Machine Learning and Compressed Sensing for Wireless Controlled Multi Agent Systems

Bachelor/Master Thesis/Project

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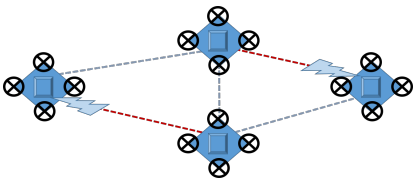
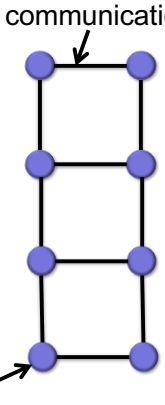
Motivation

Applications for Multi-Agent Systems

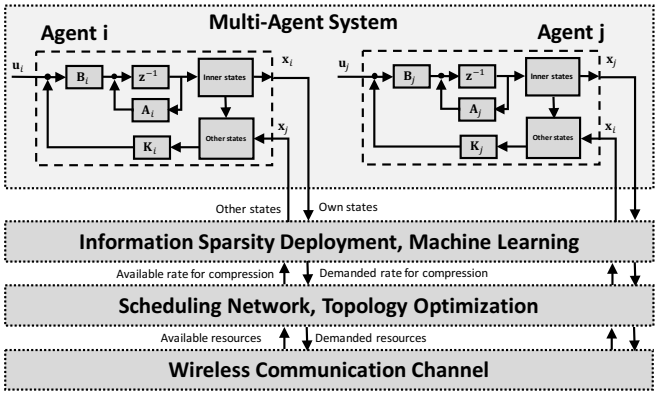
- Formation flight of drones



- Distributed robots and machines
- Autonomous cars
- Industry 4.0



Scenario



Multi Agent System

Model for simple Single-State Consensus

- Every agent updates its state $x_i(k)$ according to:

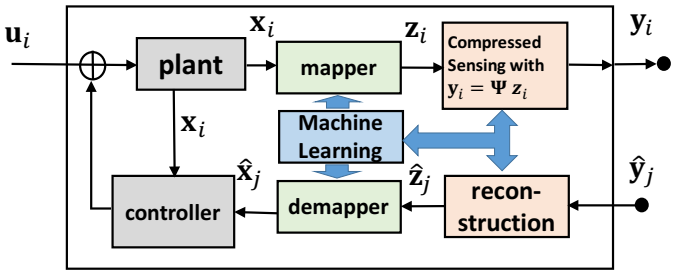
$$x_i(k+1) = x_i(k) + \varepsilon \cdot u_i(k)$$

- by using the information $x_j(k)$ of its neighbors

$$u_i(k) = \sum_{j \neq i} a_{ij}(x_i(k) - x_j(k)) .$$

Graph Problem

System Model for Multi-State Consensus



- Every agent has multiple states $\mathbf{x}_i(k)$.
- We need a sparse representation of the states for the transmission over rate-limited channels.
- Research Question: Can we learn this mapping?

Tasks

Development of Matlab Simulations

Task 1: Implementation of a simulation environment for multi-state consensus.

Task 2: Investigation on compressed sensing methods for sparse communication.

Task 3: Investigation on simple machine learning or estimation methods to find a sparse representation of the states based on prior measurements.

Requirements

Students

- Computer engineering, electrical engineering, control technique, or wireless communication

International Team

- Istanbul Technical University
- RWTH Aachen University
- University of Applied Sciences Trier

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