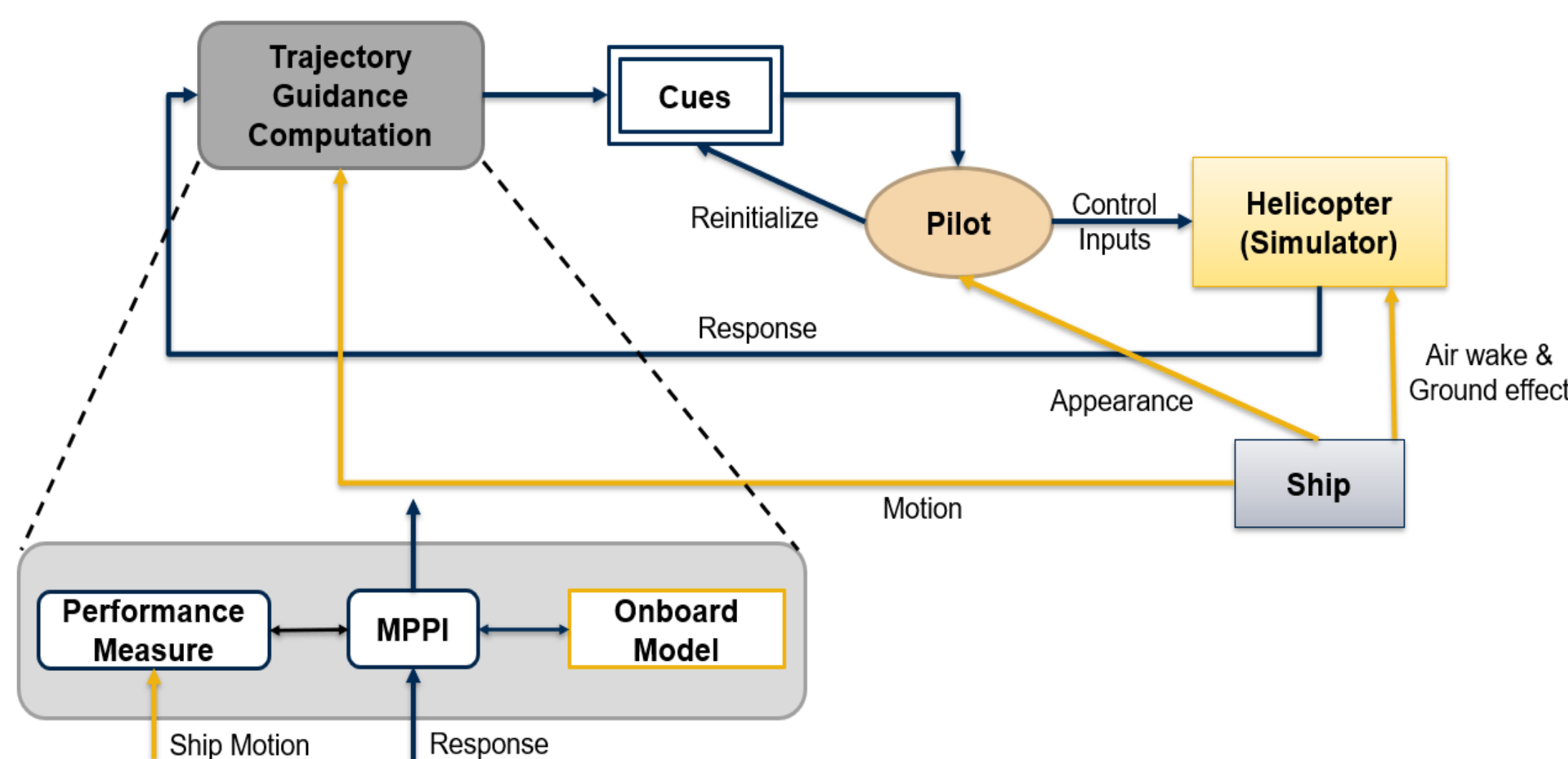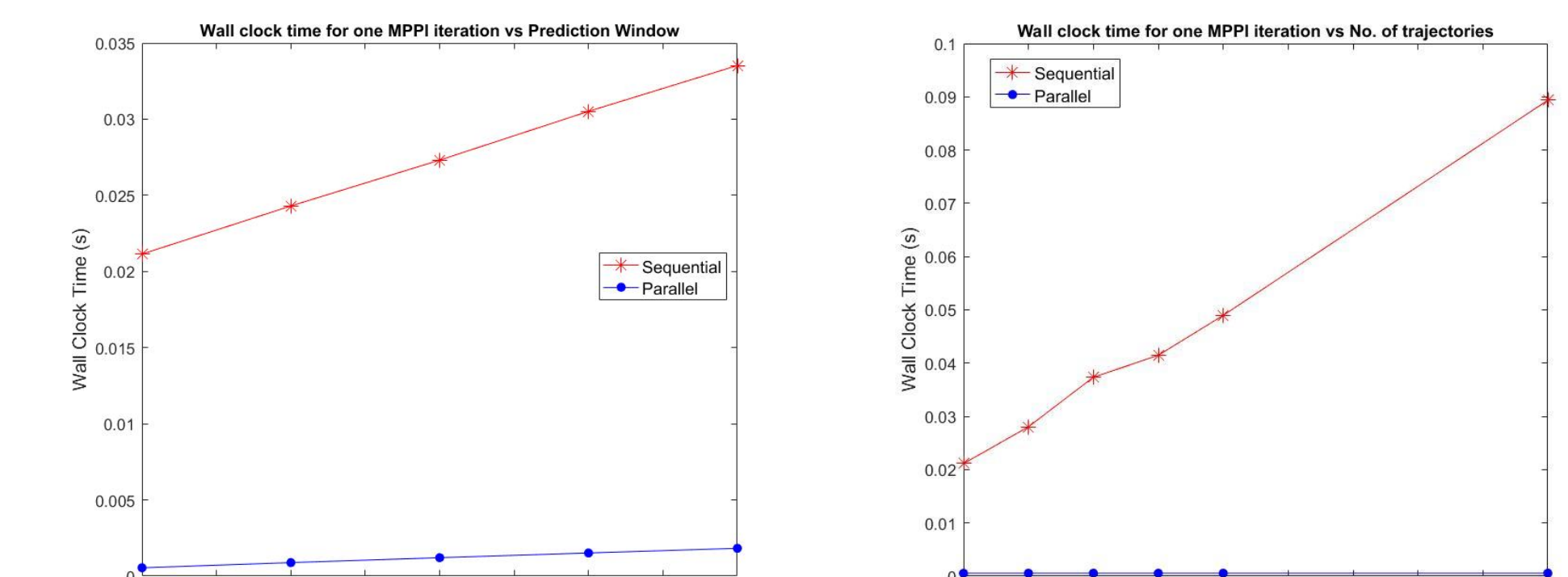

MPPI provides efficient **real-time guidance** for pilot-assist shipboard landing and **reduces pilot workload**.

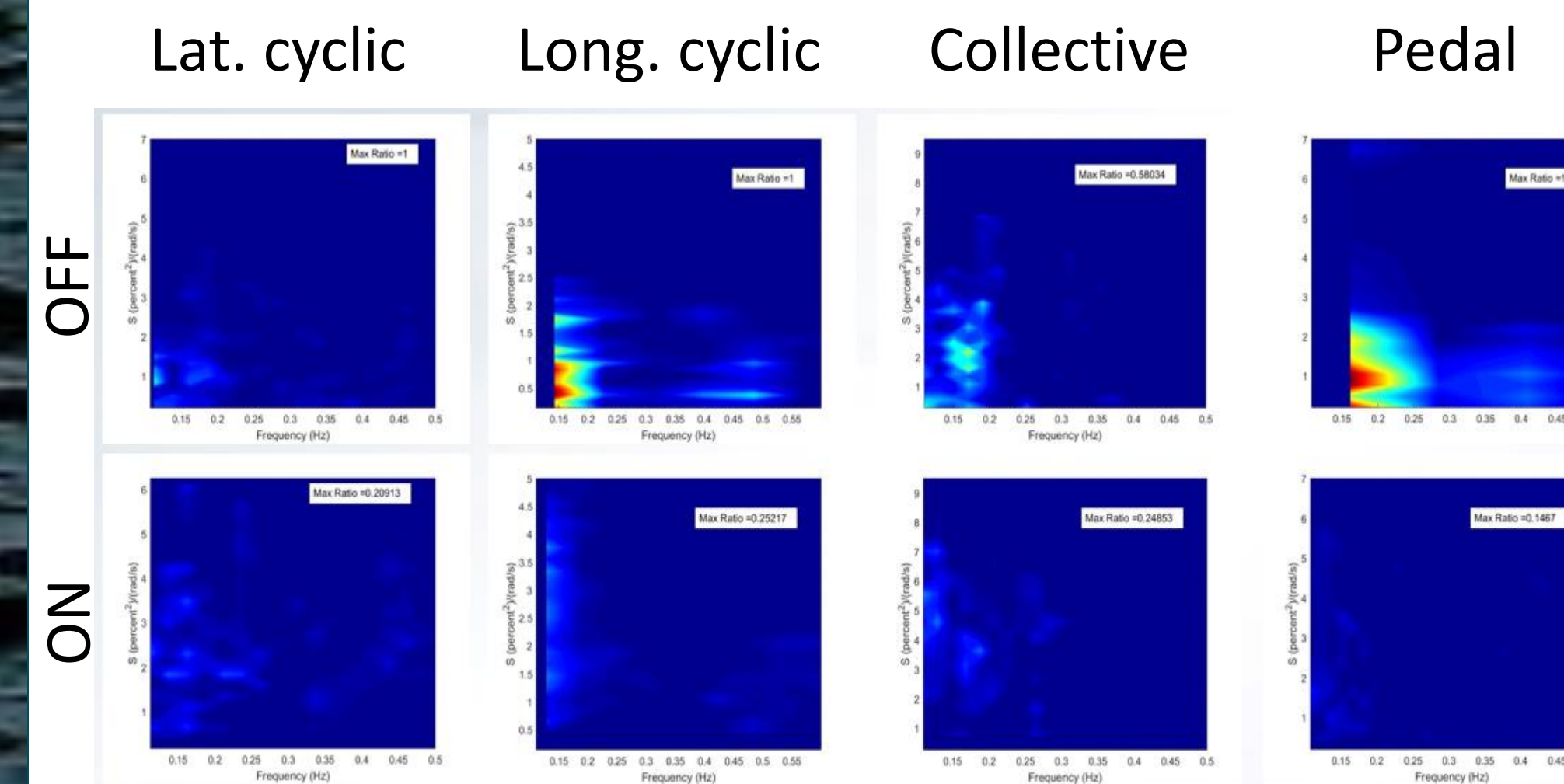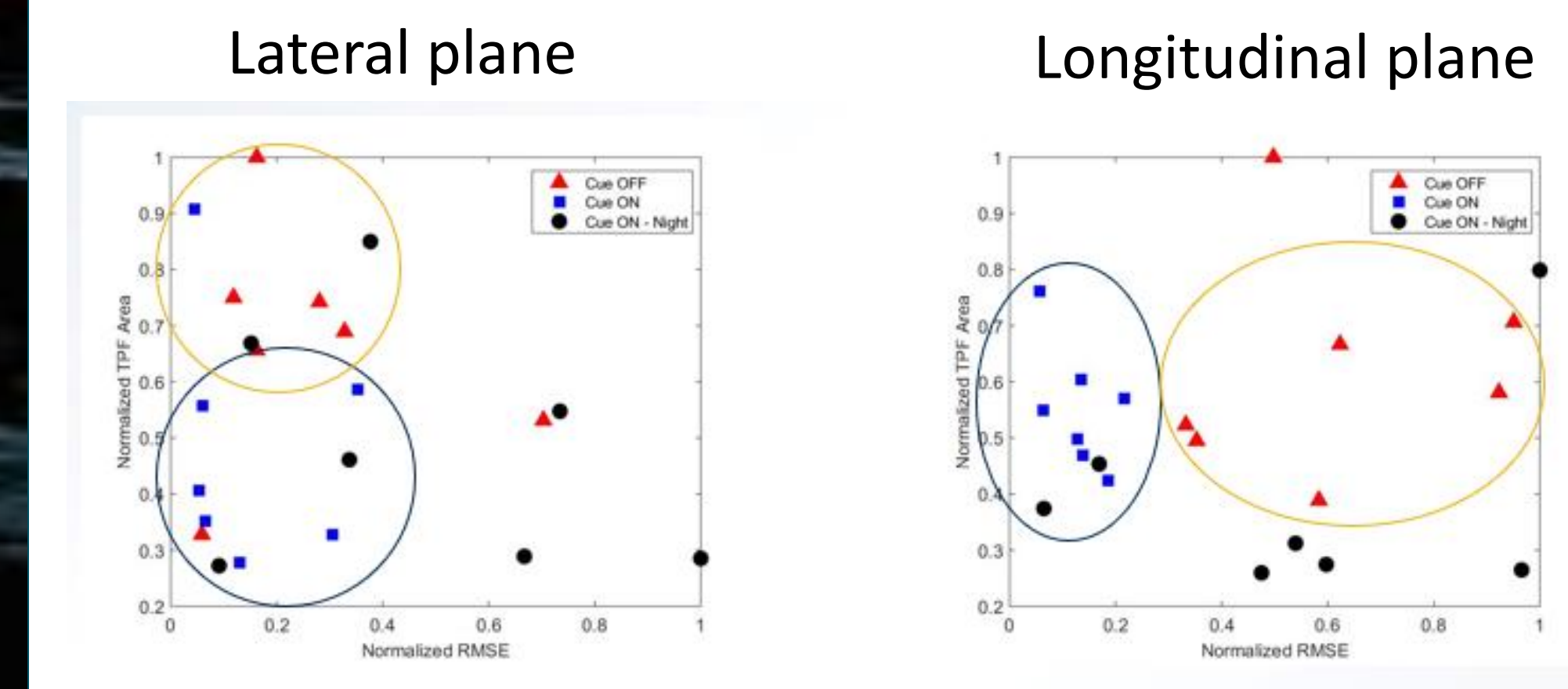**Take a picture** to **download** the **full paper**
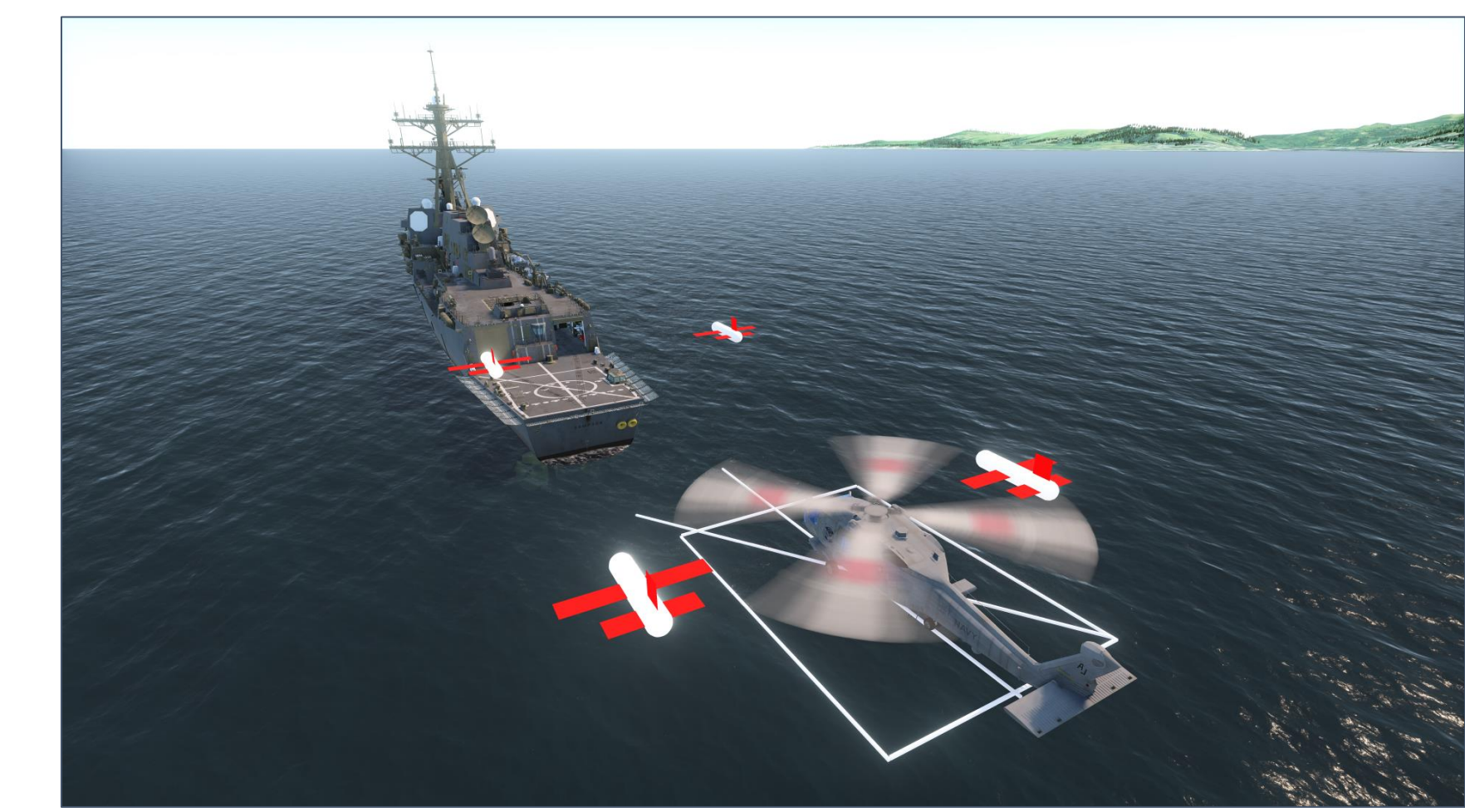
Guidance-Cueing visualization
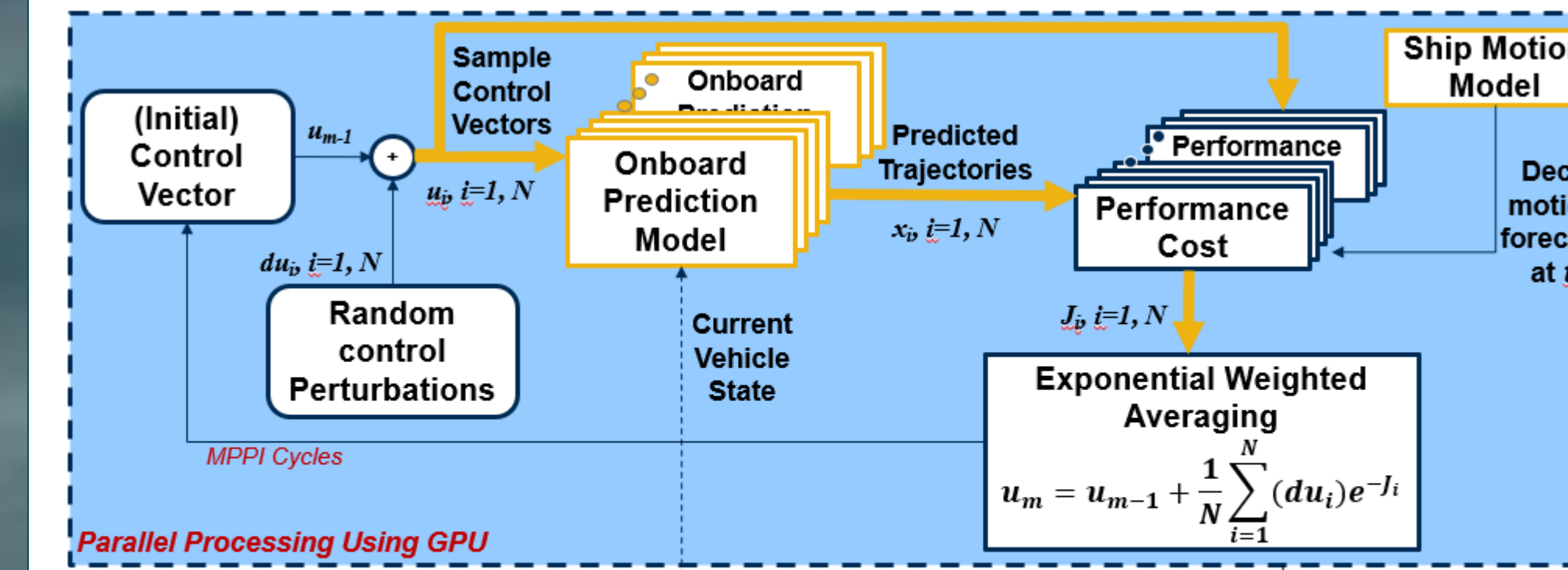
MPPI flowchart
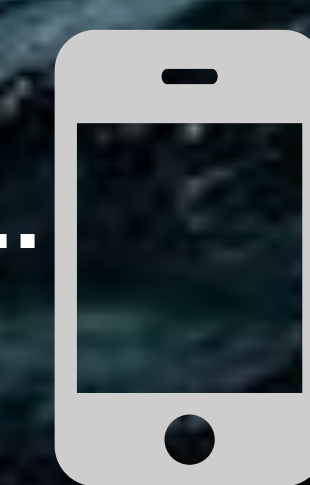

MPPI computation efficiency tests

Impact of guidance-cueing on pilot workload

Pilot workload and path tracking correlation

Georgia Tech **Vertical Lift Research Center of Excellence**
College of Aerospace Engineering