Motivation

To perform a task that requires the interactions of a set of agents, a protocol is set up. The protocol determines the expected behavior and communication patterns available to each agent.

If an agent is self-interested, she may deviate from the protocol to improve her utility.

How to guarantee that a set of agents without a common legal framework will operate smoothly?

In presence of self-interested agents, a protocol is not enough. We need a self-enforcing protocol.

Self-enforcing Protocols

Let G be an underlying game and P a protocol that receive inputs from the agents and whose outcome is a strategy of the game. The protocol P is self-enforcing if its outcome is always an equilibrium of the underlying game that gives a positive utility to every agent.

• Because the outcome of P is an equilibrium, no agent is willing to deviate from the proposed strategy.
• Because each agent receives positive utility, they are all incentivized to participate in the protocol.

Coordination Protocol

If we know the preferences of the agents, we can compute an equilibrium of the game.

A coordination protocol is a self-enforcing protocol that receives as inputs the preferences of the agents.

E.g. the Vickrey auction (or second-price auction)

PROBLEM: Agents may lie about her preferences if that improves the utility of the outcome (the game G is extended to include the agent preferences as actions).

Coming up with a coordination protocol may be difficult or even unfeasible (related to mechanism design).

Co-utility

A task is performed in a co-utile manner if it is in the best interest for each agent to help the other agents in completing it.

Because, each agent acts in her best interest, no coordination between agents is required (agents’ preferences need not be reported to the protocol).

A game is co-utility-amenable if the utility of an agent does not depend on the preferences of other agents.

The design of the co-utile protocol may require modifications in the original scenario (see the example below).

References