Strategy-Proofness of the Probabilistic Serial Rule on Sequentially Dichotomous Domains *

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Abstract

We address the problem of randomly allocating n indivisible objects to n agents. A preference elicitation procedure is proposed. The planner divides arbitrarily the object set into two subsets and asks each agent which one they want. Every object in the chosen subset is supposed to be better than every object in the other subset. Then the planner picks a subset arbitrarily, divides it further into two smaller subsets, and asks each agent which one they want. Still, every object in the chosen subset is supposed to be better than every object in the other. The planner repeats such dichotomous divisions and preference elicitations until no subset can be further divided.

Given an arbitrarily specified sequence of dichotomous divisions, the collection of all preferences that can be elicited from this procedure is called a sequentially dichotomous domain. We show that the probabilistic serial rule (Bogomolnaia and Moulin (2001)) is sd-strategy-proof on such a domain. In addition, every sequentially dichotomous domain is maximal for the PS rule to be sd-strategy-proof.

We then investigate the preference elicitation in reality and noticed that when objects are treated as combinations of various characteristics, houses and working tasks for example, agents tend to (sometimes are required to) formulate preferences lexicographically according to a deliberately specified ranking of a chosen subset of characteristics. We show, utilizing our theoretical result, that when the problem size n satisfies two technical assumptions, the object set should be described as a binary tree and the probabilistic serial rule should be used to allocate them.

Keywords: Random assignment; probabilistic serial rule; sd-strategy-proofness; sd-efficiency; sd-envy-freeness; equal treatment of equals; sequentially dichotomous domain;

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References

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