

# Progress and Plans

Mohammad Rahmani

Decide Doctoral School

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# Literature review on existing approaches in SA and CA

Resulted in narrowing the research domain to

- adopting a definition of SA and CA which is based on modeling detected anomaly in dynamic systems as a predictive model
- training predictive DBN models from detected anomalies
- methods for storing the models
- methods for retrieving the models
- combining the two previous steps using continual learning techniques

# Literature review on discretized generalized state space models

Resulted in determining two abstract communication methods to

- 1 describe generalized IA motions
- 2 describe the expected relationship over the course of time which should be maintained between a collection of IAs

# Literature review on collective aerial transportation

Resulted in determining two set of scenarios which

- define CA as modeling the detected anomaly in a previously agreed consensus between the agents
- avoid IAs dispersion around obstacles
- taking a dynamic leader-follower approach (similar to biological agents when transporting payloads)

# Scenarios - 1

**Overview:** A collection of IAs that carry an imaginary payload with some degree of freedom from a starting point to a destination (attractive force) while some repulsive forces obstruct them in two forms

- Carry a payload between them
- Carry a payload which is suspended from a cable

Repulsive forces to overcome

- Vertical column
- Horizontal obstacles
- Changes in the corridor width and height (suspended form only)
- Turning points

## Scenarios - 2

### Determining the logic of the scenarios

- Each agent tries to individually avoid repulsive forces
- Each agent describes the changes in its discreet motion space when trying to avoid repulsive forces to neighboring agents using the first communication's semantic segments
- such locally transmitted messages will be either mapped to a collective behavior described by a sequence of semantic segments of the second communication method or is detected as an anomaly in the collective behavior from which a new DBN model should be generated

## Probable questions the scenarios should answer?

- Does locally conversed motion changes detect anomalies better than state-of-the-art? Better means:
  - earlier anomaly detection from existing collective behavior models
  - generating larger anomaly signals to better differentiate them against disturbances such as sensor noises
- Does modeling CA in the form of second abstraction language improves state-of-the-art in homeostasis in swarms?
- Can a coupled encoder-decoder architecture improve state-of-the-art in improving catastrophic forgetting in ANNs?



# Prague MRS summer school



Resulted in

- Presenting the aforementioned scenarios
- Using their Multi-UAV framework for simulating the scenarios

# Simulation Environment

- Simulink
- Matlab
- ROS + Airsim

MRS enabled frameworks

- RotorS
- Hector Quadrotors
- ...

**ROS + GAZEBO** applied in a framework developed by CTU-MRS

# Questions

## ■ Questions?