

Homework 5

ECE 590

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Question 1:

Assume that the given vault is size of $N \times N$. In Figure.1, runtime of different data size for recursion and dynamic programming has been recorded. Y axis is set with unit ns and X axis with data size.

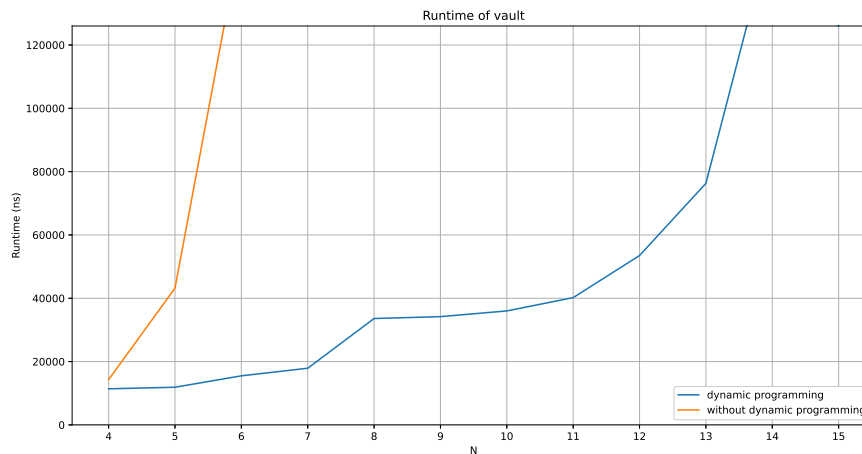


Figure 1: Runtime of different data size for vault.

Recursion:

For every move, the dragon has 2 choices. Recursion depth is $N + N$.

Dynamic Programming:

The entire vault is traversed one time. And @cache is used to store the node we have traversed and the space can be saved.

From the figure, it can be seen that the curve without dynamic programming is exponential.

Question 2:

Assume that the given number of matrix is N . In Figure.2, runtime of different data size for recursion and dynamic programming has been recorded. Y axis is set with unit ns and X axis with data size.

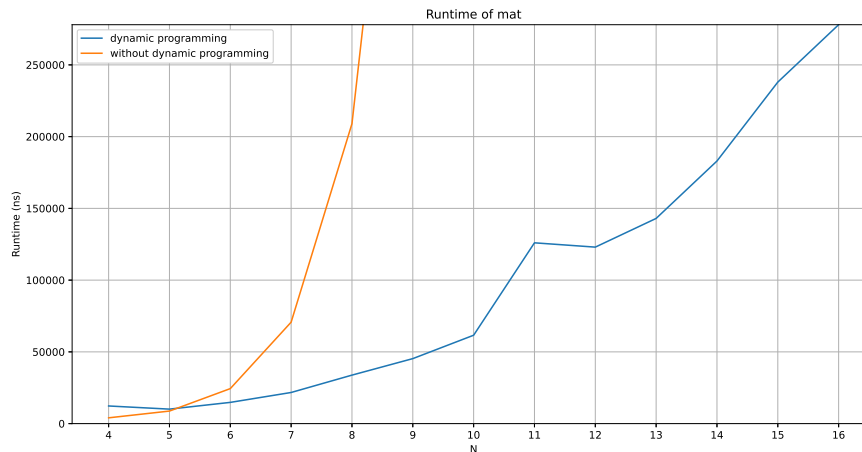


Figure 2: Runtime of different data size for mat.

Recursion:

For N matrixs, there are N kinds of seperation to 2 parts. And for each sub-sequences, there are also length of that subsequence kinds of seperation to 2 parts until the length of that subsequence is 1.

Dynamic Programming:

@cache is used to store the node we have traversed and the space can be saved.

From the figure, it can be seen that the curve without dynamic programming is exponential.

Question 3:

In Figure.3, runtime of different data size for recursion and dynamic programming has been recorded. Y axis is set with unit ns and X axis with number of nodes.

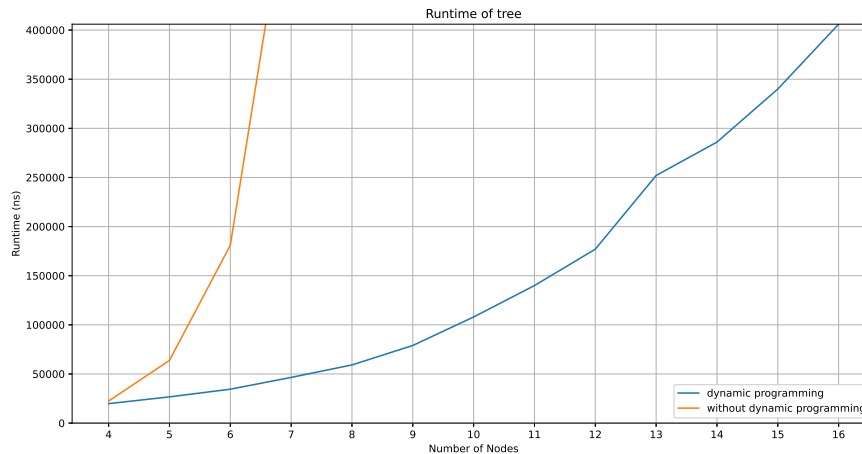


Figure 3: Runtime of different data size for tree.

Recursion:

Time complexity is exponential. For N nodes, there are N kinds of separation to 2 parts(left and right). And for each subsequences, there are also length of that subsequence kinds of separation to 2 parts until the length of that subsequence is 1.

Dynamic Programming:

@cache is used to store the node we have traversed and the space can be saved.