ETH
Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Distributed Computing

HS 2010

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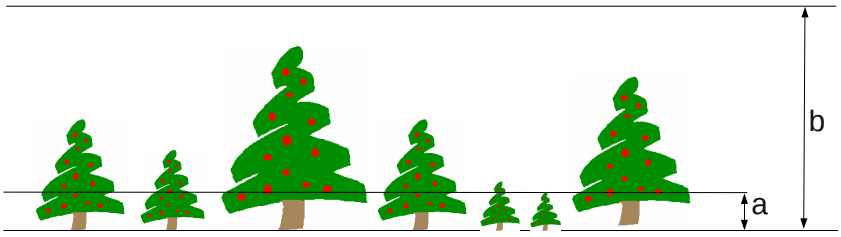
Discrete Event Systems

Exercise Sheet 11

1 Competitive Christmas



Roger has been instructed by his children to buy a Christmas tree as large as possible. Nearby his house, a Christmas market sells Christmas trees in a street. Since Roger additionally has to get a lot of presents for Christmas, he does not really have time for searching for a large Christmas tree. But as he passes through this particular street *exactly once* on his optimised shopping route anyway, he intends to get a tree on the way.

Being in a hurry, Roger forgot his glasses at home and because he is short-sighted, he can only see the tree right in front of him. Hence, Roger walks through the street and has to decide (online) when to buy a tree (he cannot turn back because then he would not have enough time to get a present for his wife – a disaster).

Roger knows from biology classes that the height of fir trees is in the interval $[a, \ldots, b]$ and he knows further that there are n trees in the street.

a) Help Roger! Give as good a deterministic algorithm as possible that tells Roger when to buy a Christmas tree.

b) How good is your algorithm? What is its competitive ratio?

2 The Best Secretary

The Distributed Computing group needs a new secretary because the current one is about to retire after decades of impeccable service. Hence, Roger needs to find a new one with equally good qualifications.

Roger has received n applications and invited all n candidates for an interview. He invites them into his office in a definable order. After each interview, Roger rates the current candidate with a grade $[0, \ldots, \infty]$ and has to decide immediately and irrevocably whether he wants to hire the candidate or not.

a) Describe an algorithm that with probability $p \geq 1/4$ selects the *best* candidate.

Note: Roger is very ambitious, hence he only wants to hire the *best* candidate. If he does not get the best one, he does not care about the quality of the candidate at all.

b) Can Roger do better?