ALPEN-ADRIA UNIVERSITÄT KLAGENFURT

Progress and Plans

Mohammad Rahmani

Decide Doctoral School

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Table of contents

- Literature review on existing approaches in individual SA and CA
- Literature review on discretized generalized state space models
- Literature review on collective aerial transportation
- Literature review on formation control and consensus seeking
- Determining experimental scenarios
- Outlining probable questions to which this research must answer
- Attending Prague summer school
- Determining simulation environment

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 the 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

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 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 approach 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 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?