Institut for Matematik og Datalogi
Syddansk Universitet

August 21, 2006
JFB

Introduction to Computer Science
E06 – Lecture 1

Textbook

Computer Science: An Overview, 9th Edition, by J. Glenn Brookshear, 2006. The textbook will be supplemented with notes.

Format

Lectures will be on Tuesdays and Fridays in U26. The Tuesday lectures will be 8:15–10 and the Friday lectures will be 12:15–14. The discussion sections will be on Tuesdays 14:14–16, and most will be in U14, though some discussion sections will take place as labs in IMADA's terminal room. Your "instruktor" is Jacob Aae Mikkelsen.

The course will be graded on a Pass/Fail basis, and satisfactory completion of all 7 assignments is required to pass. "Satisfactory completion" means that the answers are correct, with only minor errors, and that they have been turned in on time. You are allowed to retry (at most once) on at most 3 assignments which were not approved. These 7 assignments count as the exam in the course, so cheating on these assignments is viewed as cheating on an exam. You are allowed to talk about course material with your fellow students, but working together on assignments is cheating.

The weekly notes and other information about the course are available through the Worldwide Web. Use the URL:

http://www.imada.sdu.dk/Courses/DM501/

Please read the appropriate sections in the textbook or notes before coming to class and bring your textbook with you. Preparing for discussion sections (and labs) is important.

I have office hours on Mondays from 9:00 to 9:45 and Tuesdays from 13:00 to 13:45.

Lecture, September 5

We begin with an introduction to the course, covering chapter 0 in the textbook, but skipping section 0.2. We will also begin on chapter 1.

Lecture, September 8

We will cover more of chapter 1 in the textbook.

Discussion section: week 36

Discussion in groups:

1. Divide into groups of three people (or four). One person will choose five cards to give to the first "performer", the first performer will give four of them to the second "performer", one at a time, and the second performer will announce what the fifth card is. Each person should practice each "performer" part at least three times.

2. Discuss (in your groups) various methods for improving the magic trick. For example, if the first card determines the suit, after seeing the trick repeated several times, the audience might find it easier to guess how it is done. Define an algorithm for a modification of the trick which makes this harder to see.

3. Discuss how to do a magic trick, where one performer is thinking of a number between 1 and 24, tells the audience the number, gets some cards from the audience, and passes some cards to the second performer, who announces the number.

4. Discuss how to extend this to larger numbers than 24. When might it be better to only use the color on the card (whether it is red or black, but also consider using the four different suits), rather than some permutation (ordering) of the cards?

5. Find a "bad" pair of integers for the greatest common divisor algorithm, where a pair is bad if the algorithms must perform a lot of steps relative to how large the numbers are. (One expects more steps for larger numbers.)

6. Do problem 3 on page 87 of the textbook.

7. Design a circuit containing only AND and XOR gates (with at most two inputs) which takes three bits as input and outputs a 1 if the input has at least two ones, and a 0 otherwise. (In the student resources for the course textbook, under the Activities for Chapter 1, there is a simulator for logic circuits which you could use to check your circuit. It is time consuming to use, though.) As an extra challenge, try to do it so that there is only one AND gate, though more XOR gates. (Minimizing the number of AND gates can be useful in some cryptographic applications.)

8. Discuss questions 2 and 4 on pages 31–32 of the textbook.

Assignment due 8:15, September 12

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.)

1. Write down the algorithm for the “magic trick” described in class, where one performer passes four of five playing cards to the other, so that the other can tell what the fifth card is. Write this as an algorithm, so that all steps are clearly specified, without ambiguity.

2. Design a circuit containing only AND, OR and NOT gates (with at most two inputs) which takes four bits as input and outputs a 1 if the input is 1001, 0111 or 1110, and a 0 otherwise. (In the student resources for the course textbook, under the Activities for Chapter 1, there is a simulator for logic circuits which you could use to check your circuit. It is time consuming to use, though.)