

Online packing of rectangles and d -dimensional cubes

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Abstract

In my dissertation I examine the online packing of d -dimensional boxes and d -dimensional cubes. Denote by b_d [by c_d , respectively] the greatest number such that any sequence of d -dimensional boxes [cubes, respectively] of edge length smaller than or equal to 1 and of total volume not greater than b_d [than c_d , respectively] can be packed online into the d -dimensional unit cube I^d (i.e., a cube of edges of length 1). In Chapter 2 I describe an algorithm for online packing of rectangles. By using this algorithm I show that $b_2 \geq 0.2837$. Moreover, in Chapter 3 I prove that $b_d \geq (3 - 2\sqrt{2}) \cdot 3^{-d}$. In Chapter 4 I show that if $n \geq 3$ and $d \in \{3, 4\}$ or if $n \geq 1$ and $d \geq 5$, then any sequence of d -dimensional cubes of edge lengths not greater than 1 whose total volume does not exceed $(n + 1) \cdot 2^{-d}$ can be online packed into n unit d -dimensional cubes. In Chapter 5 I show that this result holds true also for $n = 1$ and $d = 4$, i.e., $c_4 \geq 1/8$. This is the crucial result in my dissertation. In Chapter 6 I give results (without proofs) regarding the bin packing problem.

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