CSC443 Assignment 1

I experiment writing and reading a 50 MB file consists of random characters.

And used 10 different block size ranging from 100b to 3MB to test the writing speed. And I did 5 tests for each block size

Block size:

100B   512B   1KB   4KB   64KB
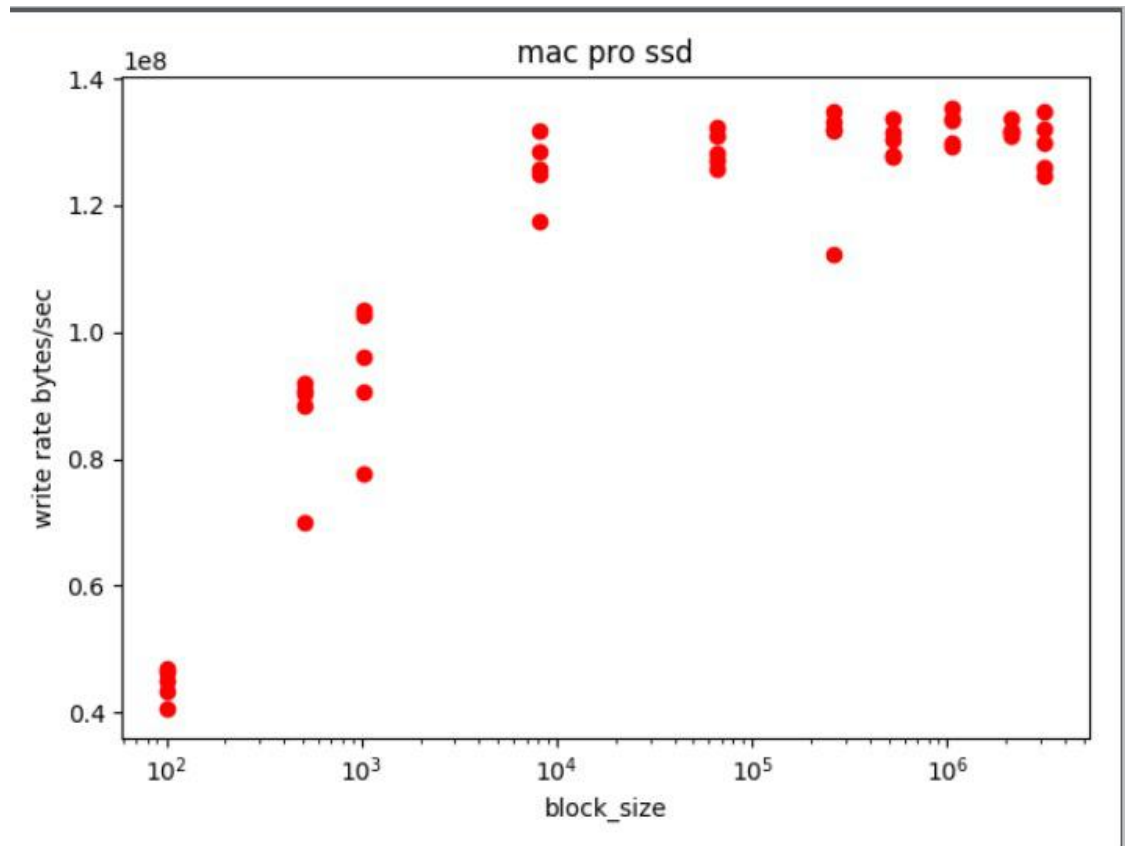
256KB 512KB 1MB   2MB   3MB

type "make" in console to make executable : `create_random_file get_histogram`

And type "python3 write_random_file.py" in console to see the write rate printed out for all block sizes

type "python3 read_random_file.py" in console to see the read rate printed out for all block sizes

1 Writing rate experiment
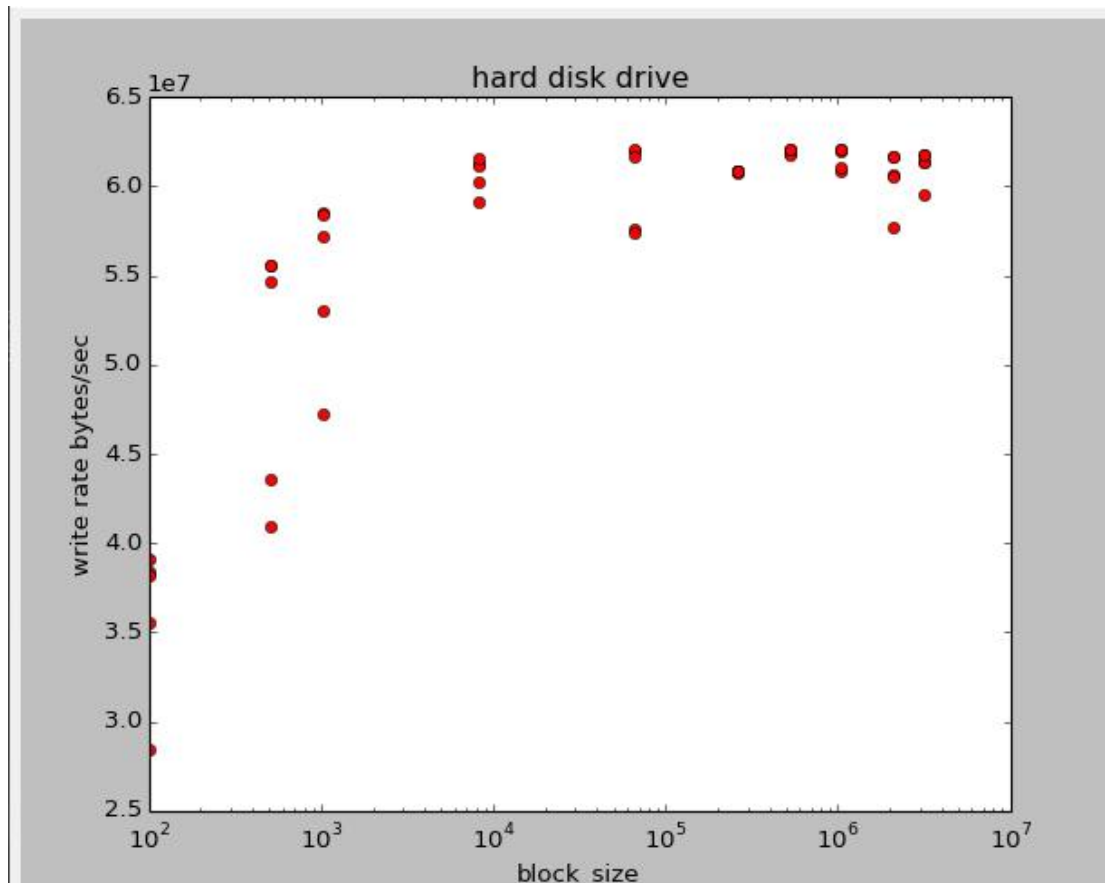
1.1 writing to mac pro SSDs

Observation:

The writing rate keeps increasing until block size reaches 4KB.

The peak writing rate is about 130MB/second after 4KB block size.

The reason is that if the block size is smaller than SSDs page size, then it is inefficient since the same page has to be loaded into memory multiple times. So the optimum block size would probably be the page size of the SSDs which is 4KB in this case.
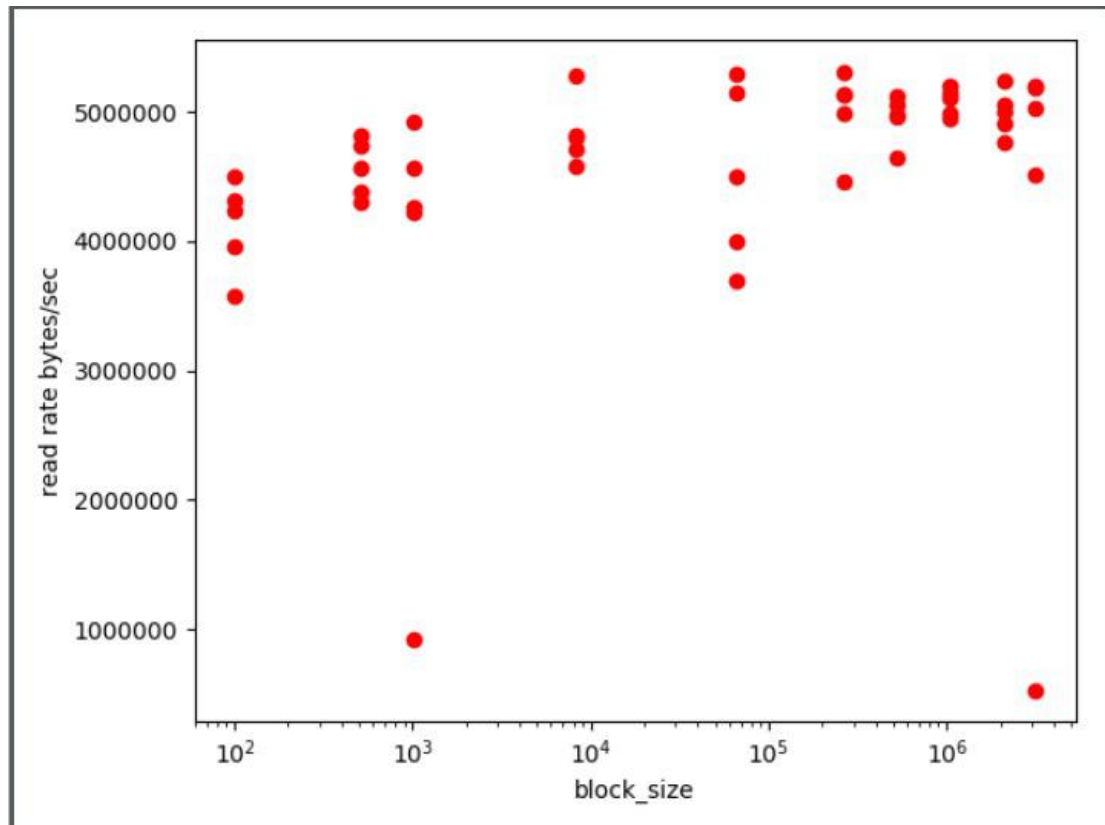
1.2 writing to my desktop hard disk drive

Observation:

The writing rate keeps increasing until block size reaches about 256KB. The peak writing rate is about 62MB/second. we see that longer sequence of bytes tend to have more stable and better behavior since short writes might require more seeks and rotations for the hard disk drive.

1.3 writing to USB 2.0

Observation:

The writing rate changes very little as block size getting bigger. The peak writing rate is about 4.5MB/second. It is possible that writes are always buffered to a specific size. So block size does not matter much. So there is no optimum block size.
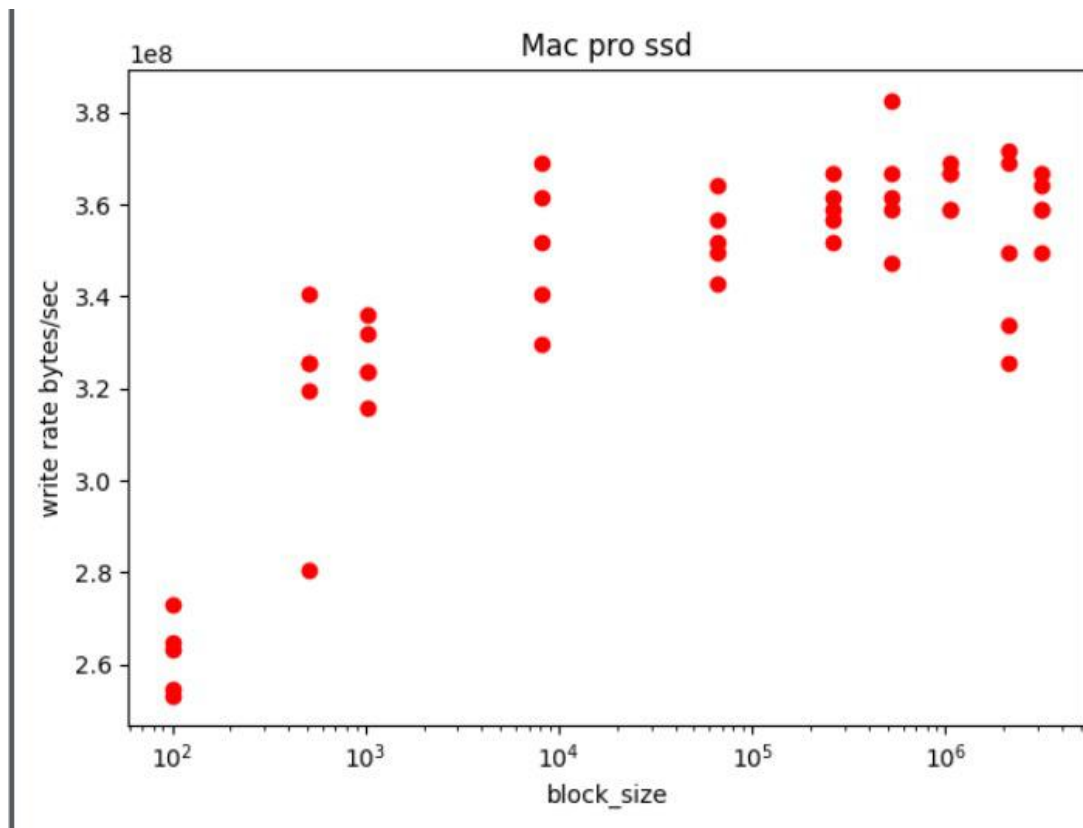
Compare:

Writing rate is low for both SSDs and Hard disk drives when block size is very small. Writing on USB is significantly slower then SSDs and Hard disk drives.

SSDs writes faster than hard disk drives.

And the optimum block size for SSDs is smaller than that for hard disk drives.

2 Reading rate experiment

*2.1 reading from mac pro SSDs*

Observation:

The writing rate keeps increasing until block size reaches 4KB.

The average peak writing rate is about 360MB/second after 4KB block size.

The reason is that if the block size is smaller than SSDs page size, then it is inefficient since the same page has to be loaded into memory

multiple times. So the optimum block size would probably be the page size of the SSDs which is 4KB in this case.

2.2 reading from my desktop hard disk drive
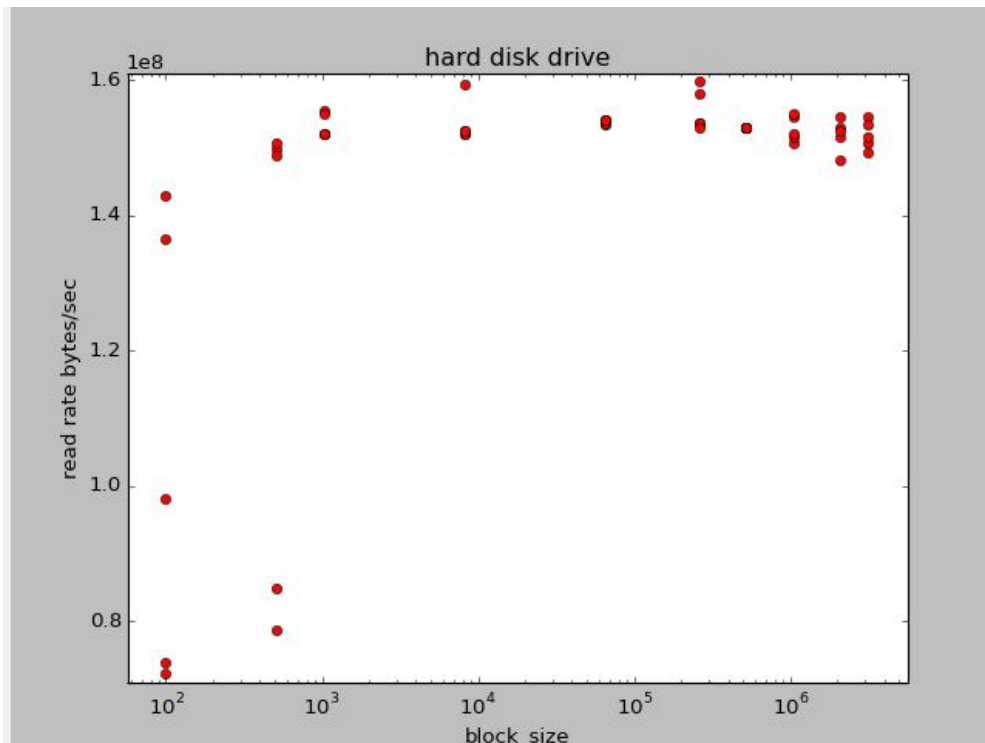
Observation:

The writing rate keeps increasing until block size reaches about 256KB. The peak writing rate is about 150MB/second. we see that longer sequence of bytes tend to have more stable and better behavior since short reads might require more seeks and rotations for the hard disk drive. The optimum block size could be large as 256KB

2.3 reading on USB 2.0
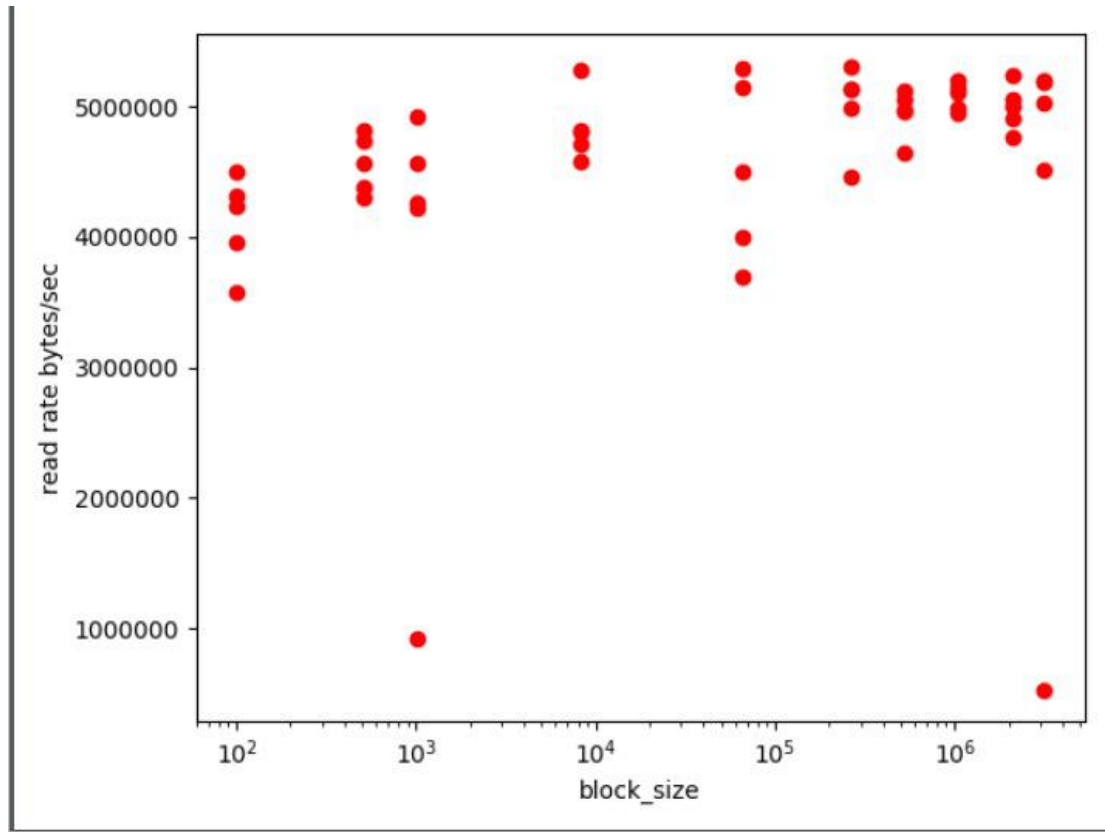
Observation:

The reading rate changes very little as block size getting bigger. The peak writing rate is about 5MB/second. It is possible that reads are always buffered to a specific size. So block size does not matter much and there is no optimum block size.

Compare:

Reading rate is low for both SSDs and Hard disk drives when block size is small. Reading on USB is significantly slower.

But SSDs reads faster than hard disk drives.

And the optimum block size for SSDs is smaller than that for hard disk drives.