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Lab 10

Quicksort - Miller and Random

**Conclusion**

Looking at the data, the time to perform a Miller quicksort on the unsorted list seems to be similar to the random quicksort of both the unsorted and sorted lists in order of magnitude and value. However, the Miller quicksort of the sorted list is considerably slower, taking about six to seven times the time needed to perform a random quicksort on a copy of the same list. Thus, one can show that the Miller quicksort compared to the random quicksort is slower for an already sorted list. This validates the hypothesis that the Miller quicksort is O (n^2) for a sorted list, and that the random quicksort is O (n log(n)) for a sorted list. In addition, the time needed for a random quicksort does not seem to depend on the state of entropy of the list. That is, for a random quicksort, there is not a considerable difference in timings for sorted and unsorted lists. This validates the hypothesis that, on average, the random quicksort performs in O (n log(n)) time for any list.

**Data**

Random numbers from 0 to 500 and list length of 10000

Miller quicksort unsorted list

0.05468440055847168

Miller quicksort sorted list

0.42258524894714355

Random quicksort sorted list

0.07720589637756348

Random quicksort unsorted list

0.08422207832336426

[Finished in 0.9s]

Miller quicksort unsorted list

0.05213665962219238

Miller quicksort sorted list

0.42265915870666504

Random quicksort sorted list

0.06215476989746094

Random quicksort unsorted list

0.07068777084350586

[Finished in 0.8s]

Miller quicksort unsorted list

0.06115841865539551

Miller quicksort sorted list

0.424593448638916

Random quicksort sorted list

0.06717777252197266

Random quicksort unsorted list

0.07620358467102051

[Finished in 0.7s]

Miller quicksort unsorted list

0.056684017181396484

Miller quicksort sorted list

0.4321160316467285

Random quicksort sorted list

0.06220531463623047

Random quicksort unsorted list

0.07323241233825684

[Finished in 0.8s]

Miller quicksort unsorted list

0.06613421440124512

Miller quicksort sorted list

0.4512012004852295

Random quicksort sorted list

0.061663150787353516

Random quicksort unsorted list

0.06868219375610352

[Finished in 0.8s]

Miller quicksort unsorted list

0.05518031120300293

Miller quicksort sorted list

0.44568753242492676

Random quicksort sorted list

0.06864643096923828

Random quicksort unsorted list

0.07068777084350586

[Finished in 0.8s]

Miller quicksort unsorted list

0.059624671936035156

Miller quicksort sorted list

0.4472057819366455

Random quicksort sorted list

0.0691525936126709

Random quicksort unsorted list

0.07122445106506348

[Finished in 0.8s]

Miller quicksort unsorted list

0.06417179107666016

Miller quicksort sorted list

0.43518805503845215

Random quicksort sorted list

0.06367731094360352

Random quicksort unsorted list

0.07165122032165527

[Finished in 0.9s]

Miller quicksort unsorted list

0.08973836898803711

Miller quicksort sorted list

0.4306483268737793

Random quicksort sorted list

0.06270027160644531

Random quicksort unsorted list

0.07519388198852539

[Finished in 0.9s]

Miller quicksort unsorted list

0.05514883995056152

Miller quicksort sorted list

0.4366576671600342

Random quicksort sorted list

0.06567502021789551

Random quicksort unsorted list

0.07419514656066895

[Finished in 0.8s]