

Christopher Lewis
PA4: Matrix Multiplication
(Date: To be declared)

Table of Contents

Introduction: 2

Project structure: 2

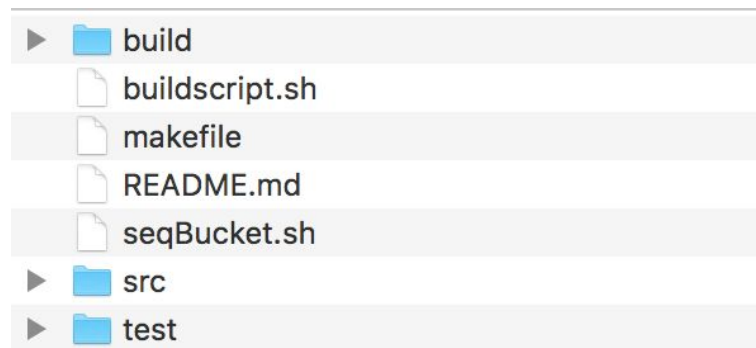
Sequential Execution: 3 - 4

Overview:

Project 4 requires that I look at matrix multiplication both sequentially and how it looks when parallelized. This is important because matrix multiplication is a N^3 operation so over time the runtime will increase very fast when ran sequentially. Below is a thorough analysis of the sequential and parallel portions of this project.

Project Layout:

Below is the structure of the project.



Inside **build** you will find a script that will be called using **sbatch** below is a sample of what will be found inside the script(s).

Sequential Script

```
#!/bin/bash
#SBATCH -N1
#SBATCH -n1
#SBATCH --time=00:40:00
#SBATCH --mail-user=christopherlewis@nevada.unr.edu
for (( a=100; a<=2700; a+=100 ))
do
    srun seqMatrix $a seqMatrixTimed.txt
done
```

Parallel Script (Will add later)

Sequential Bucket-Sort

Sequential matrix multiplication is an operation that starts with three dynamically allocated two dimensional arrays of the same size (a, b, and c) and will multiply matrix a with matrix b and will place the result in c. The runtime for each operation is displayed below in table 1 and the graph is displayed in figure 1.

100	0.002554
200	0.01719
300	0.053221
400	0.153108
500	0.348994
600	1.440536
700	3.249776
800	4.982005
900	8.272502
1000	12.442264
1100	17.744076
1200	24.0098
1300	31.461668
1400	40.537735
1500	50.422523
1600	62.061611
1700	75.282082
1800	89.908958
1900	108.164139
2000	125.075066
2100	146.303238
2200	168.79129
2300	215.459198
2400	223.854843
2500	254.842773
2600	292.553833
2700	356.168152

Table 1: In the table above, right column is the time and the left is the matrix size.

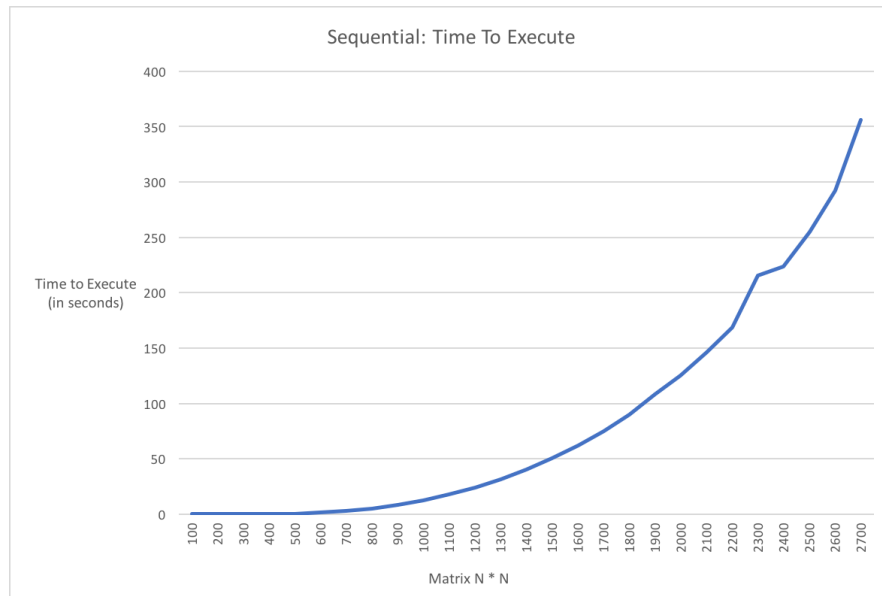


Figure 1: In the graph above, the X-Axis is the size of the data set and the Y-Axis is the time taken to execute. As the numbers get larger, so does the execution time in an N^3 fashion.

Parallel Bucket-Sort

Parallel Bucket Sort is a little different from sequential. The parallel program will treat each processor as its own group of cells.