

The report of homework 7

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scale/algorithm (num/s)	Insertion Sort	Merge sort	Quick sort	cstdlib qsort	STL sort
100	3.5e-05	4.4e-05	1e-05	7e-06	9e-06
500	0.000726	5.9e-05	4.6e-05	3.5e-05	8.7e-05
1000	0.002904	0.000152	0.000106	5.9e-05	0.00015
5000	0.044353	0.000637	0.000613	0.000355	0.000566
10000	0.054195	0.001198	0.001322	0.000758	0.001214
50000	1.21397	0.006204	0.007496	0.004476	0.007065
100000	4.87161	0.013093	0.016177	0.009577	0.015017
500000	121.379	0.071538	0.093847	0.054098	0.089552
1000000	485.603	0.148523	0.195643	0.113956	0.182601
5000000	12140.075	0.82294	1.07888	0.638145	0.9906

```

yang@DESKTOP-ICMCDBE: ~
scc@scclab:07$ ls
a.out ds7.pdf generateRandFile.cpp generateRandFile.cff input.txt p7.cpp
scc@scclab:07$ ./a.out
read file done
3
insertion Sort
The total time is 3.5e-05 seconds
The total time is 0.000726 seconds
The total time is 0.002904 seconds
The total time is 0.044353 seconds
The total time is 0.054195 seconds
The total time is 1.21397 seconds
The total time is 4.87161 seconds
The total time is 121.379 seconds
The total time is 485.603 seconds

scc@scclab:07$ ./a.out
read file done
3
quick Sort
The total time is 1e-05 seconds
The total time is 4.6e-05 seconds
The total time is 0.000106 seconds
The total time is 0.000132 seconds
The total time is 0.000613 seconds
The total time is 0.000758 seconds
The total time is 0.004476 seconds
The total time is 0.009577 seconds
The total time is 0.016177 seconds
The total time is 0.019564 seconds
The total time is 0.093847 seconds
The total time is 0.195643 seconds
The total time is 1.07888 seconds
scc@scclab:07$

scc@scclab:07$ ./a.out
read file done
4
merge Sort
The total time is 4.4e-05 seconds
The total time is 5.9e-05 seconds
The total time is 0.000152 seconds
The total time is 0.000637 seconds
The total time is 0.001198 seconds
The total time is 0.006204 seconds
The total time is 0.013093 seconds
The total time is 0.071538 seconds
The total time is 0.148523 seconds
The total time is 0.82294 seconds
scc@scclab:07$ lscpu
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 12
On-line CPU(s) list: 0-11
Thread(s) per core: 2
Core(s) per socket: 6
Socket(s): 1
NUMA node(s): 1
Vendor ID: GenuineIntel
CPU family: 6
Model: 158
Model name: Intel(R) Core(TM) i7-8700 CPU @ 3.20GHz
Stepping: 10
CPU MHz: 4306.964
CPU max MHz: 4600.000
CPU min MHz: 800.000
BogoMIPS: 6384.00

scc@scclab:07$ ./a.out
read file done
4
stdlb qSort
The total time is 7e-06 seconds
The total time is 3.5e-05 seconds
The total time is 5.9e-05 seconds
The total time is 0.000355 seconds
The total time is 0.000476 seconds
The total time is 0.009577 seconds
The total time is 0.054098 seconds
The total time is 0.113956 seconds
The total time is 0.638145 seconds
scc@scclab:07$ ./a.out
read file done
5
STL Sort
The total time is 9e-06 seconds
The total time is 8.7e-05 seconds
The total time is 0.00015 seconds
The total time is 0.00056 seconds
The total time is 0.001214 seconds
The total time is 0.007065 seconds
The total time is 0.015017 seconds
The total time is 0.089552 seconds
The total time is 0.182601 seconds
The total time is 0.9906 seconds
scc@scclab:07$ ./a.out
read file done
5
STL Sort
The total time is 8e-06 seconds

```

The last 2 results of insertion sore are time out! Which might coast 485 seconds and 3.37 hours.

I use yellow mark to repersent TLE(Time Limit Exceed).

Insertion sort : $\Theta(n^2)$

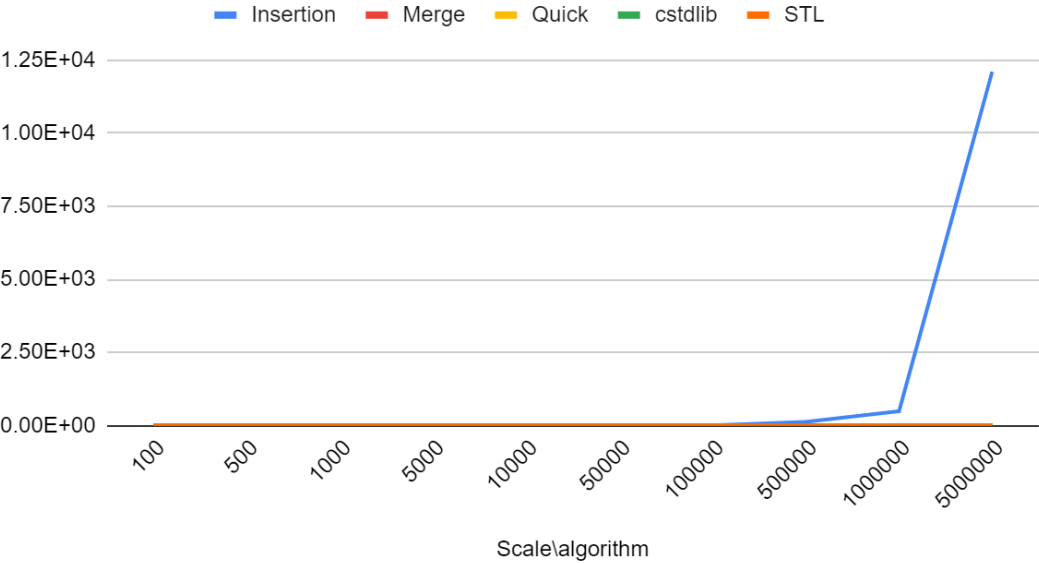
Merge sort : $\Theta(n \log n)$

Quick sort : $\Theta(n \log n)$

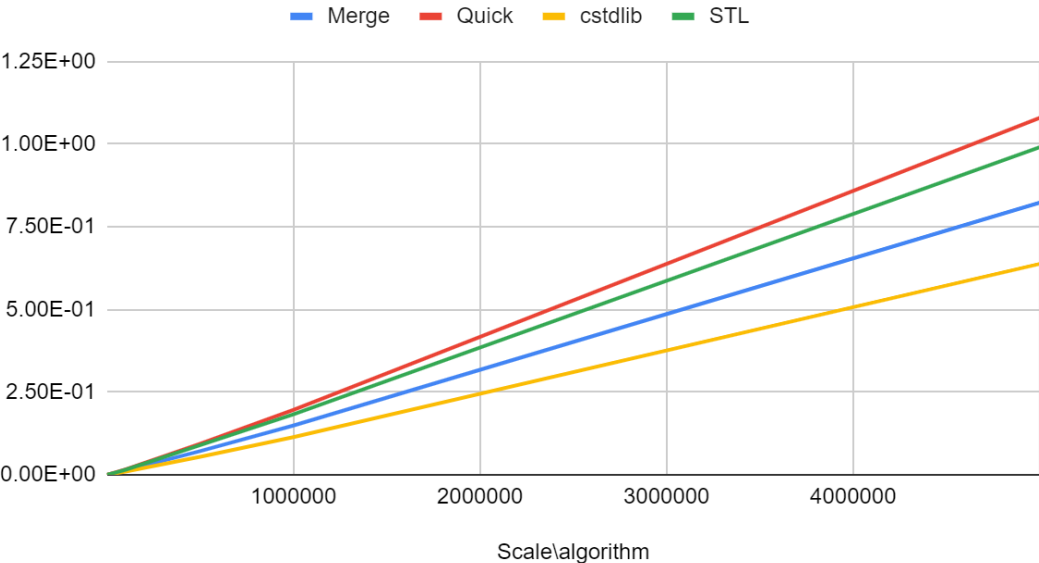
cstdlib qsort : $\Theta(n \log n)$

STL sort : $\Theta(n \log n)$

Insertion、Merge、Quick、cstdlib和STL



Insertion、Merge、Quick、cstdlib和STL



About

My CPU: i7-8700 3.2GHz

```
scc@scc-lab:07$ lscpu
Architecture:          x86_64
CPU op-mode(s):        32-bit, 64-bit
Byte Order:             Little Endian
CPU(s):                 12
On-line CPU(s) list:   0-11
Thread(s) per core:    2
Core(s) per socket:    6
Socket(s):              1
NUMA node(s):          1
Vendor ID:              GenuineIntel
CPU family:             6
Model:                  158
Model name:             Intel(R) Core(TM) i7-8700 CPU @ 3.20GHz
Stepping:               10
CPU MHz:                4306.964
CPU max MHz:            4600.0000
CPU min MHz:            800.0000
BogoMIPS:               6384.00
Virtualization:         VT-x
L1d cache:              32K
L1i cache:              32K
L2 cache:               256K
L3 cache:               12288K
NUMA node0 CPU(s):     0-11
Flags:                  fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat pse36
                        clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdtscp lm constant_tsc art
                        arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid aperfmperf tsc_known_freq pni
                        pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16 xtpr pdcm pcid sse4_1 s
                        se4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave avx f16c rdrand lahf_lm abm 3dnowprefe
                        tch cpuid_fault epb invpcid_single pti ssbd ibrs ibpb stibp tpr_shadow vnmi flexpriority ept
                        vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm mpx rdseed adx smap clflush
                        opt intel_pt xsaveopt xsavec xgetbv1 xsaves dtherm ida arat pln pts hwp hwp_notify hwp_act_wi
                        ndow hwp_epp md_clear flush_lld
scc@scc-lab:07$
```

My RAM: (8G DDR4 2666)*2

Handle 0x0040, DMI type 17, 40 bytes	Handle 0x0041, DMI type 17, 40 bytes
Memory Device	Memory Device
Array Handle: 0x003F	Array Handle: 0x003F
Error Information Handle: Not Provided	Error Information Handle: Not Provided
Total Width: 64 bits	Total Width: 64 bits
Data Width: 64 bits	Data Width: 64 bits
Size: 8192 MB	Size: 8192 MB
Form Factor: DIMM	Form Factor: DIMM
Set: None	Set: None
Locator: ChannelA-DIMM1	Locator: ChannelA-DIMM2
Bank Locator: BANK 0	Bank Locator: BANK 1
Type: DDR4	Type: DDR4
Type Detail: Synchronous	Type Detail: Synchronous
Speed: 2666 MT/s	Speed: 2666 MT/s
Manufacturer: Kingston	Manufacturer: SK Hynix
Serial Number: D4237674	Serial Number: 926D93A2
Asset Tag: 9876543210	Asset Tag: 9876543210
Part Number: 9905702-082.A00G	Part Number: HMA81GU6CJR8N-VK
Rank: 1	Rank: 1
Configured Clock Speed: 2666 MT/s	Configured Clock Speed: 2666 MT/s
Minimum Voltage: Unknown	Minimum Voltage: Unknown
Maximum Voltage: Unknown	Maximum Voltage: Unknown
Configured Voltage: 1.2 V	Configured Voltage: 1.2 V

My OS: Ubuntu 18.04(Linux kernel: 4.15.0)

```
scc@scc-lab:07$ uname -a
Linux scc-lab 4.15.0-64-generic #73-Ubuntu SMP Thu Sep 12 13:16:13 UTC 2019 x86_64 x86_64 x86_64 GNU/Linux
```

My compiler: GNU GCC 7.4.0

```
scc@scc-lab:07$ gcc -v
Using built-in specs.
COLLECT_GCC=gcc
COLLECT_LTO_WRAPPER=/usr/lib/gcc/x86_64-linux-gnu/7/lto-wrapper
OFFLOAD_TARGET_NAMES=nvptx-none
OFFLOAD_TARGET_DEFAULT=1
Target: x86_64-linux-gnu
Configured with: ../src/configure -v --with-pkgversion='Ubuntu 7.4.0-1ubuntu1~18.04.1' --with-bugurl=file:///usr/share/doc/gcc-7/README.Bugs --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++ --prefix=/usr --with-gcc-major-version-only --program-suffix=-7 --program-prefix=x86_64-linux-gnu- --enable-shared --enable-linker-build-id --libexecdir=/usr/lib --without-included-gettext --enable-threads=posix --libdir=/usr/lib --enable-nls --with-sysroot=/ --enable-clocale=gnu --enable-libstdcxx-debug --enable-libstdcxx-time=yes --with-default-libstdcxx-abi=new --enable-gnu-unique-object --disable-vtable-verify --enable-libmpx --enable-plugin --enable-default-pie --with-system-zlib --with-target-system-zlib --enable-objc-gc=auto --enable-multiarch --disable-werror --with-arch-32=i686 --with-abi=m64 --with-multilib-list=m32,m64,mx32 --enable-multilib --with-tune=generic --enable-offload-targets=nvptx-none --without-cuda-driver --enable-checking=release --build=x86_64-linux-gnu --host=x86_64-linux-gnu --target=x86_64-linux-gnu
Thread model: posix
gcc version 7.4.0 (Ubuntu 7.4.0-1ubuntu1~18.04.1)
```