CPSC 331 Empirical Exercise I

Ali Akbari

TOTAL POINTS

3 / 3

1 Report **3 / 3**

  ✓ **+ 3 pts** **Good:**

  Clear and consist data collection.

  Observations properly explained and connected to theory.

  Plot shows expected trends, clear explanations included.

  Report generally well-written.

    + 2 pts Fair:

  Some evidence of data, incorrect data etc.

  Non-technical explanations, incorrect analysis/interpretation of data etc.

  Plot included but not explained, unclear trend etc.

  Report written well for the most part but has grammar / style issues.

    + 1 pts Deficient:

  No evidence of data, little to no effort made to collect data.

  Data not explained/connected to theory.

  Plot lacking, poorly written report.

    + 0 pts Not done:

  Nothing submitted.

## CPSC 331 Empirical Exercise: Binary Search Complexity Report
Ali Akbari 30010402

Data Value Table

Runs	CPU Time (ms)/Total time	t(average time) = (CPU Time/(((2^k)+1)*Runs)	K(power)
100000000	16696	0.000005059393939	5
1000000	32993	0.00003218829268	10
10000	10589	0.00003231407733	15
1000	45799	0.00004367728836	20
10	17493	0.000052133201	25

Using Visual VM plugin for eclipse the following data points were recorded for binary search.

The table was used to plot the following data points with a linear trend line.

Binary Search K(power) vs. t
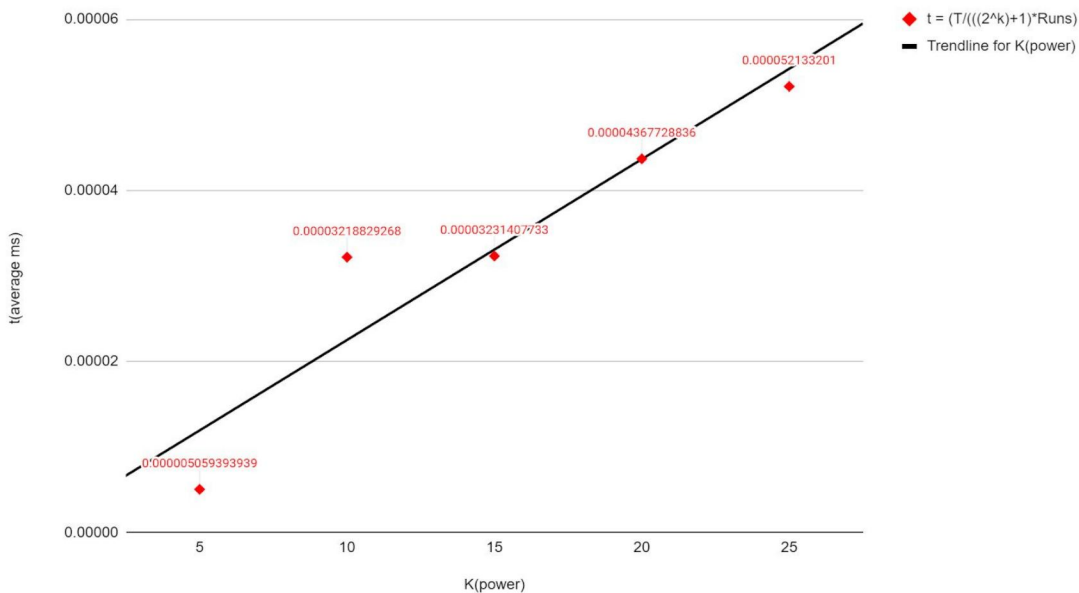
We know from the lecture that Binary Search running time complexity is $= O \, log_2 n$. Since we know that $N = 2^k$ and that $k = log_2 n$, we see that k is in the same order of the running time of Binary Search and with a rise(vertical line) over run(horizontal line) function it should show linearity as $\frac{log_2 n}{log_2 n} = 1$. This means that the Y values in this case t are increasing at the same rate as the X values which is k(power) in this case. The data does not show the exact attributes of being linear, but the trend line follows a linear path. The data collected could have been affected by the model of CPU, other computer components as well, user's physical delay between recording the CPU time and running the program, and although almost impossible the runs could be in favor of best case/ worst case of binary search skewing the data. However, primarily the graph and data do show linearity.

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