2021 NSF CYBER-PHYSICAL SYSTEMS PRINCIPAL INVESTIGATORS' MEETING

CPS: Small: Collaborative Research: Incentivizing Desirable User Behavior in a Class of CPS (1739295)

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Challenge:

- Overall challenge is to design incentives to induce desirable behavior by participants in CPS
- This year's focus was on understanding the rent possible due to information assymetry and collusion in a setting where agents interact repeatedly

Solution:

- Modeled the problem as one of moral hazard, adverse selection, and collusion possible with repeated interactions between a principal and agents
- Showed that there is a key difference between the interactions happening finitely or infinitely many times.
- Rent possible in the former case, but principal can learn from data to update contract in latter case to prevent rent

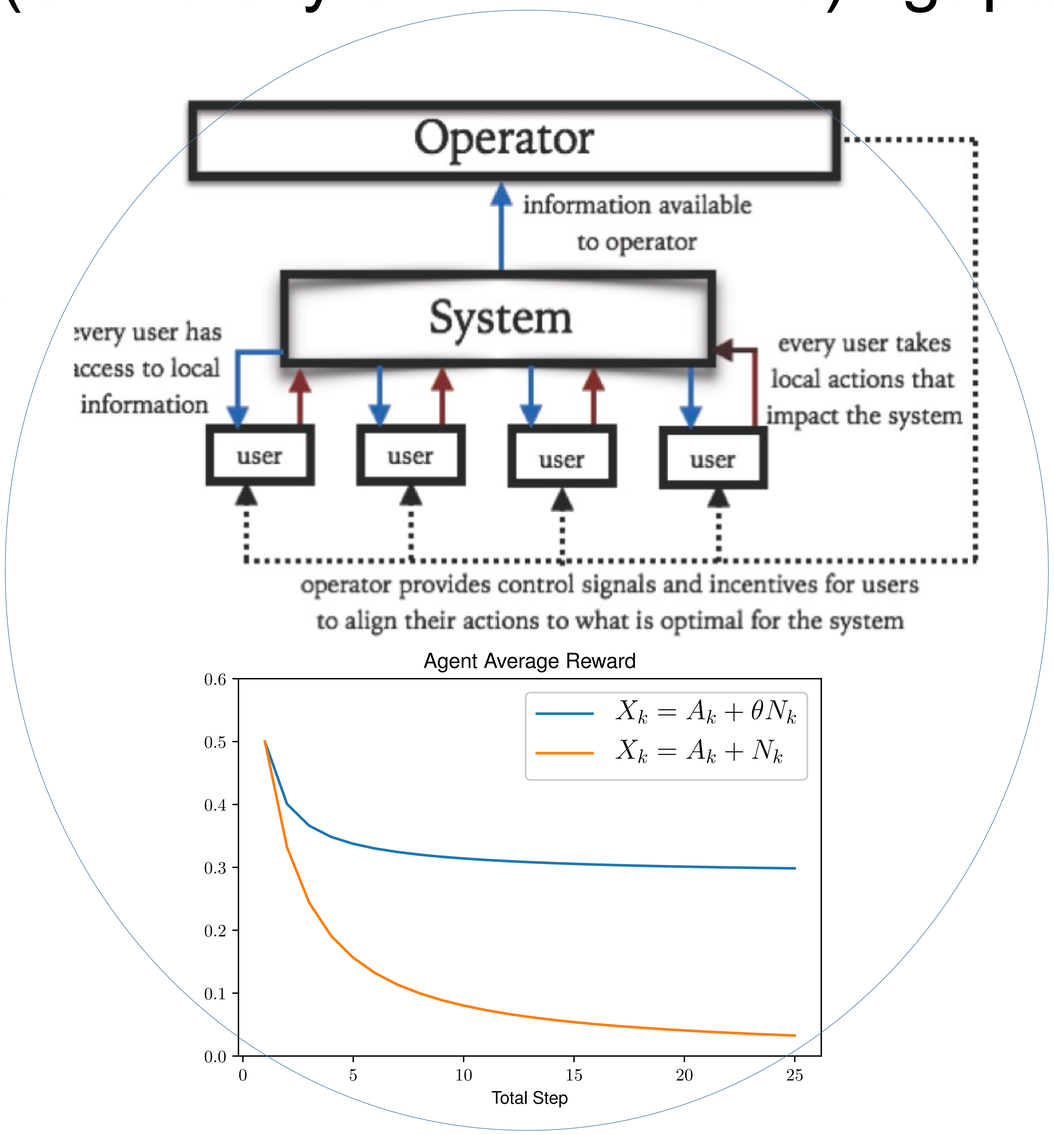

Fig. 1. Rent extracted vs Horizon

Scientific Impact:

- Many problems such as crowdsensing, demand response, CPS security etc feature information assymetry between strategic agents and an operator
- The main result shows how data driven contract design can prevent collusion and rent seeking behavior for efficient operation of such CPS.

Broader Impact:

- Reducing rent seeking behavior will leads to efficient operation of CPS with active user participation in multiple domains
- New undergraduate level class on Game Theory for Electrical Engineering developed and taught; high reviews from students has led to possibiity of adaptation for the entire college of engineering.