Beihang University
School of General Engineering

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Computer Science and Programming
Homework November 23rd, 2020

Task 1 ***Master Method***

Assume that an algorithm has a time complexity of $T(n)$. Please calculate the time complexity with the following recurrence relations.

1. $T(n) = 5T(n/2) + O(n^2)$
2. $T(n) = 5T(n/2) + O(n^3)$

And think about it, for this recurrence relation $T(n) = 2T(n/2) + nlgn$, can the master method still work? Explain why or why not.

Task 2 Integer Multiplication - Naive way

Implement the naive multiplication algorithm introduced in the lecture which has quadratic time complexity. Test the runtime of the function for several integer pairs of different lengths to see if the runtime raises as expected.

Task 3 K-select - Naive way

In previous lectures, the problems of finding the minimum and maximum elements in a list L were discussed in detail. This problem can be generalized to the case of finding the kth smallest element in a list. Please implement a naive k-select algorithm, and find out the time complexity of your algorithm.