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Exercises
Algorithm theory
Winter term 2008/09
Exercise sheet 8

TASK 1 (1 point)**:**

Compare the packing of the online strategies *Next Fit*, *First Fit* and *Best Fit* with the optimal packing for the following two input sequences:

$$\underbrace{\frac{1}{6}-2\varepsilon,\dots,\frac{1}{6}-2\varepsilon}_{6m},\underbrace{\frac{1}{3}+\varepsilon,\dots,\frac{1}{3}+\varepsilon}_{6m},\underbrace{\frac{1}{2}+\varepsilon,\dots,\frac{1}{2}+\varepsilon}_{6m}$$

$$\underbrace{\frac{1}{6}-2\varepsilon,\dots,\frac{1}{6}-2\varepsilon}_{6m},\underbrace{\frac{1}{2}+\varepsilon,\dots,\frac{1}{2}+\varepsilon}_{6m},\underbrace{\frac{1}{3}+\varepsilon,\dots,\frac{1}{3}+\varepsilon}_{6m}$$

Which packing would be created using the offline strategy *First Fit Decreasing*?

TASK 2 (1 point)**:**

We can improve the runtime of the online strategy *First Fit* from $O(n^2)$ to $O(n\ log\ n)$. For that the Bins have to be reordered after each packaging of an object. Therefore we have to store the filling level of each Bin. If we order the Bins in an appropriate way it is enough to consider only one Bin in order to decide whether a new Bin is necessary.

1. First show that the reordering of the Bins does not change the upper bound for *First Fit* ($FF(I) \leq 2\,OPT(I)$)
2. Describe the strategy *Fast First Fit*. This strategy should need at most $O(log\ n)$ steps in order to pack an object. Your description has to explain why the strategy has an overall runtime of $O(n\ log\ n)$.