Institut for Matematik og Datalogi
Syddansk Universitet

April 27, 2019
JFB

On-Line Algorithms – F19 – Lecture 15

Announcement

Please note that IMADA has just opened positions as instructor for the fall of 2019, see 'ledige stillinger SDU instruktorater' on the Web as well as posters around IMADA. Everyone interested should consider applying! Being instructor and having the responsibility to explain the solution of a problem to fellow students is a very good way of increasing your own understanding. This does not only apply to the stuff you are instructor in: when you have to explain your solution to others you become better at identifying the core of a problem and that helps you become a better student also in other courses. The deadline is short, May 12, so please apply soon. If you are in doubt whether you are suitable, or have any other questions about this, you are very welcome to talk to Kristian Debrabant (mathematics) or Jrgen Bang-Jensen (Computer Science) about it.

Lecture, April 11

At the end of the discussion section, we covered sections 12.1 and 12.2.1.

Lecture, April 23

We began on the article "Online Bin Packing with Advice", Joan Boyar, Shahin Kamali, Kim S. Larsen, Alejandro López-Ortiz. *Algorithmica*, 74(1): 507-527, 2016. The publication is available through the course's homepage. We covered up through Theorem 1 and then introduced the algorithm used in Theorem 4.

Lecture, April 30

We will continue with the article on bin packing with advice, covering sections 3 and 5. We may start on the article "The Advice Complexity of a Class of Hard Online Problems", Joan Boyar, Lene M. Favrholdt, Christian Kudahl, Jesper W. Mikkelsen. *Theory of Computing Systems*, 61(4): 1128-1177, 2017. The publication is available through the course's homepage.

0.1 Lecture, May 6

We will continue with the article on the advice complexity of a class of hard online problems.

Problems for May 1

1. I will probably lecture if we run out of problems.

2. For makespan in the identical machines case, where might advice be useful? (Note, this is a vague, open sort of question.)

3. Suppose you have a randomized algorithm for a problem, X, which chooses using a uniform distribution between 8 deterministic algorithms for X, and achieves a competitive ratio of 2. Can you define a good deterministic algorithm with advice for X? Can you say something in general about the relationship between mixed algorithms and advice complexity?

4. For the ski rental problem (see the slides), what is the competitive ratio of the randomized algorithm that on a request (whenever it hasn't yet bought the equipment) decides to buy with probability p and to rent with probability $1-p$? (It will be a function of p and the cost of buying, d.)

5. Work out the advice string for optimality for paging, with $k = 5$, for the following request sequences: $\langle 1, 2, 3, 4, 5, 6, 1, 2, 3, 4, 5, 6, 1, 2, 3, 4, 5, 6\rangle$, $\langle 1, 2, 3, 4, 5, 6, 5, 4, 3, 2, 1, 2, 3, 4, 5, 6\rangle$. When $N = k + 1$, less advice is sufficient. What?