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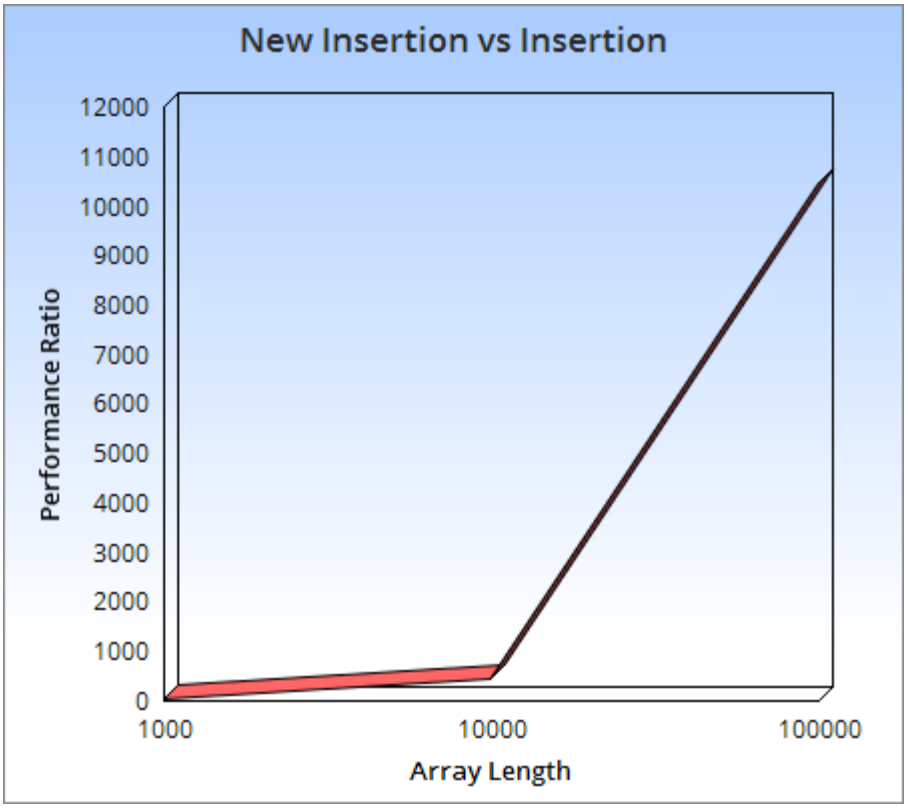
Computer Science 250
Laboratory Assignment 4
Improving Standard Sorting Algorithms
February 11, 2015

Part 1 Results

Altering Insertion Sort	Run 1	Run 2	Run 3	Run 4	Run 5	Mean(Average)	Standard Deviation
Array Length 1000	5.043	4.870	5.522	4.913	5.571	5.1838	0.30197046213165
Array Length 10000	429.310	461.410	408.542	449.632	448.370	434.47566667	20.102257896952
Array Length 100000	10280.331	10831.381	10269.832	10199.987	10596.183	10435.5428	240.63684732177

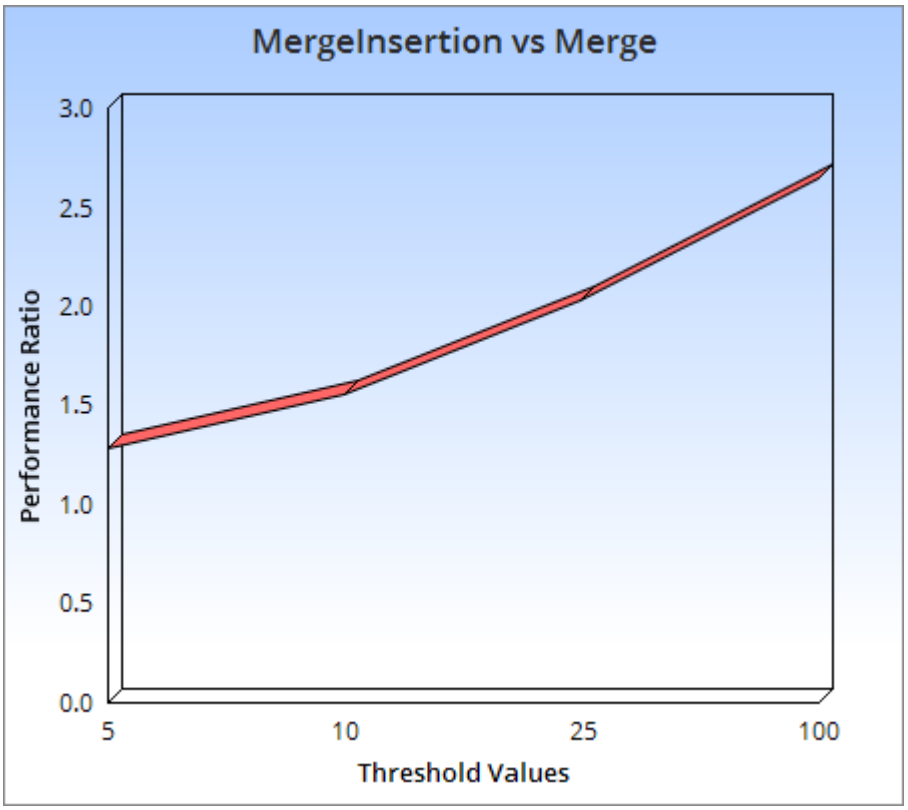
Figure 1: Results of NewInsertion vs Insertion



Part Two Results

Altering Mergesort	Run 1	Run 2	Run 3	Run 4	Run 5	Mean(Average)	Standard Deviation
Threshold Value 5	1.249	1.258	1.276	1.295	1.288	1.2732	0.017428711943227
Threshold Value 10	1.583	1.541	1.496	1.569	1.561	1.55	0.0302258167797
Threshold Value 25	2.042	1.942	2.060	2.025	2.051	2.024	0.042600469480981
Threshold Value 100	3.031	3.014	3.111	2.025	2.051	2.6464	0.49790344445485

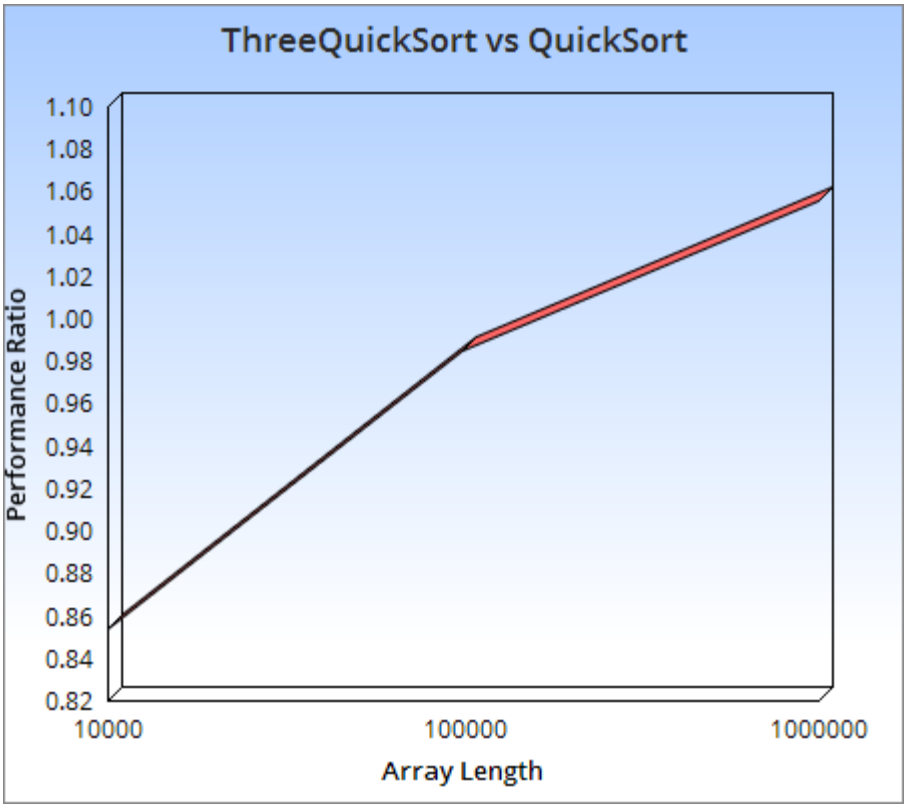
Figure 2: Results of MergeInsertion vs Merge with different threshold vaues



Part 3 Results

Altering Quicksort	Run 1	Run 2	Run 3	Run 4	Run 5	Mean(Average)	Standard Deviation
Array Length 10000	0.880	0.801	0.831	0.832	0.924	0.8536	0.043352508577936
Array Length 100000	1.014	1.007	1.028	0.930	0.943	0.9844	0.039902882101422
Array Length 1000000	1.090	1.012	0.990	1.152	1.032	1.0552	0.05871422314908

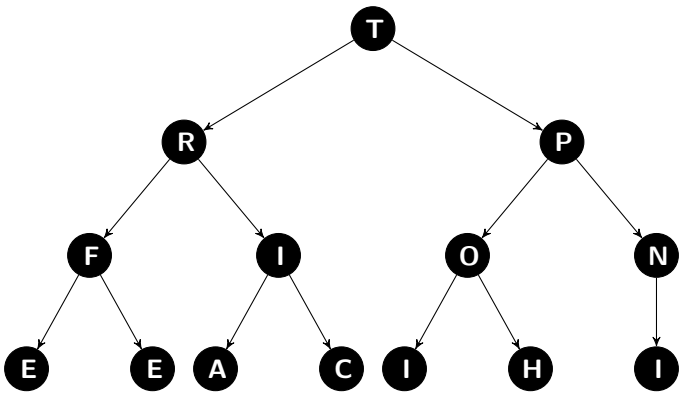
Figure 3: Results of Three QuickSort vs QuickSort



Part 4: While You Have Some Downtime

1. Trace how the Heapsort algorithm will sort the array REHEAPIFICATION

1. Build the heap



2. Sorting

TRPFIONEEACIHI
IRPFIONEEACIHI
IRPFIONEEACIH Sorting Array: T
RIPFIONRRACIH
HIPFIONRRACIR
Sorting Array: TR
PIHFIONRRACIR
PIOFIHNEEACI
PIOFIINRRACH
HIOFIINEEAC Sorting Array: TRP
OIHFIINEEAC
OINFIIHEEAC
CINFIIHEEA Sorting Array: TRPO
NICFIIHEEA
NIIFICHEEA
AIIFICHEE Sorting Array: TRPON
IAIFICHEE
IIIFACHEE
EIIFACHE Sorting Array: TRPONI
IEIFACHE
IFIEACHE
EFDIEACH Sorting Array: TRPONII
IFEEACH
IFHEACE

EFHEAC Sorting Array: TRPONIII
HFEEAC
CFEEA Sorting Array: TRPONIIIH
FCEEA
FEECA
AEEC Sorting Array: TRPONIIIHF
EAEC
ECEA
ACE Sorting Array: TRPONIIIHFE
EAC
AC Sorting Array: TRPONIIIHFEE
CA
A Sorting Array: TRPONIIIHFEEC
Sorting Array: TRPONIIIHFEECA

2. What is the minimum number of items that must be exchanged during a **RemoveMax()** operation on a heap of size N? Give a heap of size 15 for which this minimum is achieved. Of a heap size n, the minimum number of items that must be exchanged is 2.