

1 Schedule

Problem sessions:

Part 1 of the homework is **due Nov 3**.
Part 2 of the homework is **due Nov 5**.
The **QUIZ** will be on **Tuesday, Nov. 10, 2008**.

2 List of algorithms covered in the class

(B-basic, I-intermediate, A-advanced):

- B: Huffman encoding (p.139, DSV).
- I: Coin-change problems (handout).
- I: Longest increasing subsequence (p.157, DSV).
- I: Edit distance (p.159, DSV).
- I: Knapsack (p.164, DSV).
- A: Chain matrix multiplication (p.171, DSV).
- A: Independent sets in trees (p.176, DSV).

3 Basic material

Important concepts, problems, theorems, and algorithms:

- Two basic greedy algorithms: Huffman encoding, coin change.
- Two basic dynamic programming algorithms: knapsack, longest increasing subsequence.

Testing method:

- Trace all of the four algorithms above/compute answer to example problems.

Example test problems (homework):

4.1 (due Nov 3) Suppose that symbols a, b, c, d, e, f, g, h occur with frequencies $1/36, 1/36, 1/12, 1/9, 5/36, 1/6, 7/36, 1/4$, respectively. Construct the Huffman encoding of the alphabet.

4.2 (due Nov 3) Consider the coin change problem with coin values 1, 3, 5. Does the greedy algorithm always find an optimal solution? If the answer is no, provide a counterexample. If the answer is yes, give a proof.

4.3 (due Nov 3) Consider the coin change problem with coin values 1, 4, 6. Does the greedy algorithm always find an optimal solution? If the answer is no, provide a counterexample. If the answer is yes, give a proof.

4.4 (due Nov 3) Consider the coin change problem with coin values 1, 4, 7. Does the greedy algorithm always find an optimal solution? If the answer is no, provide a counterexample. If the answer is yes, give a proof.

4.5 (due Nov 3) Consider the knapsack problem with knapsack limit 136 and the following items (weight,value):

$(41, 4), (48, 4), (44, 4), (37, 3), (29, 2), (26, 2), (22, 2), (40, 4), (46, 4)$.

Find an optimal solution of the problem.

4.6 (due Nov 3) Find the longest increasing subsequence of

$5, 3, 4, 1, 6, 10, 7, 11, 12, 8, 9$.

