
Third Assignment

Selected Topics in Efficient Algorithms

To be returned in the lectures on December 4th, 2007.

Exercise 1: We modify the BIT algorithm from the lecture in the following way. We do not complement $b(x)$ on every access, but only if x is not at the front of the list. Show that this modified version of BIT is not $7/4$ -competitive.

Exercise 2: We observe a strategy for list update that can somehow be seen as the deterministic version of the BIT algorithm. In our strategy $b(x) = 0$ for all x at the beginning. An item is moved to the front if and only if $b(x) = 1$ on access (this is every even access). Show that this strategy is 2-competitive.

Exercise 3: Let $G = (V, E)$ be an undirected graph and $\deg(v)$ the degree of vertex v . Show that

1. $\sum_{v \in V} \deg(v) = 2|E|$ and
2. the number of nodes with odd degree is always even.

Exercise 4: Let $G = (V, E)$ be an undirected graph. An edge is called a *bridge*, if its deletion increases the number of connected components in G . Prove the following statements.

1. An edge e is a bridge, if and only if it is not contained in any cycle.
2. If all degrees in G are even then G contains no bridge.