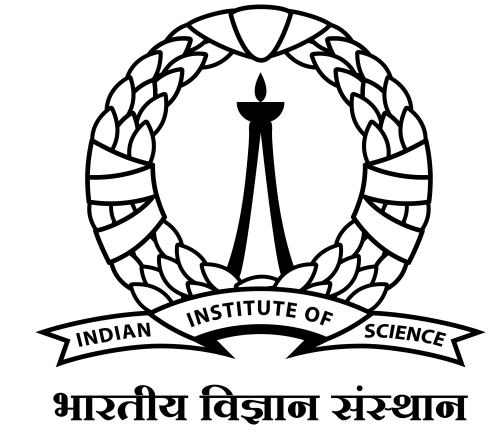


Control and Network Systems Group, IISc

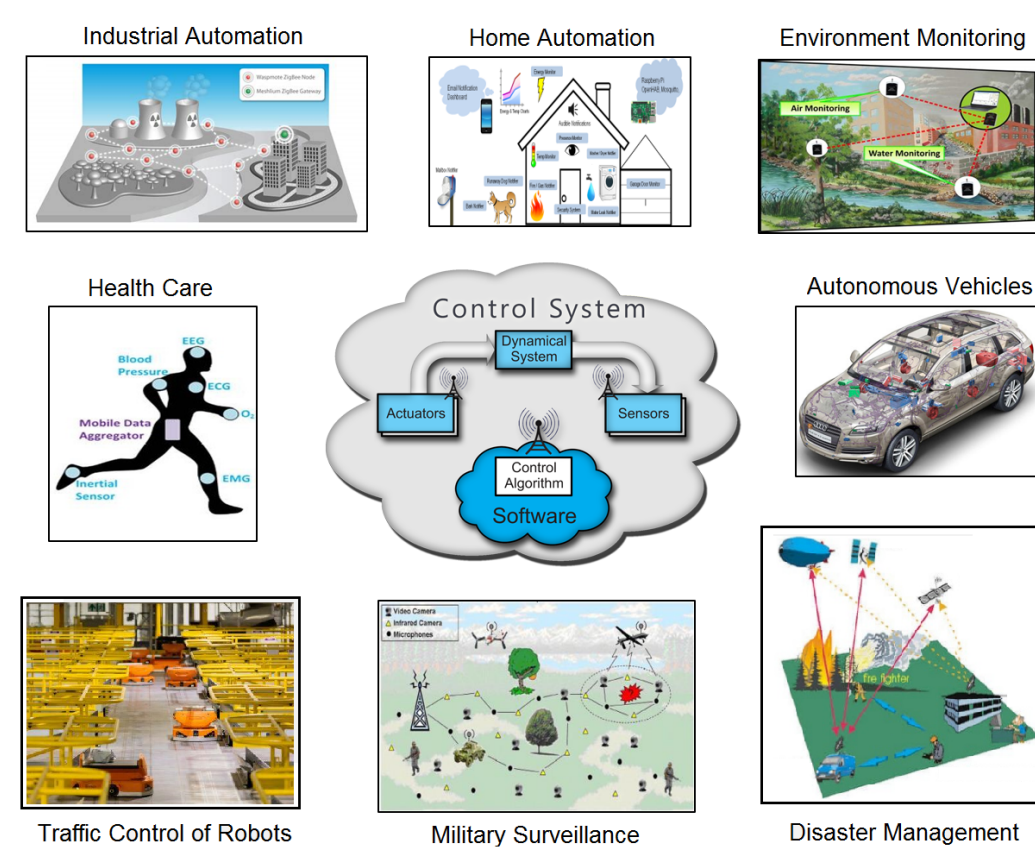
Pavankumar Tallapragada, Anusree Rajan, Aravind S, Harini V, Nishchal Hoysal G, Prashil Wankhede Rajesh



CNS Group

Our group deals with modeling and control of agents connected over a network.

Control over Networks



Challenges

- Resource constraints
- Sampling and quantization
- Time delays and packet drops
- Scheduling multiple processes
- Asynchronous communication
- Desynchronized clocks
- Latency
- Data Fidelity
- Data Corruption
- Network overheads

Event/Self-Triggered Control

- Efficient utilization of resources
- Control updates based on need

Reinforcement Learning Aided Efficient and Distributed Planning for Multi-Agent Systems

Challenges

- Need for coordination
- Real-time and distributed implementation
- Failure robustness
- Safety constraint satisfaction
- Inherent randomness
- Communication constraints/delays
- Computation scalability

Our Approach

Fusion of model-based optimization and model-free reinforcement learning

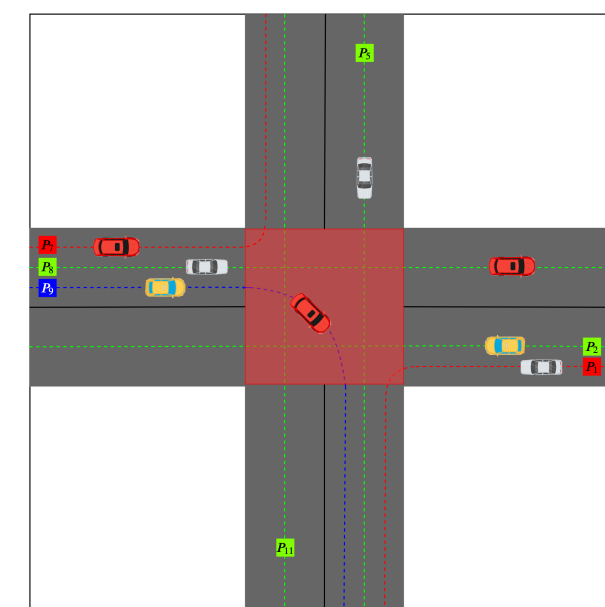


Figure 1: Autonomous navigation



Figure 2: Warehouses

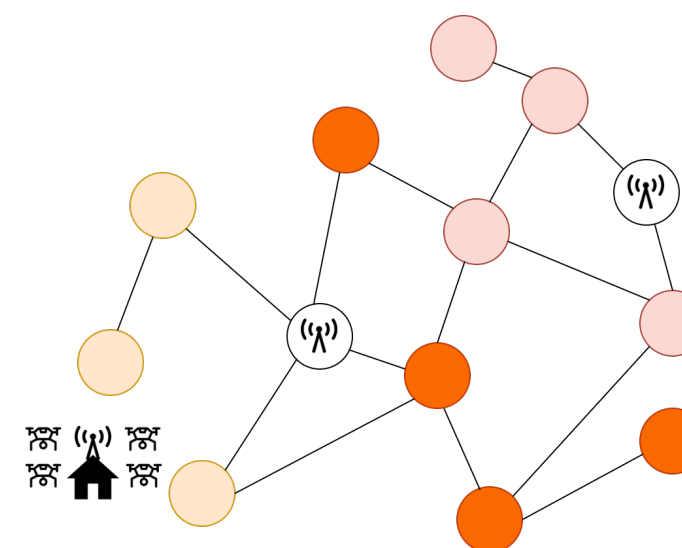


Figure 3: Multi-agent surveillance



Figure 4: Fleet management

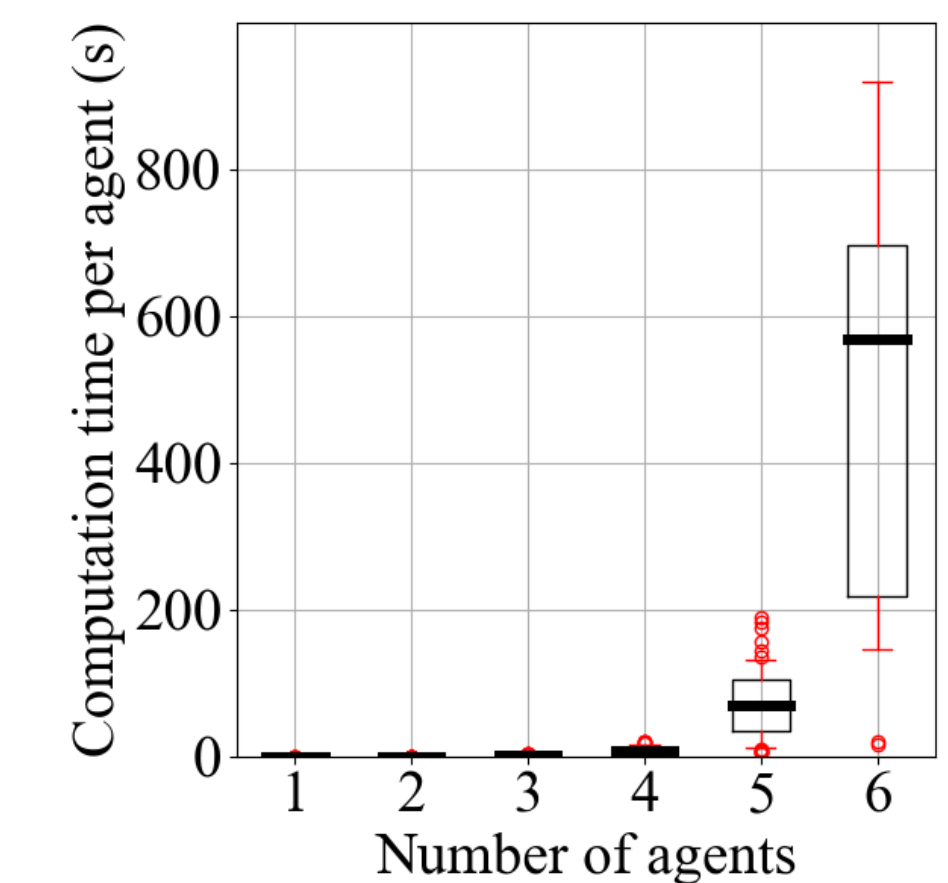


Figure 5: Computation time explosion

Social Networks and Opinion Modelling

- Modelling of opinions in a social network.
- Modelling of social ties and relationships among the agents using a graph.
- Models convert qualitative descriptions of social phenomena into quantitative ones.
- Different equilibrium opinion behaviours such as consensus, clustering, polarization etc.
- Evolution of social power of the agents.



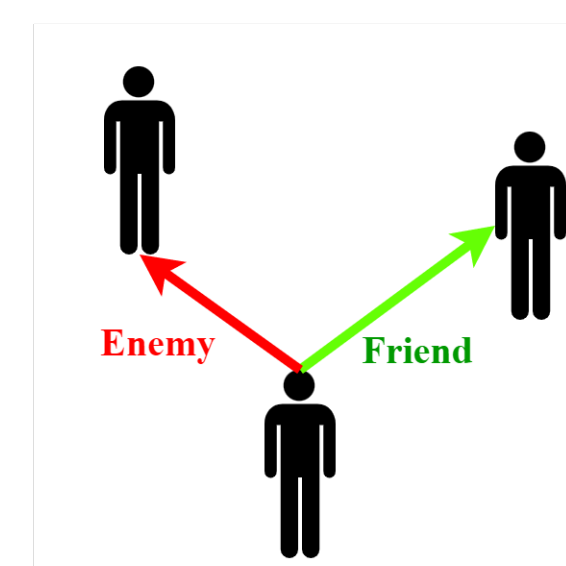
Figure 6: Social Network



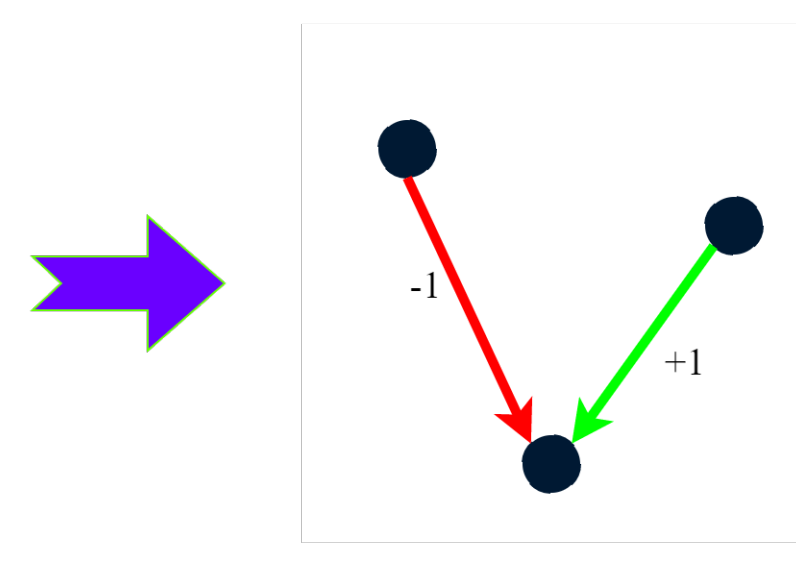
Figure 7: Consensus



Figure 9: Clustering



a) Social Connections



b) A directed signed graph

Figure 8: Modelling social ties using a graph

Discussion on a bill proposal

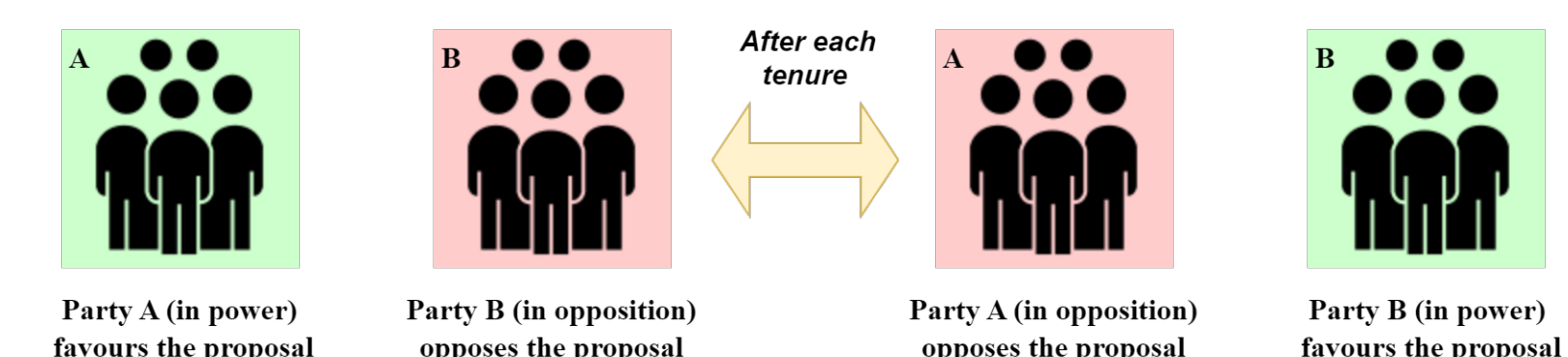


Figure 10: Periodic Behaviour of opinions