Bin packing games

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In bin packing, items with positive sizes are packed into a minimum number of bins such that the total size of items in any bin is at most 1. We consider the bin packing game where any item has also a weight, and the cost of a bin (i.e., 1) is shared among the items in the bin proportionally to their weights. Any item can move to another bin if it fits and after the move the item will pay less.

A packing is called a Nash Equilibrium (NE) if no item can benefit from moving. The price of anarchy (PoA) is the asymptotic worst-case ratio between the number of bins in an NE and of bins in a (socially) optimal solution. A much stronger concept of a stable packing is the Strong NE (SNE), where no coalition of items can move so that each member of the coalition reduces its own cost by the move. If we compare the SNE packings with the optimal packings, we get the measure called $SPoA$ (strong price of anarchy).

We review the existing versions of this game, with the related results. We introduce a new kind of equlibrium and its performance. Some questions about how to define weights to make the PoA low. And some generalizations: market sharing games.