

Online Fair Division with Unequal Entitlements

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Poster Abstract

In previous work¹, we formalized a model for *online fair division* designed to capture features of a real-world allocation problem in which food items are allocated to charities, or agents. The items in this model arrive one by one and the agents simply declare whether they like them or not. We considered two simple allocation mechanisms, namely LIKE and BALANCED LIKE, for this model and analyzed axiomatic properties of these mechanisms such as strategy-proofness and envy-freeness.

This simple model ignores the different abilities of the agents to feed people. The agents in practice have indeed *unequal entitlements* to the items. In this work, we propose two new mechanisms, namely ENTITLEMENT and BALANCED ENTITLEMENT, that allocate the items according to the entitlements of the agents. In the special case of equal entitlements, ENTITLEMENT degenerates to LIKE and BALANCED ENTITLEMENT degenerates to BALANCED LIKE. We investigate the influence this generalization has on their strategy-proofness and envy-freeness, and we further study their efficiency, monotonicity, anonymity and neutrality. Additionally, we perform a worst-case competitive analysis on the social welfare and compute their envy-freeness bounds inspired by one case-study in Australia. We conclude that BALANCED ENTITLEMENT achieves 35 times fairer and 10% more egalitarian allocations than ENTITLEMENT with equal and unequal entitlements. Finally, BALANCED ENTITLEMENT achieves allocations that are between only 5% and up to 15% worse than the optimal (offline) allocation from an egalitarian perspective.

¹M. Aleksandrov, H. Aziz, S. Gaspers and T. Walsh. Online Fair Division: Analysing a Food Bank Problem, In *Proceedings of the Twenty-Fourth International Joint Conference on Artificial Intelligence, IJCAI 2015*, Buenos Aires, Argentina, July 25-31, 2015, 2540–2546, <http://ijcai.org/papers15/Papers/IJCAI15-360.pdf>