Autonomous And Adaptive System (AAS) Lab

LI-HSING YEN

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“Autonomous” System

- programmable agent that makes its own decision (choice/strategy/action) without any instruction from outside
  - *robot, unmanned vehicle, unmanned* aerial vehicle (UAV), automated trading system
- We consider a fleet of such agents, possibly connected by wireless links. Each has its own interest which may be conflicting with other’s but should work together with other agents for a system goal.

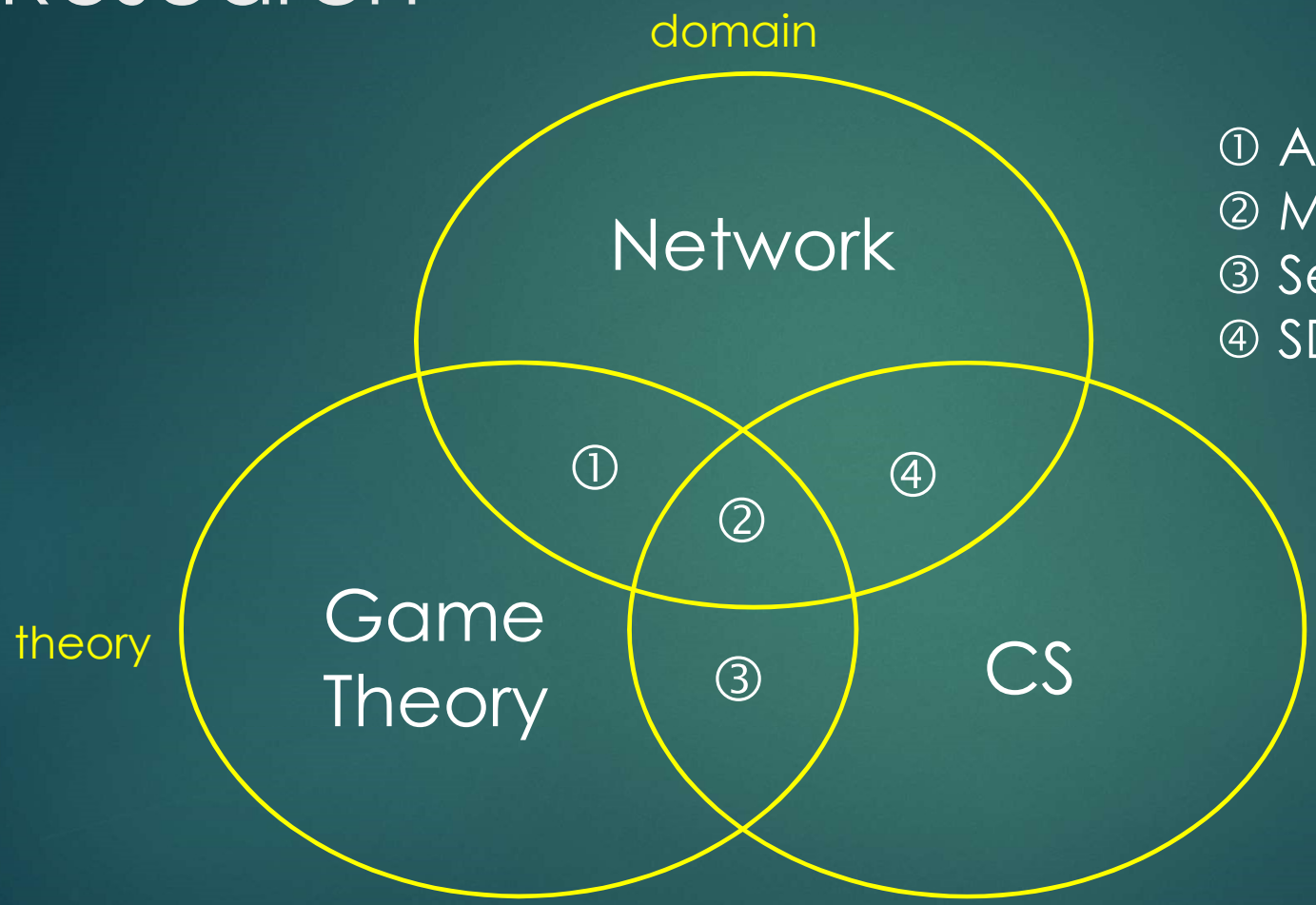
“Adaptive” System

- External conditions (environment) may change over time
- Agents dynamically adapt to environment by locally responding to these changes (without waiting for external instructions)
- Quick response, but may not be globally optimal
- The way to react is the key point

What Are The Issues?

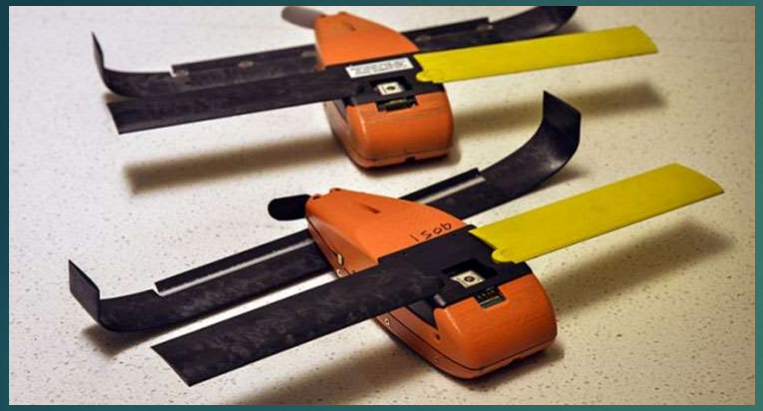
- There is no central control entity (self-organization)
- Agent's interests may be conflicting, and it may not be an agent's obligation to cooperate with other agents
- The interactions among agents and the reactions to changing environment may cause instability or poor performance to the whole system
- Call for a decentralized mechanism design that fairly and efficiently distributes shared resource and/or load among agents

Research



① AP, Channel Selection
② MEC, SFC
③ Self-Stabilizing Algorithm
④ SDN, Cloud, FL

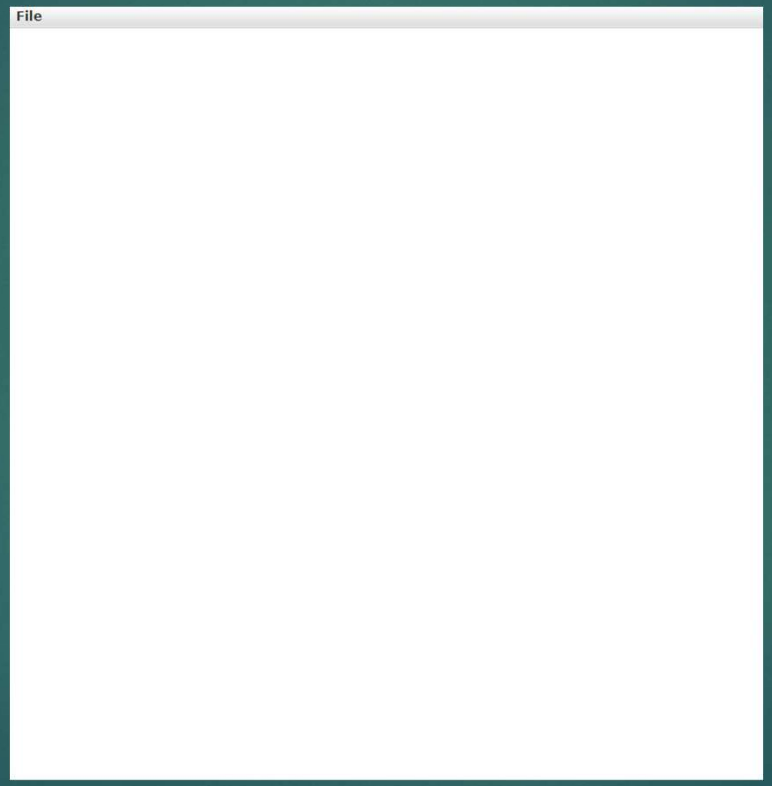
Application Examples



Ongoing Researches

- Autonomous deployment of UAVs as access points to serve wireless terminals (done)
- Embedding of service function chain (SFC) and network slice (NS) into multi-access edge computing (MEC) systems
- Incentive mechanism for federated learning (FL)
- Multi-agent reinforcement learning (MARL) for finding solutions to the above-mentioned optimization problems

Autonomous UAV deployment (demo)



360 terminals
20 UAVs (black)

Federated Learning (FL)