lab01writeup.txt

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1 Introduction

In this paper, I will demonstrate that our hypothesis of order of magnitude estimates of exponential, linear, and logarithmic run times was correct; I will compare the run time of the Fibonacci sequence in two different ways in order to prove that the execution time in exponential time, O(2n), is greater than linear time, O(n), which is greater than logarithmic time, O(log n).

2 Evidence&Analysis

2.1 Exponential vs Linear Execution Time of Fibonacci Sequence

Through graphing the execution time in exponential time, O(2n), versus the execution time in linear time, O(n), it is shown by Figure 1 that the linear execution time is much faster than the exponential execution time(ns). As the input size of n goes from 0 to 50, it is clearly seen that the blue exponential time line increases linearly, with a steeper slope, in execution time(ns) while the orange linear time stays relatively flat with a slight slop, thus demonstrating that the linear execution time takes much less time than the exponential execution time.

2.2 Linear vs Logarithmic Execution Time of Fibonacci Sequence

From Section 2.1, it was proven that the linear execution time was much faster than the exponential execution time.

Through graphing the execution time in linear time, O(n), versus the execution time in logarithmic time, O(log n), it is shown by Figure 2 that the logarithmic time is much faster than the linear time(ns). As the input size of n goes from 0 to one million, it is clearly seen that the blue linear execution time increases linearly with a steeper slope. In contrast, the orange logarithmic execution time stays relatively flat with a slight slop, thus demonstrating that the logarithmic execution time takes much less time than the linear execution time.

3 Conclusion

In this paper, I have demonstrated that the execution times of the Fibonacci function is the fastest to slowest in the following order: logarithmic, linear, and exponential. Therefore, our hypothesis of order of magnitude estimates of exponential, linear, and logarithmic run times was correct

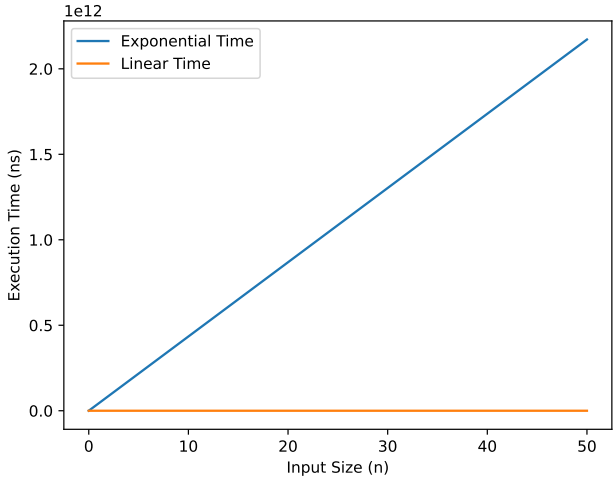

Figure 1: Exponential vs Linear Execution Time Graph in nanoseconds.

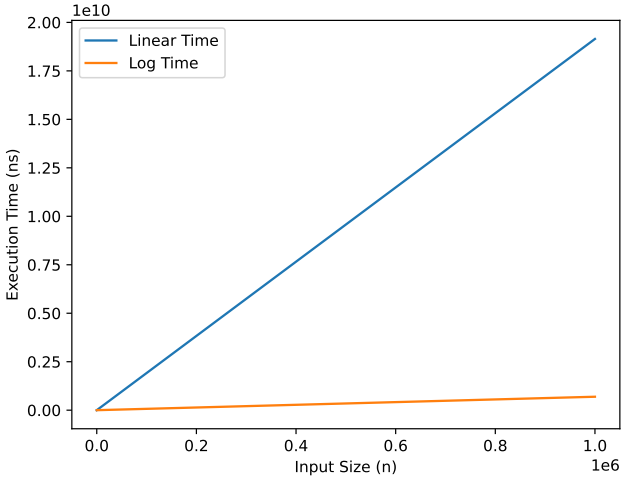

Figure 2: Linear vs Logarithmic Execution Time Graph in nanoseconds.