

Weighted module placement based on rectangle packing

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2D rectangle packing problems ask to pack several modules in the minimum area without overlap. In this research, we consider the weight of a module in addition to its area. For a placement of the modules in the engine room of a car, and so on, it is important to pack the modules not only in the small area, but also with the low inertia moment and with the small gap between the center of gravity of the modules and the center of the area. Using sequence pairs to specify relative positions of rectangles, we solve the resulting nonlinear programming problems to determine the locations of all rectangles. To find good sequence pairs, we then resort to local search techniques. A local search algorithm is in general defined by the neighborhood (a subset of the set of all sequence pairs) of the current sequence pair. We propose a hybrid algorithm of local search and mathematical programming by combining some specialized neighborhoods to this problem and using an approximation algorithm to solve the nonlinear programming problems. The proposed algorithm can solve problem instances with up to 50 rectangles in reasonable amount of time.