Environment Design in Human Computation

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The Problem

- How do we design the **environments** in human computation systems?
- Can we utilize the **collective information** obtained from multiple users to improve the design?

Agent Type Elicitation

Assumption:

- Agents fall into a relatively small set of types

Main Idea:

If agent types are known, we can use the actions from agents of the same agent type to speed up environment design. The convergence speed is $O(m/k)$ times faster than the single-agent case.

Algorithm:

1. Pick a subset *E* from all environments **E**.
2. For each agent, present him/her every environment in *E* and observe his/her behaviors.
3. Classify the agents.

Definition p-separable agent types

Two agents of different types are *p-separable*, if the probability that they choose actions with the same utility values is less then *p* in the environment set *E*.

Lemma 1

If the agent types are p-separable over the environment set E with |E|= r, the probability of eliciting the wrong agent type after observing r environments is less than $(k-1)p^r$.

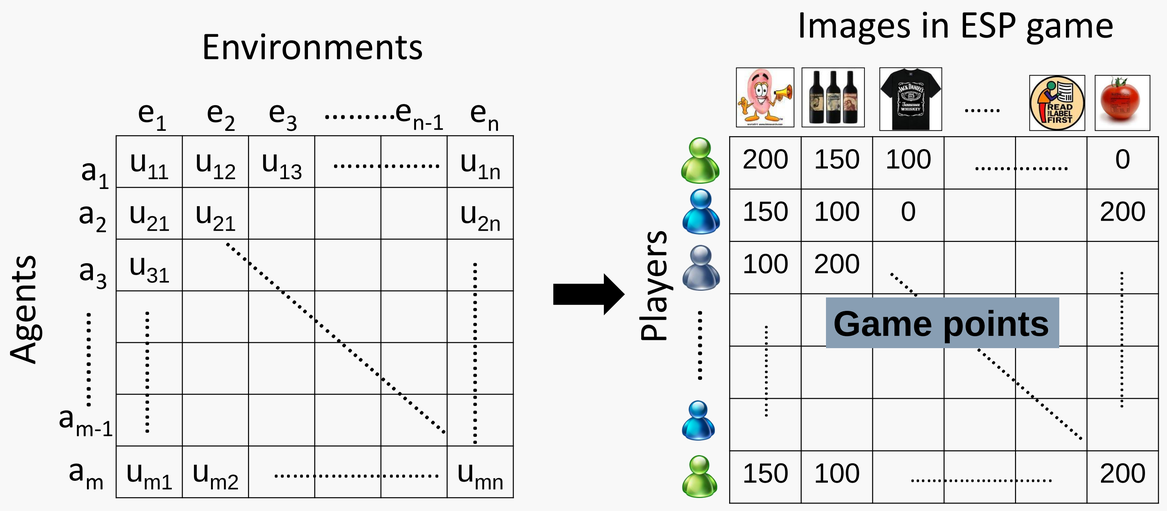
Collaborative Filtering

Assumption:

- There is no explicit agent type.
- Like-minded agents take similar actions.

Main Idea:

By recording the utility values of agent actions, we can construct a **decision matrix** and apply any collaborative filtering algorithm to make recommendations of environments to agents.



Decision matrix of agents