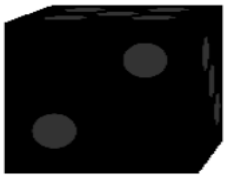
Project Report

3D Cubes



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Major: Computer Science

Sem: 4

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Part one:

Introduction:

Computer Graphics were invented and developed to mainly make a representation of the real-world environments and objects by making a mathematical abstraction of it to manipulate it due to the interval real world variables like (motion, lighting, perspectives, projections, materials ...etc.)

Objective:

The main objectives of this Graphical simulation are:

- Create a real-world 3d simulation of a dice.
- Make the dice move in different ways like if is thrown.
- Make a simple lighting on the dice.

Limitation:

Here are some limits of the simulation.

- Lighting is only (diffuse) there is not any (Specular areas).
- Can not control the rotation of the cubes with keys.

Used software:

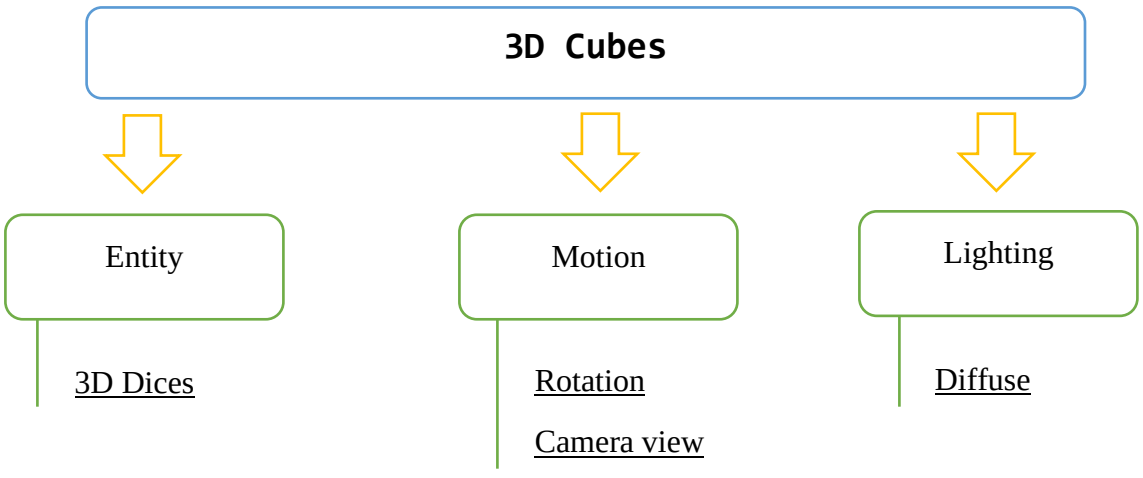
- Java

Used Libraries:

- slick-util.
- lwjgl_util.
- lwjgl.

Part two:

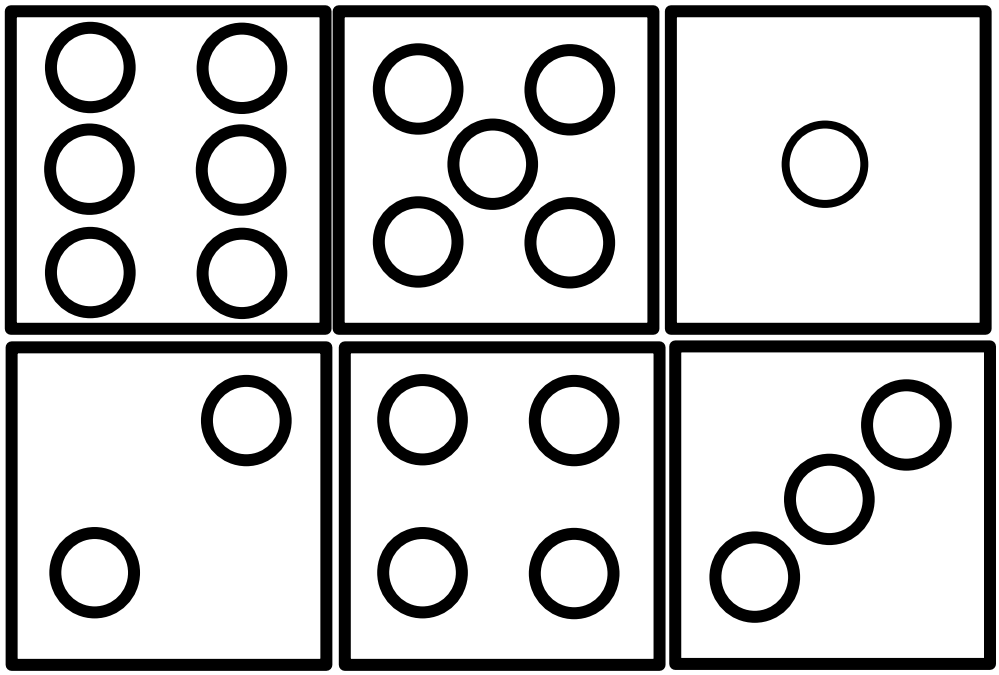
Simulation Architecture:



General definition:

Entity:

6 images of different dots assembled in the form of a cube to represent the dice faces



Motion:

Giving movement to the dice entity by:

- Rotation on different axis's(X,Y,Z).
- Camera movement which can be controlled by the following keys:

```
KEY_W : move in the direction of z+  Forward
KEY_D : move in the direction of x-  Right
KEY_A : move in the direction of x+  Left
KEY_S : move in the direction of z-  Backward
KEY_E : move in the direction of y-  Down
KEY_Q : move in the direction of y+  Up
```

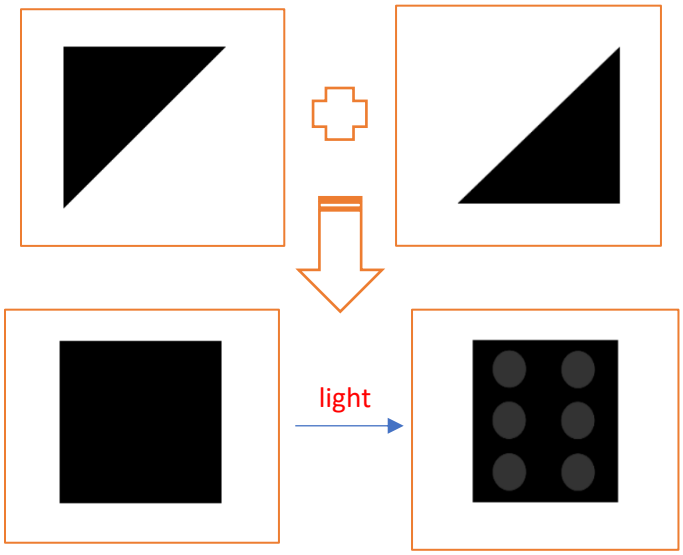
Lighting:

Diffuse lighting can be turned on by pressing the `KEY_L`
(if it is not turned on , the dice entity will remain dark with out any dots visible to the eye)

Part four:

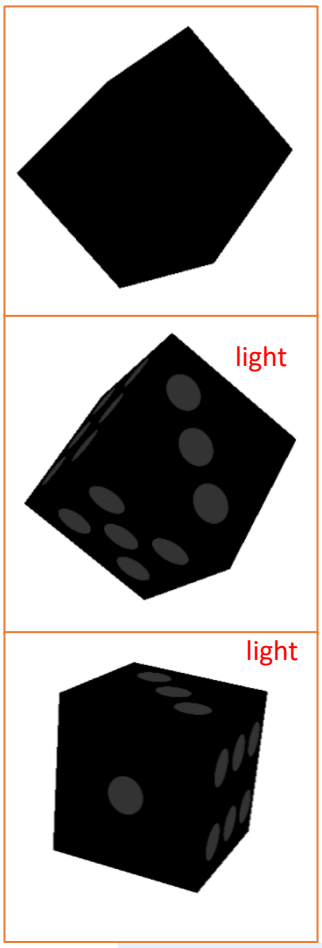
Simulation :

1 dice face:




```
vertice = {0.5f,0.5f,0,
           -0.5f,-0.5f,0,
           0.5f,-0.5f,0,
           0.5f,0.5f,0}

textureCoord= {0,0,
               0,0.6f,
               0.6f,0.6f,
               0.6f}

indice  = {0,1,3,
           3,1,2};
```

1 cube :




```
indice1 = {
          0,1,3,
          3,1,2, };

indice2 = {
          4,5,7,
          7,5,6,};

indice3 = {
          8,9,11,
          11,9,10,};

indice4 = {
          12,13,15,
          15,13,14,};

indice5 = {
          16,17,19,
          19,17,18,};

indice6 = {
          20,21,23,
          23,21,22};
```

```
textureCoord1= {0,0,
                0,0.6f,
                0.6f,0.6f,
                0.6f,0,

                0,0,
                0,0.6f,
                0.6f,0.6f,
                0.6f,0,

                0,0,
                0,0.6f,
                0.6f,0.6f,
                0.6f,0,

                0,0,
                0,0.6f,
                0.6f,0.6f,
                0.6f,0,

                0,0,
                0,0.6f,
                0.6f,0.6f,
                0.6f,0,

                0,0,
                0,0.6f,
                0.6f,0.6f,
                0.6f,0};
```

```
vertice1 = {
-0.5f,0.5f,0,
-0.5f,-0.5f,0,
0.5f,-0.5f,0,
0.5f,0.5f,0,

-0.5f,0.5f,1,
-0.5f,-0.5f,1,
0.5f,-0.5f,1,
0.5f,0.5f,1,

0.5f,0.5f,0,
0.5f,-0.5f,0,
0.5f,-0.5f,1,
0.5f,0.5f,1,

-0.5f,0.5f,0,
-0.5f,-0.5f,0,
-0.5f,-0.5f,1,
-0.5f,0.5f,1,

-0.5f,0.5f,1,
-0.5f,0.5f,0,
0.5f,0.5f,0,
0.5f,0.5f,1,

-0.5f,-0.5f,1,
-0.5f,-0.5f,0,
0.5f,-0.5f,0,
0.5f,-0.5f,1 };
```

Rotation by`(1, 0.5f, 0.5f)`

3 Cubes:

```
indice1 = {             textureCoord1= {0,0,
            0,1,3,                     0,0.6f,
            3,1,2, };                  0.6f,0.6f,
                                       0.6f,0,

indice2 = {                            0,0,
            4,5,7,                     0,0.6f,
            7,5,6,};                   0.6f,0.6f,
                                       0.6f,0,

indice3 = {                            0,0,
            8,9,11,                    0,0.6f,
            11,9,10,};                 0.6f,0.6f,
                                       0.6f,0,

indice4 = {                            0,0,
            12,13,15,                  0,0.6f,
            15,13,14,};                0.6f,0.6f,
                                       0.6f,0,

indice5 = {                            0,0,
            16,17,19,                  0,0.6f,
            19,17,18,};                0.6f,0.6f,
                                       0.6f,0,

indice6 = {                            0,0,
            20,21,23,                  0,0.6f,
            23,21,22};                 0.6f,0.6f,
                                       0.6f,0};
```

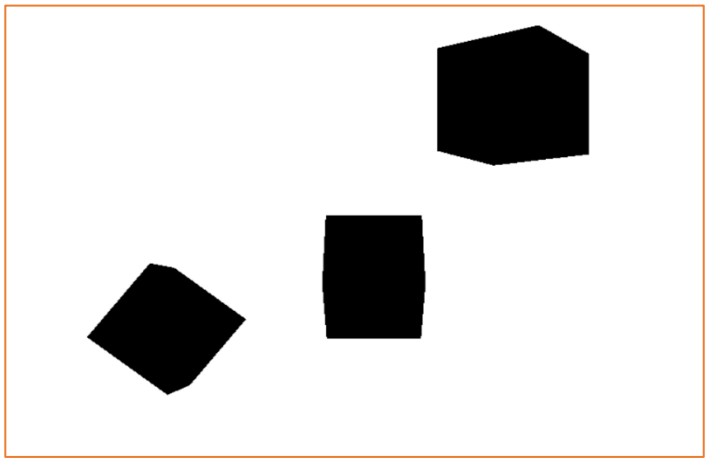
```
Left cube = {
-2f,-1f,0,
-2f,-2f,0,
-1f,-2f,0,
-1f,-1f,0,

-2f,-1f,1,
-2f,-2f,1,
-1f,-2f,1,
-1f,-1f,1,

-1f,-1f,0,
-1f,-2f,0,
-1f,-2f,1,
-1f,-1f,1,

-2f,-1f,0,
-2f,-2f,0,
-2f,-2f,1,
-2f,-1f,1,

-2f,-1f,1,
-2f,-1f,0,
-1f,-1f,0,
-1f,-1f,1,

-2f,-2f,1,
-2f,-2f,0,
-1f,-2f,0,
-1f,-2f,1};
```

```
Mid cube = {
-0.5f,0.5f,0,
-0.5f,-0.5f,0,
0.5f,-0.5f,0,
0.5f,0.5f,0,

-0.5f,0.5f,1,
-0.5f,-0.5f,1,
0.5f,-0.5f,1,
0.5f,0.5f,1,

0.5f,0.5f,0,
0.5f,-0.5f,0,
0.5f,-0.5f,1,
0.5f,0.5f,1,

-0.5f,0.5f,0,
-0.5f,-0.5f,0,
-0.5f,-0.5f,1,
-0.5f,0.5f,1,

-0.5f,0.5f,1,
-0.5f,0.5f,0,
0.5f,0.5f,0,
0.5f,0.5f,1,

-0.5f,-0.5f,1,
-0.5f,-0.5f,0,
0.5f,-0.5f,0,
0.5f,-0.5f,1 };
```

```
Right cube = {
1.5f,2.5f,0,
1.5f,1.5f,0,
2.5f,1.5f,0,
2.5f,2.5f,0,

1.5f,2.5f,1,
1.5f,1.5f,1,
2.5f,1.5f,1,
2.5f,2.5f,1,

2.5f,2.5f,0,
2.5f,1.5f,0,
2.5f,1.5f,1,
2.5f,2.5f,1,

1.5f,2.5f,0,
1.5f,1.5f,0,
1.5f,1.5f,1,
1.5f,2.5f,1,

1.5f,2.5f,1,
1.5f,2.5f,0,
2.5f,2.5f,0,
2.5f,2.5f,1,

1.5f,1.5f,1,
1.5f,1.5f,0,
2.5f,1.5f,0,
2.5f,1.5f,1 };
```

Right cube = Translation of Mid cube by `(2,2)`

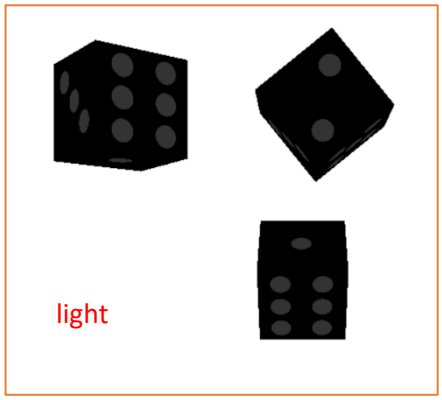
Left cube = Translation of Right cube by `(-3.5,-3.5)`

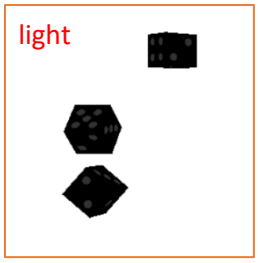


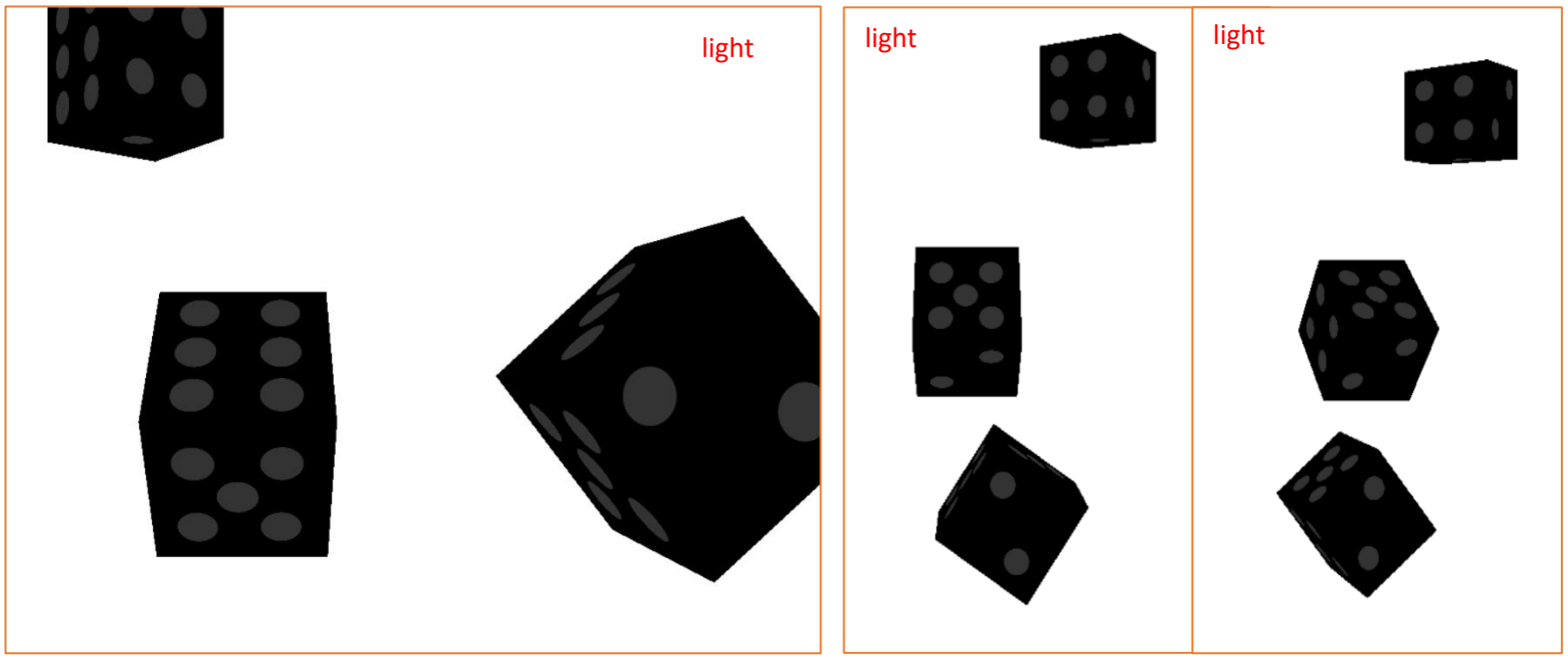
Mid cube Rotates on the x axis `(1, 0, 0)`

Right cube Rotates on the y axis `(0, 1, 0)`

Left cube Rotates on the z axis `(0, 0, 1)`







Part five:

Conclusion:

3d cubes (dices movement simulation) is actually a powerful software which calculates and processes a lot of mathematical variables to output such a beautiful representation of a real world entity made of simple images and prepectives.

This simulation was created by CS.TEAM if you would like to contact us for more details here is the available email: cs.team@gmail.com. we will be pleasure to hear your opinion and answer your questions.

Thank you.