Assignment 1 - CS618A

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1 System Configuration

- Processor: Intel(R) Core(TM) i3-2310M CPU @ 2.10GHz
- Memory: 2918620 kB
- USB: 2.0, 16GB

2 Tests

- Create 100 r binary files, named r00-r99 of sizes 2kB.
- Create 100 s binary files, named s00-s99 of sizes 64kB.
- Read r files randomly atleast 1000 times.
- Read s files randomly atleast 1000 times.
- Overwrite half bits of r files in random order atleast 1000 times.
- Overwrite half bits of s files in random order atleast 1000 times.
- Read r files and s files in different ratios, atleast 1000 times.
- Overwrite r files and s files in different ratios, atleast 1000 times.

  For each of above, calculate minimum, maximum, mean, standard deviation of execution times. The tests were performed on hard disk as well as a USB media. The comparison is done on the basis of throughput, *i.e.* bytes per second.

3 Reading files

3.1 Part 1,2

Hard disk:

- Average time to read r files - 2.8666e-05 sec
- Average time to read s files - 2.8639e-05 sec

- Throughput for r(random) files = 2048/2.8666e-05 = 71443521.9424 bytes/sec
- Throughput for s(sequential) files = 65534/2.8639e-05 = 2288278222 bytes/sec

Ratio of throughput(s/r) = 32.02.

USB:

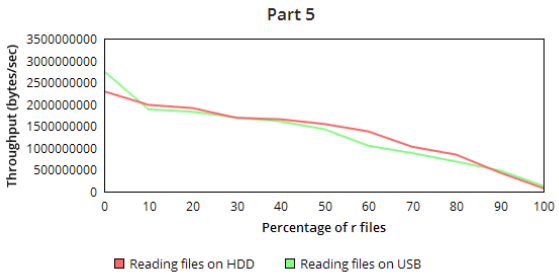
- Average time to read r files - 1.6527e-05
- Average time to read s files - 2.393e-05
- Throughput for r(random) files = 2048/1.6527e-05 = 123918436.498 bytes/sec
- Throughput for s(sequential) files = 65534/2.393e-05 = 2738570831.59 bytes/sec

Ratio of throughput(s/r) = 22.09.

Observations:

- The throughput is higher for reading sequential files than random files in both the cases. The reason should be that random files require more disk seeks than the sequential accesses of files, thus resulting in lower throughput.
- The ratio of throughput is also more for hard disk than USB. USBs do not have to perform disk seeks in order to access random files thus increasing the throughput of random files significantly, and reducing the ratio.

3.2 Part 5



- As expected, with the increase in the percentage of the random files, the throughput for reading files decreases.
- For USB too, we observe a similar trend as part 1 and 2. USB performs better than hard disk in terms of reading random files. This is because of no disk seeks in USBs.

4 Writing files

4.1 Part 3,4

Hard disk:

- Average time to write r files - 0.009577596 sec
- Average time to write s files - 0.312562838 sec
- Throughput for r(random) files = (2048)/0.009577596 = 22159.87 bytes/sec
- Throughput for s(sequential) files = (65534)/0.312562838 = 175165.71 bytes/sec

Ratio of throughput(s/r) = 7.90.

USB:

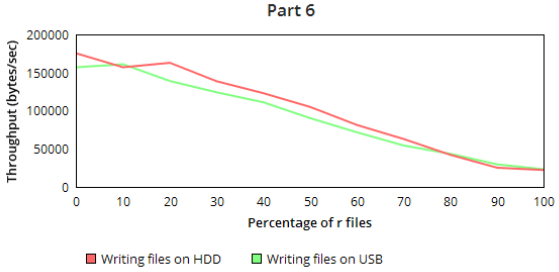
- Average time to write r files - 0.00962596 sec
- Average time to write s files - 0.309611587 sec
- Throughput for r(random) files = 2048/0.00962596 = 23083.01 bytes/sec
- Throughput for s(sequential) files = 65534/0.309611587 = 156900.70 bytes/sec

Ratio of throughput(s/r) = 6.79.

Observations:

- The throughput is higher for writing sequential files than random files in both the cases. The reason should be that random files require more disk seeks than the sequential accesses of files, thus resulting in lower throughput.
- The ratio of throughput is more for hard disk than USB. USBs do not have to perform disk seeks in order to access random files thus increasing the throughput of random files significantly, and reducing the ratio.

4.2 Part 6



- As expected, with the increase in the percentage of the random files, the throughput for writing files decreases. The reason is obvious, that it requires more disk seeks.
- For writes, hard disk performs better than USB, since writes are very slow on USB.