Institut for Matematik og Datalogi
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March 12, 2004
JFB

On-Line Algorithms – F04 – Lecture 7

Lecture, March 10

We finished chapter 6 and began motivating the relative worst order ratio.

Lecture, March 17

We will begin looking at the article "The relative worst order ratio applied to paging", at http://www.imada.sdu.dk/~/online/paging.pdf. In section 2, we will initially only consider definitions 1 and 2 and skip the others. Next we will cover Lemmas 6 and 7 and Theorem 5, followed by Lemmas 3, 4, and 5 and Theorem 4. Then we will cover section 5.

Lecture, March 17

We will cover sections 3, 6 and 7. This will mean that we need to look at the other definitions in section 2, also.

Problems for Monday, March 15

1. Show that with the relative worst order ratio, for a given problem, the ordering as to which algorithms are better than which is transitive. Show that if $\mathrm{WR}_{\mathbb{A},\mathbb{B}} \geq 1$ and $\mathrm{WR}_{\mathbb{B},\mathbb{C}} \geq 1$, then $\mathrm{WR}_{\mathbb{A},\mathbb{C}} \geq \mathrm{WR}_{\mathbb{B},\mathbb{C}}$. Furthermore, show that if $\mathrm{WR}_{\mathbb{A},\mathbb{B}}$ is bounded above by some constant, then $\mathrm{WR}_{\mathbb{A},\mathbb{C}} \geq \mathrm{WR}_{\mathbb{A},\mathbb{B}}$.

2. Lemma 4 in the article "The relative worst order ratio applied to paging" does not hold if the conservative algorithm is allowed look-ahead. How do you know this? Where does the proof fail?

3. Find another sequence which would separate LRU's and FWF's behavior under the relative worst order ratio. (It's not necessary to get as large a ratio as the one in the article. Try for $\frac{3}{2}$.)

4. Try defining an algorithm which is based on FIFO and uses look-ahead. What is its relative worst order ratio compared to FIFO? To LRU?

5. The proof of Lemma 1 only holds for $l \leq k$. Why? What if $l \geq k$?