

## CSC112 section-C Lab 6

### Sort algorithm analysis

Yasuhiro Nakae

#### Bubble sort:

The result shows the execution time increase exponentially as the data set becomes larger. When the data set is 10K, the execution time is around 900ms. When the data set is 20K, the execution time is around 3600ms. We then discover that as the data set increases to the twice of the original(10K to 20K), the root of the execution time also increase the the twice of the original(30 to 60). Therefore, it perfectly fits  $O(n^2)$ . Although optimized code was taken, we did not see drastic decrease in execution time.

#### Merge sort:

The result shows the execution time increase logarithmically as the data set becomes larger. When the data sets changed from 10K to 20K, the execution time changed from 50 to 133. We see the root of execution time increase around 5 as the data set increase 10K. Therefore, we can conclude that merge the time complexity is expressed by

$$T(n) = 2T(n/2) + O(n) \quad \text{or} \quad T(n) = \log N$$

Where  $2T(n/2)$  corresponds to the time separating to small array and  $O(n)$  corresponds to the time merge the entire array. The average  $O(n)$  will be  $n(\log n)$ .