Proposal draft for experimental plan - Version 0.2

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Scientific goal

- The null hypothesis will probably be testing a method derived from slide 9 (**Probable solutions**) to improve the (at least one of the) **self-awareness** challenges mentioned in Slide 3 (**Challenges**).

Technical goal

- Collective areal manipulation (load transportation) in tight corridors

Challenges

Based on an autonomous self-aware paradigm

- Motion (Path) planning (Generative Model generation)
- Trajectory tracking which involves
    - State estimation techniques
- Collision avoidance which involves
    - Major abnormal detection (A new model is needed)
    - Descriminative Flight model selection
- Disturbance rejection (dealing with minor abnormalities)
    - Minor abnormally detection (Current Trajectory needs to be modified)
    - Decision making and control
- ...

There are existing solutions for all aforementioned problems in individual drones and drone swarms but not necessarily in cooperative areal payload transportation.

Scenarios - Reference

Rigid load transportation from one location to another by tracking a straight line at a fixed height
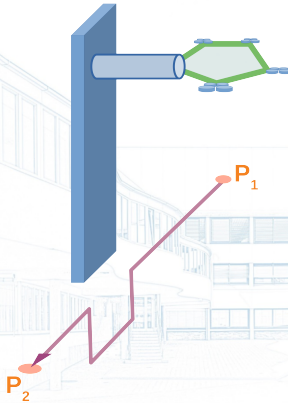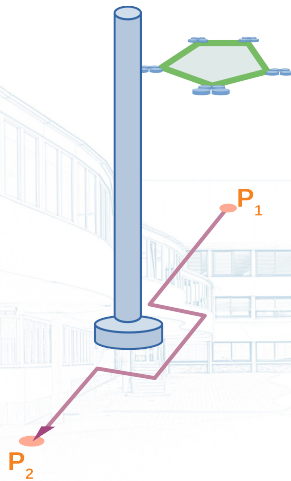

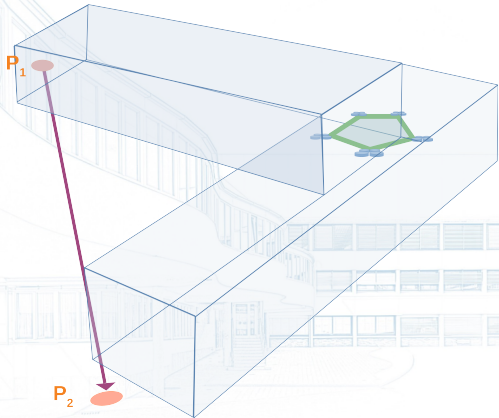**Reference task**: Straight line trajectory tracking

P_1

P_2

Scenarios - Horizontal collision avoidance
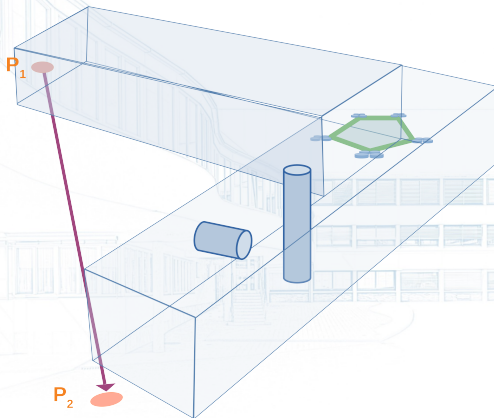
Scenarios - Vertical collision avoidance

Scenarios – Turning

Scenarios - Altogether scenario

Together, all the following three scenarios must make payload transportation possible in tight corridors

Probable solutions to improve the state of the art

- Swarm intelligence to model emergence of a collective behavior from local, agents behavior
- Local Communication through sharing practicing generative models with neighbors using
  - An individual agent state description language with words made of alphabets of different derivatives of time
  - A collective state description language with words made of alphabets of possible co-occurrence of different generalized state space regions
- Formation control which involve studying architecture such as
  - Static Leader-follower architecture
  - Dynamic Leader Follower architecture
  - Leaderless architecture
- ...