

Lab 6

Due: at the end of class

1 Reading

Read Chapter 15.1 of the textbook.

2 Exercises

Write out solutions to the exercises below. Please include the names of everyone in your group.

1. Consider modifying the rod-cutting problem by charging for each cut. Each rod has a value of p_i , but each cut incurs a constant cost of c . The revenue associated with a solution is now the sum of the prices of the pieces minus the costs of making all the required cuts. Using the dynamic programming algorithm as a starting point, write pseudocode to find the maximum price of a rod with this modified problem. (The last “cut” - leaving the rod whole - does not cost anything.)

2. Draw the recursive call tree for the MERGE-SORT procedure from Section 2.3.1 of the textbook on an array of 8 elements. Explain why memoization fails to speed up a good divide-and-conquer algorithm such as MERGE-SORT.

3. Show, by means of a counterexample, that the following “greedy” strategy does not always determine an optimal way to cut rods. Define the **density** of a rod of length i to be p_i/i , that is, its value per length. The greedy strategy for a rod of length n cuts off a first piece of length i , where $1 \leq i \leq n$, having maximum density. It then continues by applying the same greedy strategy to the remaining piece of length $n - i$.

For the counterexample, give the price table, rod length, and describe how a greedy strategy will cut it up suboptimally.

3 Grading

Exercise 1: 40%

Exercise 2: 20%

Exercise 3: 40%