Assignment 3 Report:

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| **Test** | **Average Time (Over 5 Runs) (Milliseconds)** | | | |
| **Base Single-Threaded** | **Base Multi-Threaded (i.e. Ass1 Solution)** | **Multi-Threaded SIMD (i.e. Ass2 Solution)** | **Stage 4 OpenCL** |
| cornell 1024x1024x1 | 1016ms | 232ms | 203ms | 193ms |
| cornell 1024x1024x4 | 14426ms | 3450ms | 3281ms | 628ms |
| cornell 500x300x1 | 127ms | 29ms | 28ms | 181ms |
| cornell-256lights 512x512x1 | 23830ms | 5625ms | 2500ms | 762ms |
| allmaterials 1024x1024x1 | 303ms | 96ms | 87ms | 175ms |
| 5000spheres 960x540x1 | 19857ms | 4843ms | 1418ms | Error: Triangle container null |
| bunny500.txt 1024x1024x1 | 23107ms | 4118ms | 559ms | Error: Sphere container null |
| bunny10k.txt 256x256x1 | 40931ms | 7862ms | 862ms | Error: Sphere container null |

From the table of above, it shows third test is slower than other. It is because CPU power is stronger than GPU. When the calculate volume stay a low level, CPU will faster than GPU output. While, if the calculate volume reach a special level, the speed of GPU calculate will be faster than other.

Sixth, seventh and eighth test shows error. It should because the triangle contain or sphere container of scene is null. It means GPU require exception access when it load data.

It has a bug in my program in stage 4, isTriangleIntersection function under isShadow function. It shows a serious shadow judgement problem.