

Assignment 01 Algorithm performance analysis

Exercise 1.3-10 (p.17)

Ackerman's function $A(m, n)$ is defined as:

$$A(m, n) = \begin{cases} n + 1, & \text{if } m = 0. \\ A(m - 1, 1), & \text{if } n = 0. \\ A(m - 1, A(m, n - 1)), & \text{otherwise.} \end{cases}$$

This function is studied because it grows very quickly for some small values of m and n .

- (a) Write a recursive version of this function. Test your code by using the following test cases.

Input	Output
0 1	2
3 1	13
2 0	3

- (b) Using step count to evaluate the performance. Draw the graph with various m, n .

- (c) Measure the real performance time. Draw the graph with various m, n .

Note: For (b) and (c), you only need to change one variable at a time. For instance, set $m = 1$ and change n from 0 to 50. Or, set $n = 5$ and change m from 0 to 50.

- (d) What is the time complexity in big-oh notation? (Hint: Get the step count function $T(m, n)$ first. If you do not know how to solve the function with two variables. Please secure one variable first and derive the step count function. For instance, secure $m = 1$, and solve $T(1, n)$.)