Proposition de recherche doctorale

Fair Division with Partial and Dynamic Observability

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Résumé du projet de recherche (Langue 1)

Fair division is a fundamental problem in computer science and economics. Several notions of fairness can be considered: proportionality, envy-freeness (and the many variants of it), or social welfare measures with an egalitarian flavour. Recently, this problem has been considered in the context of (1) partial observability, and (2) dynamic observability.

(1) Partial observability means that agents are not necessarily fully aware of the entire allocation resources. For instance, if agents are located on a network and if they can only see their neighbours, how should these notions be adapted? Several propositions have been made to account for these situations [1,4,5], eg. possible and necessary envy, or Bayesian envy. Interestingly, for some notions (typically, envy), the amount of information available to an agent makes it easier to enjoy a fair state.

(2) Dynamic observability means that agents can observe (partial) allocations at different timesteps. Since an agent has no way of knowing how the allocation evolves besides her own observations, her view may not only be incomplete, but also incorrect. In this setting, we defined the evidence-based envy [4] which is based on the observation of the agent only.

The purpose of this PhD is to study these questions in a distributed resource allocation setting, ie. agents perform local deal to improve upon an initial allocation [6].

Among the several issues that could be investigated, we can cite:
- Design new measures of fairness in the context of (possibly dynamic) networks: for instance, we may consider the distance in the network as a useful indicator as to how envious an agent can be of another one.
- Allow agents to infer new knowledge from their observations. From the location of observed resources, an agent can indeed infer (even uncertain) knowledge on the location of unobserved resources. Some knowledge on the preferences of the other agents could also be deduced from the success or the failure of the exchanges. This additional knowledge could then be exploited to refine the notions of envy and the decisions of the agents with partial and dynamic observability.

Résumé du projet de recherche (Langue 2)

Allow agents to plan ahead the exchanges. (So far, myopic agents have been considered ie. agents performing rational deals that immediately improve their utility). Nonetheless, the agents could accept non-rational deals to make better deals in the future. The agents could thus plan ahead the possible exchanges while taking into account the uncertainty on resource locations and on the preferences of the agents.

- Study settings beyond the additive case for agents' preferences, allowing to take into account some (even restricted) degree of synergy between resources (eg. k-additivity)

Informations complémentaires (Langue 1)
References


