

Introduction to Computer Science

E04 – Lecture 8

Lecture, October 25

Kim Skak Larsen lectured on databases concentrating on sections 9.1 and 9.2.

Lecture, November 1

Rolf Fagerberg will lecture on file structures from section 9.5. Then we will continue with security and encryption.

Lecture, November 8

We will continue with encryption from section 11.6 and discuss exponentiation, an efficiency concern with RSA and many other public key cryptosystems.

Discussion section: week 44

Discuss the following problems from the textbook in groups of three or four.

1. Sequential files: Question 3 on page 390 and Problem 51 on page 399.
2. Hashing: Questions 6 and 7 on page 391.
3. Merging: Question 1 on page 390, Problems 47 and 55 on page 399, and Question 2 on page 390.

4. Assume sets of numbers are represented by sequential files sorted on element value. For example, the set $\{4, 7, 13, 9, 2\}$ is represented by a sequential file containing 2, 4, 7, 9, 13.

Describe algorithms for constructing $A \cap B$ and $A - B$ from A and B (finding $A \cup B$ is covered in Problem 48 on page 399, which is given as an assignment below).

5. Assume the database relations A and B each are stored as sequential files of tuples, ordered according to attribute X (which is an attribute of both relations).

Sketch an algorithm based on merging for executing the statement

$$C \leftarrow \text{JOIN } A \text{ and } B \text{ where } A.X = B.X$$

6. Assume again that the database relations A and B each are stored as sequential files, but now no longer ordered on the X attribute.

Describe an algorithm based on nested loops for executing the statement

$$C \leftarrow \text{JOIN } A \text{ and } B \text{ where } A.X = B.X$$

How many comparisons between tuples are performed (as a function of $|A|$ and $|B|$, the numbers of tuples in each relations)?

Describe how to speed up the algorithm by first using hashing on each relation.

7. Explain how a poorly chosen hash function can result in a hash storage system becoming little more than a sequential file.

Assignment due 8:15, November 9

Late assignments will not be accepted. Working together is not allowed. (You may write this either in English or Danish, but write clearly if you do it by hand.) Show your work where it is relevant.

1. Problem 48 on pages 399.
2. Problem 54 on pages 399.
3. Problem 56 on page 399.