

# Finding an envy-free room assignment with linear programming

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## **Abstract**

Our task is to assign  $n$  agents to  $n$  rooms and find the rent of each room in such a way that no agent can achieve more utility by moving to a different room. It is well-known that this problem can always be solved and linear programming duality is the key to it. We consider a more general setting. We have double rooms (or more generally, rooms with different capacities) and certain constraints determine which agents can share a room. The goal is to find a feasible envy-free room assignment such that agents in the same room have to pay the same. It turns out that the problem is NP-hard in general, but for certain interesting special cases we suggest efficient algorithms that find a solution if it exists.