

# Fair division of a graph \*

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We consider fair allocation of indivisible items under an additional constraint: there is an undirected graph describing the relationship between the items, and each agent's share must form a connected subgraph of this graph. We focus on agents that have additive utilities for the items, and consider several common fair division solution concepts, such as proportionality, envy-freeness and maximin share guarantee. While finding good allocations according to these solution concepts is computationally hard in general, we design efficient algorithms for special cases where the underlying graph has simple structure, and/or the number of agents-or, less restrictively, the number of agent types-is small. In particular, we prove that for acyclic graphs a maximin share allocation always exists and can be found efficiently. In the second part of the talk we deal with the situation when the items are undesirable.

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