

## CS770 – P3 Report

Shape 3D is Where all the code goes in except for matrix multiplication in cpu and gpu which is done in Scene Manager class. Below are the following performance tests I have performed and the results are carefully observed for each case.

The following functionalities are implemented in P3

1. Unshared Shared apart buffer test
2. Shared apart buffer test
3. Unshared joint buffer test
4. Shared joint buffer test
5. Unshared joint blocked buffer test
6. Unshared joint interleaved buffer test
7. Draw arrays
8. Draw elements
9. Matrix multiplication in cpu
10. Matrix multiplication in gpu
11. Three coordinates
12. Four coordinates
13. Performance compared in Mac vs Linus operating systems

Below are the performance measures which I observed with the different buffer tests. Each measure is observed carefully by repeated number of iterations.

### Required Tests

#### I. Unshared apart test vs Shared apart test

Code :- bua.da.mc vs bsa.da.mc

CATEGORY	bua.da.mc	bsa.da.mc	bua.da.mc	bsa.da.mc
NO OF OBJECTS	1000	1000	5000	5000
SCENE CREATION TIME	0.107	0.076	0.37	0.214
INITIAL REDRAW	0.185	0.063	0.435	0.175
AVERAGE REDRAW	0.0046	0.0039	0.0190	0.0156
FRAME RATE	203.667	241.000	52.333	63.000

#### Description:

It is clear from the above table that; shared apart buffer test shows better performance than the Unshared apart buffer test. In case of 1000 objects shared buffer test performs considerably very faster than the unshared buffer test.

#### II. Unshared Shared joint test vs Shared joint test

Code:- buj.da.mc vs bsj.da.mc

CATEGORY	buj.da.mc	bsj.da.mc	buj.da.mc	bsj.da.mc
NO OF OBJECTS	1000	1000	5000	5000
SCENE CREATION TIME	0.19	0.16	0.648	0.208
INITIAL REDRAW	0.165	0.13	0.747	0.184
AVERAGE REDRAW	0.0100	0.0072	0.0409	0.0174
FRAME RATE	104.333	156.333	24.000	65.333

*Description:*

Shared joint buffer tests resulted in higher performance than the unshared joint. In case of 1000 objects the results were observed to be little bit similar in case of performance when the no of objects is changed to 5000, the shared joint test performance is way higher than the unshared joint test.

### III. Unshared apart using draw elements vs shared apart using draw elements

Code: - bua.de.mc vs bsa.de.mc

CATEGORY	bua.de.mc	bsa.de.mc	bua.de.mc	bsa.de.mc
NO OF OBJECTS	1000	1000	5000	5000
SCENE CREATION TIME	0.119	0.079	0.402	0.226
INITIAL REDRAW	0.123	0.062	0.702	0.182
AVERAGE REDRAW	0.0082	0.0050	0.0239	0.0177
FRAME RATE	117.000	204.000	44.333	67.333

*Description:*

When using the draw elements along with the shared and unshared apart buffers the performance with the shared apart is found to be considerably faster than the unshared apart. Usage of draw elements provided considerably same performance like the draw arrays.

### IV. shared apart with matrix multiplication in cpu vs shared joint with matrix multiplication in gpu.

Code: -bsa.da.mc vs bsj.da.mg

CATEGORY	bsa.da.mc	bsj.da.mg	bsa.da.mc	bsj.da.mg
NO OF OBJECTS	1000	1000	5000	5000
SCENE CREATION TIME	0.073	0.078	0.222	0.249

INITIAL REDRAW	0.07	0.067	0.189	0.217
AVERAGE REDRAW	0.0065	0.0052	0.0186	0.0174
FRAME RATE	225.667	182.333	58.000	63.667

Description: -

As we can see that performance of shared apart with cpu multiplication is faster than the shared joint with matrix multiplication in gpu in case of 1000 object however when the no of objects is increased to 5000, the shared joint buffer with matrix multiplication in gpu is faster than the shared apart with matrix in cpu.

### Optional Tests

#### V. Shared joint with draw arrays three coordinates vs shared apart with draw arrays four coordinates

Code: -bsj.da.mc.c3 vs bsa.da.mc.c4

CATEGORY	bsj.da.mc.c3	bsa.da.mc.c4	bsj.da.mc.c3	bsa.da.mc.c4
NO OF OBJECTS	1000	1000	5000	5000
SCENE CREATION TIME	0.078	0.077	0.233	0.227
INITIAL REDRAW	0.066	0.064	0.201	0.189
AVERAGE REDRAW	0.0039	0.0049	0.0141	0.0154
FRAME RATE	245.333	234.667	70.333	64.333

Description: -

The c4 coordinates is observed to be slower this may be because c3 is used with shared joint and c4 is used with shared apart. Technically bsj with c3 is observed to be faster than c4. I observed that there is not a much difference between the three and four coordinates.

#### VI. Shared joint with draw arrays three coordinates vs shared apart with draw arrays four coordinates compared with linux systems and mac systems

Code: Bsa.da.mc.c3 vs Bsa.da.mc.c4

*Mac: -*

CATEGORY	bsj.da.mc.c3	bsa.da.mc.c4	bsj.da.mc.c3	bsa.da.mc.c4
NO OF OBJECTS	1000	1000	5000	5000

SCENE CREATION TIME	0.078	0.077	0.233	0.227
INITIAL REDRAW	0.066	0.064	0.201	0.189
AVERAGE REDRAW	0.0039	0.0049	0.0141	0.0154
FRAME RATE	245.333	234.667	70.333	64.333

***Linux: -***

CATEGORY	bsj.da.mc.c3	bsa.da.mc.c4	bsj.da.mc.c3	bsa.da.mc.c4
NO OF OBJECTS	1000	1000	5000	5000
SCENE CREATION TIME	0.063	0.061	0.185	0.182
INITIAL REDRAW	0.018	0.017	0.047	0.044
AVERAGE REDRAW	0.0040	0.0039	0.0177	0.0172
FRAME RATE	248.333	248.667	57.000	58.333

Considerably performance in Linux was better than Mac OS. I observed that initial redraw and the average scene creation time is very fast in linux compared to the mac whereas the frame rate is slower in linux than the mac. When creating more than 10,000 objects too the frame rate of mac is faster than the linux.

**VII. Shared joint with blocked, draw arrays, matrix in cpu, 3 coordinates VS  
Share joint with interleaved, draw arrays, matrix in cpu, 4 coordinates**

bsj.ab.da.mc.c4 vs bsj.ab.da.mc.c4

CATEGORY	bsj.ab.da.mc.c4	bsj.ai.da.mc.c4
NO OF OBJECTS	1000	1000
SCENE CREATION TIME	0.083	0.131
INITIAL REDRAW	0.064	0.07
AVERAGE REDRAW	0.0040	0.0042
FRAME RATE	174.667	222.667

Description: - When combining all the five coordinates along with the shared joint blocked and the interleaved , I observed that the performance is better with the interleaved whereas there is less performance when usage of blocked with shared joint buffer test.

**VIII. Shared joint with blocked, using draw arrays, matrix mul in gpu, with c4 VS  
Share apart with draw elements, matrix mul in gpu, with c4**

Code: - Bsj.ab.da.mg.c4 vs Bsa.de.mg.c4

CATEGORY	Bsj.ab.da.mg.c4	Bsa.de.mg.c4
NO OF OBJECTS	1000	1000
SCENE CREATION TIME	0.083	0.074
INITIAL REDRAW	0.068	0.068
AVERAGE REDRAW	0.0039	0.0038
FRAME RATE	244.667	245.000

Description: - On comparing both the ends the result was almost same with share joint and shared apart even though using with coordinates 4 and multiplication in gpu. The difference would be better observed when providing larger objects. When ran with 10,000 objects the bsj frame rate was little bit ahead of bsa, but still it's almost same. So, there is no actually performance measure in this case.

**Conclusion**

Thus the various performance measures have observed with different buffer tests and the results are tabulated effectively in the table respectively.