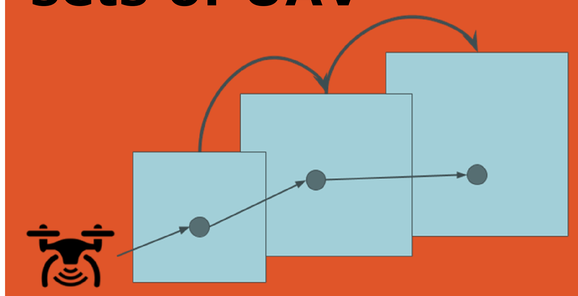
COLLEGE OF ENGINEERING

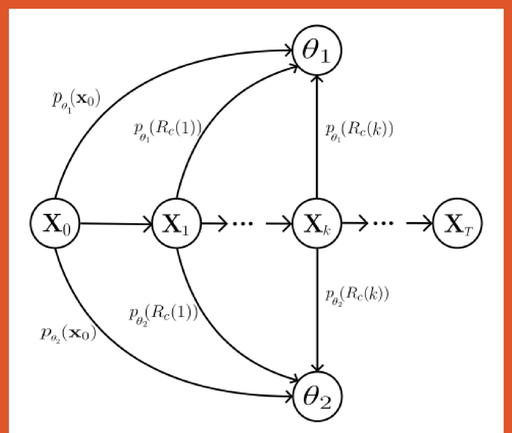
Electrical Engineering and Computer Science

TECHNICAL COMPONENTS:

1. Compute reach sets of UAV



2. Compute risk using Markov models



3. Learn new UAV controller

Oregon State University

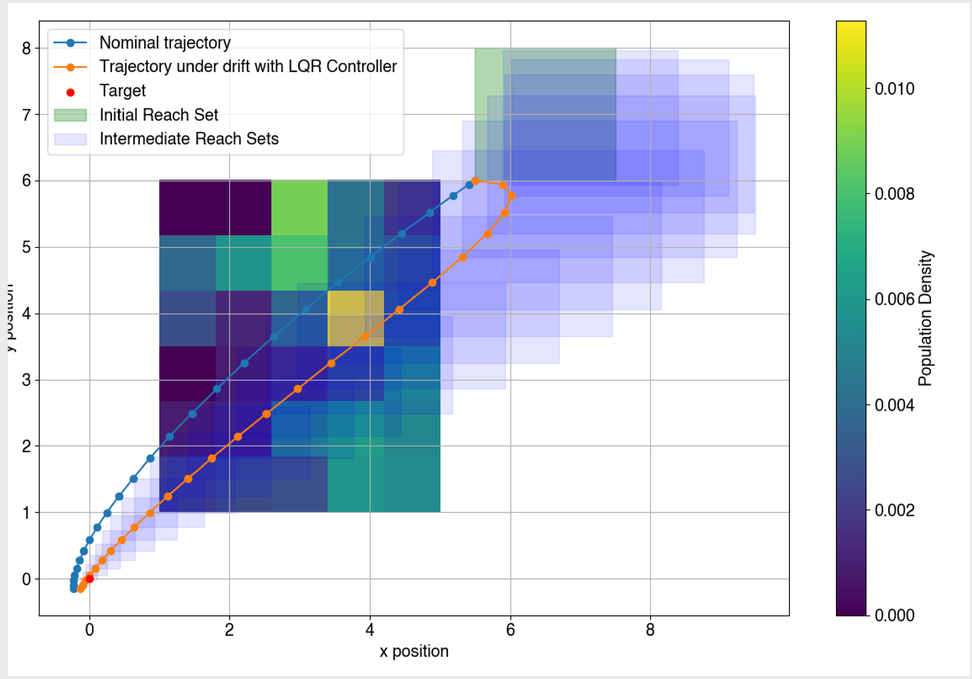
PRREACH SAFETY IN THE NAS

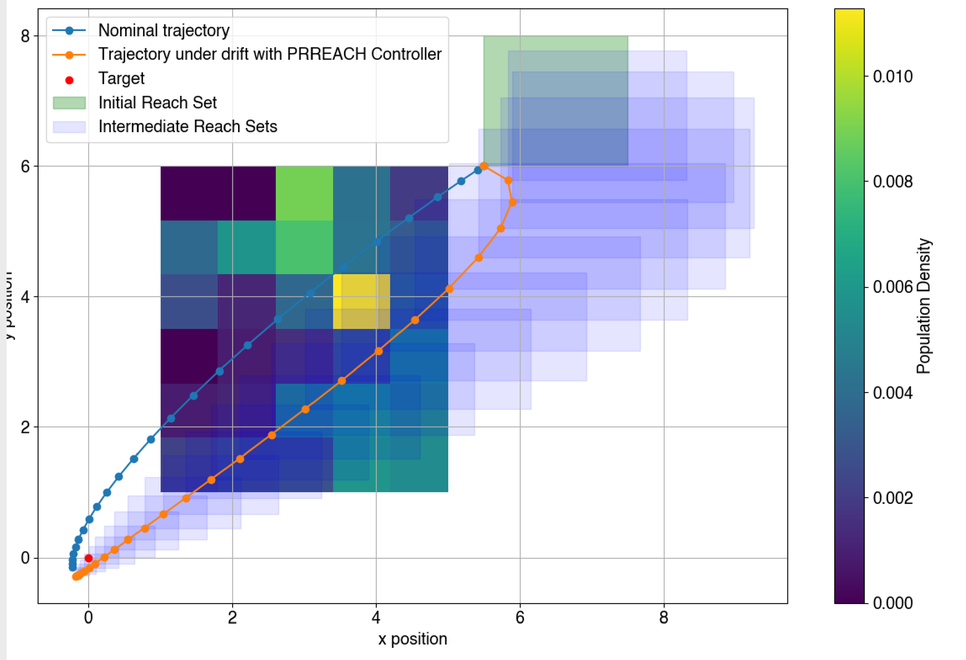
Probabilistic **R**isk Assessment (PRA) with **Reach**ability for Unmanned Aerial Vehicles (UAV)

RISK OF A HAZARD OUTCOME GIVEN A HAZARD CAUSE

Reach sets of a UAV under dynamics associated with a hazard cause (e.g. sensor error causing drift) allow us to relate the UAV's feasible trajectory with a hazard outcome (e.g. collision with a person).

RIGHT: The reach sets show how all feasible trajectories under wind disturbance overlap with highly populated areas.





MITIGATING RISK THROUGH CONTROL OPTIMIZATION

PRReach uses a formalization of risk given reach sets to optimize for a new UAV controller that produces risk-bounded trajectories.

LEFT: The reach sets and sample trajectory of a PRReach-optimized controller that avoids highly populated areas but is still able to reach the target.

POTENTIAL IMPACT TO THE NAS:

- Automation of FAA Part 107 Waiver Requests
- In-flight risk assessments to increase airspace safety
- Practical implementation of risk assessments given readily available UAV dynamics

TEAM:

- Nicole Fronda (PhD, Oregon State University)
- Hariharan Narayanan (PhD, Drexel University)
- Houssam Abbas (Professor, Oregon State University)
- Steven Weber (Professor, Drexel University)

Drexel UNIVERSITY