Proposal experimental plan draft - Version 0.1

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Proposal Goal

Scientific

- Investigating whether intelligent agents' semantic-awareness help with emergence of better collective behavior, better means
  - Maintaining higher levels of homeostasis

Technical

- Scalable object transportation

Inspired by

- Swarm intelligence

Goal

- **Primary**: Improvement in existing aerial cooperative load transportation

Semantic-awareness meaning

- A mutual understanding of the meaning of different composition of the alphabet of the language which describes the generalized experienced/currently observed/future predicted (using generative models) (descritized) states. Example of the parts which could be composed together in a moving robot. For example:
  - Position
  - Speed (first derivative of position change)
  - Alteration (second derivative of position)
- Considering the meaning of different parts of this language in the context in which they appear to provide
  - Temporality semantics
  - Similarity semantics

Goal - semantic perspective

Each agent receives sequences of generative models that neighboring agents have, are or will experience(d) and they decide for individual actions which emerges in a collective behavior to solve a problem.

Related study area

- Bayesian self-aware Artificial Intelligence
- Collective adaptive systems
  - Collective object transportation
- Swarm navigation and Self-organizing
- Dynamic system modeling
  - Dynamic Bayesian modeling
- Discretization of continuous features
- Semantics

Methodology

A Bayesian Artificial intelligence approach will be taken which must include

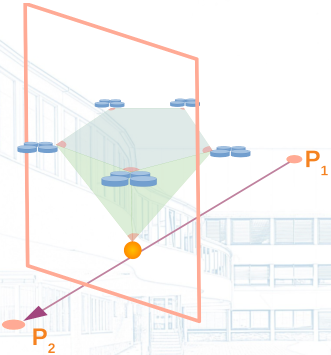
- Individual perception
- Discretization (using clustering methods) of state space and derive the alphabet of two languages
  - Alphabets of words describing interaction between neighboring agents
  - Alphabets of words describing individual dynamism
- Abnormality detection in individual motion

Methodology - 2

- Abnormality detection in interaction
- Generative individual models
- Generative interaction models
- Descriminative models
- Control decision making according abnormality detection

Potential scenarios: Horizontal Frame Scenarios

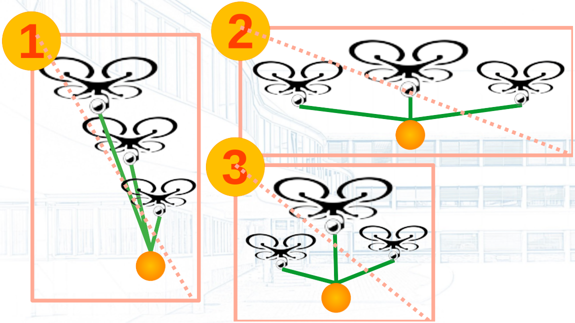
Reference transportation



The importance of such obstacles is that every surface can be divided to small, similar surfaces such that they approach the shape of the surface.

Potential scenarios: Horizontal Frame Scenarios - Frame passage

New Generative DBN models can be learned out of the following scenarios.



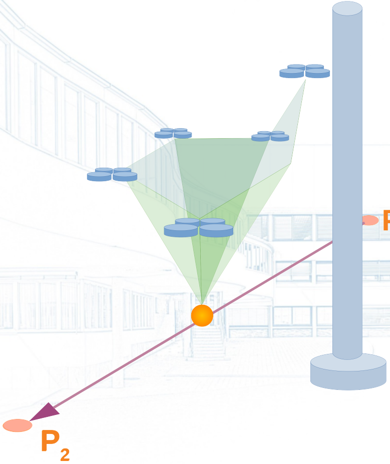
Potential scenarios: Horizontal Frame Scenarios

- **Scenario 1**: Row formation to pass through a vertically narrow frame
- **Scenario 2**: Line formation to pass through a horizontally narrow frame
- **Scenario 3**: Compact formation to pass through a small window

The goal is that through semantic transaction of generative models, such formations are achieved

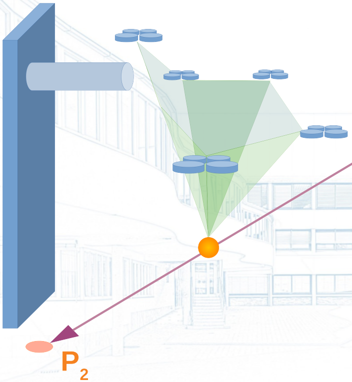
Potential scenarios: Vertical column avoidance

Unlike frames, a collective behavior is **not** necessary in this scenario



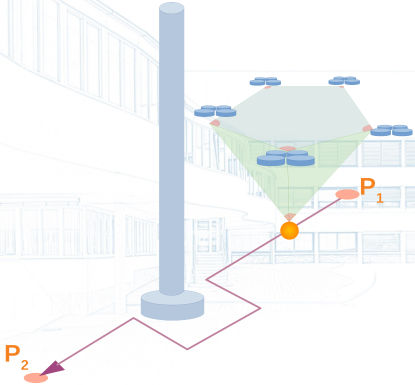
Potential scenarios: Horizontal column avoidance

Unlike frames, a collective behavior is **not** necessary in this scenario



Potential scenarios: Horizontal column avoidance

This scenario can represent a set of scenarios in orientation vector between neighboring agents does not change but a collective shift is required.

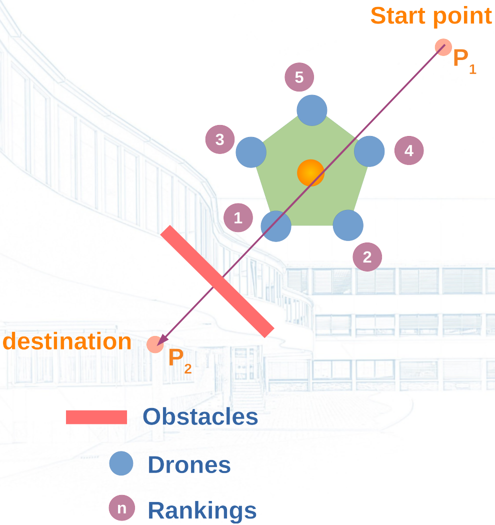


Communication rules

To keep communication decentralized, a ranking strategy according to closeness of agents to destination is needed and the following rules should be observed.

- No agent can transmit the generative models from other agents to the neighboring agent.
- Messages can be made of one generative model and the senders rank or more than one (for distributional semantics)
- Messages can only be transmitted to neighboring ranked nodes when the generative model an agent is practicing changes.

Communication rules - Ranking



Requirements

- At least three drones so that neighboring communication is meaningful, although the results could be evaluated a lot better using more drones
- Minimum two different sensors to establish a relationship between heterogeneous sensors. The best of such sensors for depth and obstacle selection in low speed are active sensors:
  - Lidar
  - Sonar