Institut for Matematik og Datalogi
Syddansk Universitet

March 2, 2010
JFB

DM508 – Algorithms and Complexity – 2010
Lecture 9

Room change:

The discussion section on March 9 will be in U26.

Lecture, March 1

We began on string matching from chapter 32, covering up through the presentation of the algorithms for KMP.

Lecture, March 8

We will finish string matching from chapter 32. If there is time, we will do a review of the course, so come with questions if you have any.

Problems to be discussed on March 16

Do problems:
32.4-1, 32.4-3, 32.4-4 (32.4-6 in 3rd edition), 32.4-5 (32.4-7 in 3rd edition).

Assignment due Wednesday, March 17, 8:15

Note that this is part of your exam project, so it must be approved in order for you to take the exam in April, and you may not work with or get help from others not in your group. You may work in groups of two or three. You may write your solutions in English or Danish, but write very neatly if you do it by hand. Remember to turn it in via Blackboard. Please turn in exactly one PDF file.

1. In a game called Adventure, a player collects gold pieces, but must have large enough containers for these pieces in order to pick them up. A player pays for containers with silver pieces, which he can simply pick up when he finds them. The cost of a container to hold up to k gold pieces is $3k$ silver pieces. Containers come in all possible sizes. Suppose that a player first buys a container of size 1. Then, whenever the player fills up its last container, it immediately buys a container with space for as

many gold pieces as it currently has. (Note that the player continues to use the old containers too.) Use amortized analysis to find out how many silver pieces a player has to use in the worst case to collect n gold pieces. Use a potential function.

2. Consider a counter which, instead of being binary, is kept in ASCII form, base 8, and assume that m digits are stored. Thus, the number one hundred forty-one (215) is stored in an array, C, of length m, where $C[0] = 53$ (00110101 in binary, the ASCII code for 5), $C[1] = 49$, $C[2] = 50$, and $C[3] = C[4] = ... = C[m-1] = 48$. Give an algorithm for incrementing this type of counter and analyze it using the potential function method. You may assume that you can increment an ASCII value, check an ASCII value, or store an ASCII value in one time unit.

3. What is the prefix function computed by the KMP algorithm for the string $P = dabbdabbadbdabbac$.