Teapot Hierarchy

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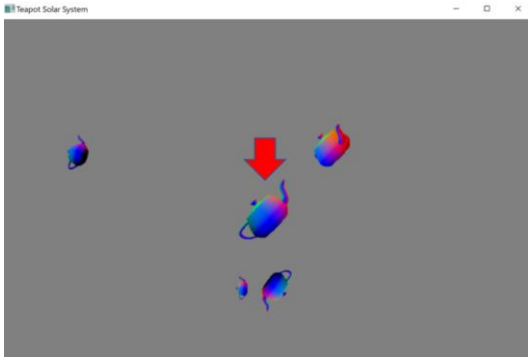
Root Teapot

The project presented consists of five teapots in a design based our solar system. The root teapot acts as “the sun” about which all the other teapots rotate.

As the root of the hierarchy it is oriented in global space.

It is translated upwards when the “x” key is pressed. When it is translated all of the other teapots undergo an equal transformation



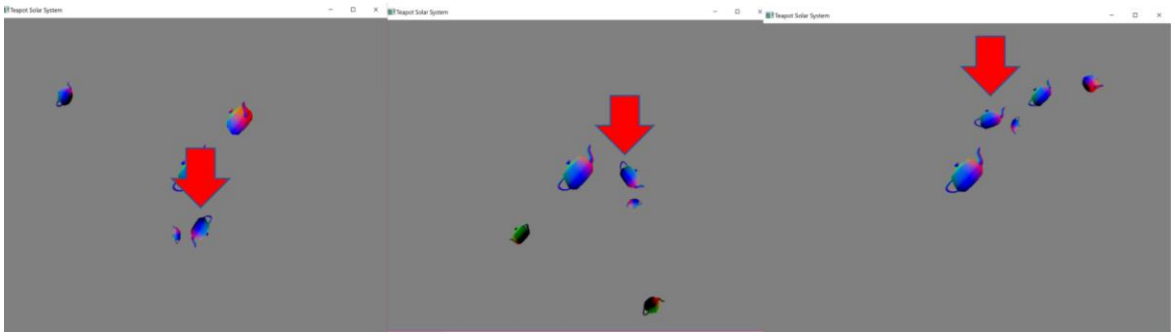
```
// Root of the Hierarchy
mat4 view = identity_mat4 ();
mat4 persp_proj = perspective(45.0, (float)width/(float)height, 0.1, 100.0);
mat4 local1 = identity_mat4 ();
local1 = rotate_z_deg (local1, 45.0f);
local1 = translate (local1, vec3 (0.0, 0.0, -75.0f));

local1 = translate(local1, vec3(0.0, roottranslate, 0.0f));


// for the root, we orient it in global space
mat4 global1 = local1;
// update uniforms & draw
glUniformMatrix4fv (proj_mat_location, 1, GL_FALSE, persp_proj.m);
glUniformMatrix4fv (view_mat_location, 1, GL_FALSE, view.m);
glUniformMatrix4fv (matrix_location, 1, GL_FALSE, global1.m);
glDrawArrays (GL_TRIANGLES, 0, teapot_vertex_count);
```

Teapot Number Two

Teapot number two rotates about the x axis of the root. This is achieved by translating away from the root before rotating about its axis

As a child of the root its global is gotten by multiplying its local by the global of the root.

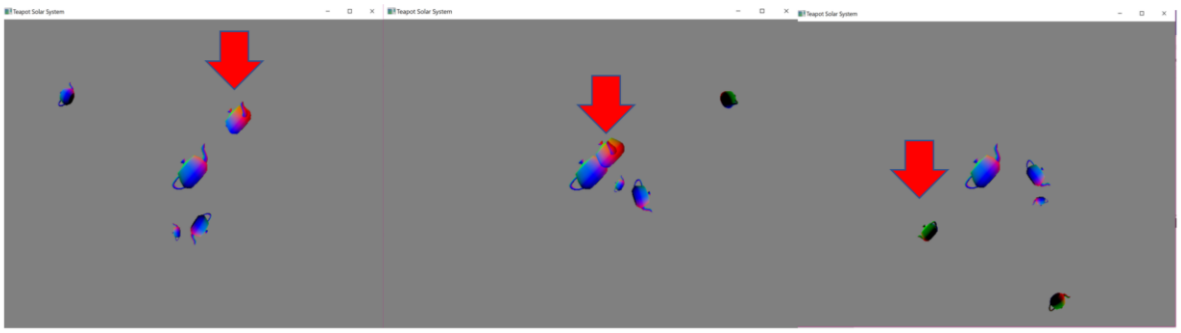
```
// child1 of hierarchy
mat4 local2 = identity_mat4 ();
local2 = translate (local2, vec3 (8.0, 8.0, 0.0));
local2 = rotate_z_deg(local2, rotatez/10);
local2 = local2*Smat1*Smat1;

// global of the child is got by pre-multiplying the local of the child by the global of the parent
mat4 global2 = global1*local2;
// update uniform & draw
glUniformMatrix4fv (matrix_location, 1, GL_FALSE, global2.m);
glDrawArrays (GL_TRIANGLES, 0, teapot_vertex_count);
```



Teapot Number Three

Teapot number three rotates about the y axis of the root. It passes in front of and behind the root as it rotates giving the overall structure more of an interesting 3D effect.

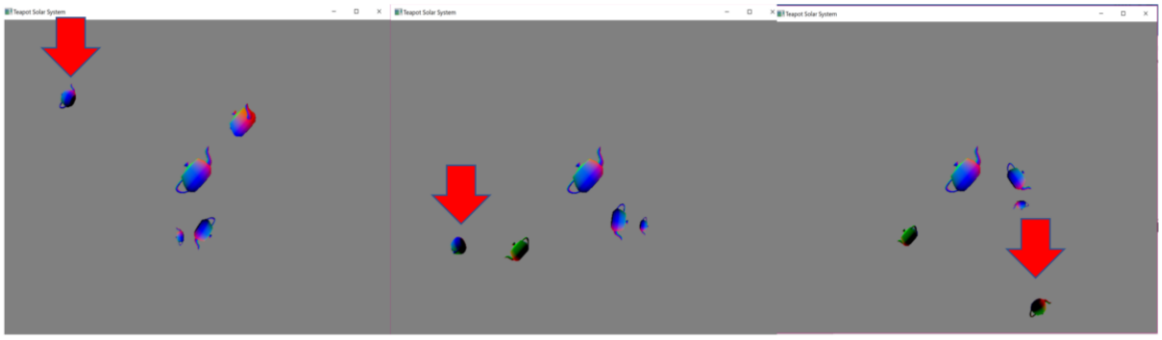
```
// child2 of hierarchy
mat4 local3 = identity_mat4();
local3 = translate(local3, vec3(22.0, 0.0, 0.0));
local3 = rotate_y_deg(local3, -rotatez / 30);
local3 = local3*Smat1*Smat1;
mat4 global3 = global1*local3;

// update uniform & draw
glUniformMatrix4fv(matrix_location, 1, GL_FALSE, global3.m);
glDrawArrays(GL_TRIANGLES, 0, teapot_vertex_count);
```



Teapot Number Four

Teapot number four takes the widest rotation about the root. It also rotates about its own y axis. This is achieved by first rotating about the y axis, then translating and then rotating about the z axis thus the z axis rotation occurs about the root

```
// child4 of hierarchy
mat4 local5 = identity_mat4();
local5 = rotate_y_deg(local5, rotatez / 5);
local5 = translate(local5, vec3(0.0, 30.0, 0.0));
local5 = rotate_z_deg(local5, rotatez/2.5);
local5 = local5*Smat2;
mat4 global5 = global1*local5;
```

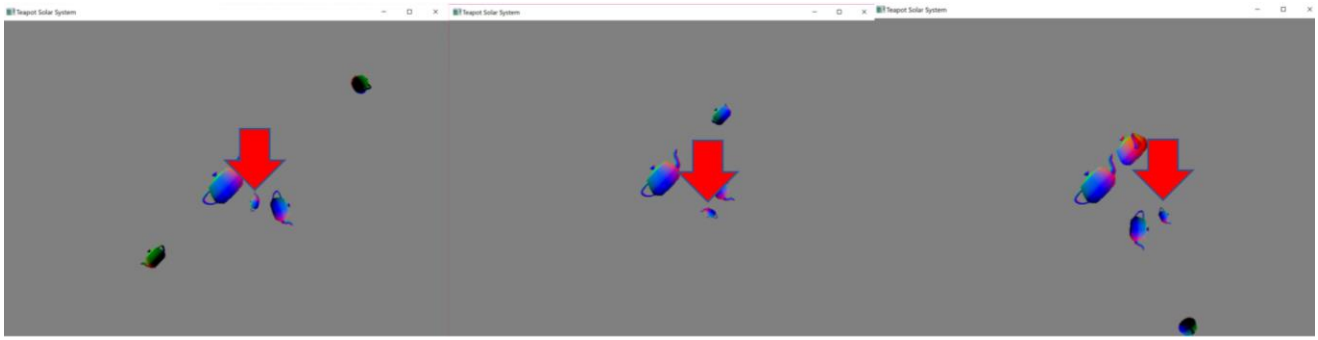


Teapot Number Five

Teapot number five fulfils the one to one requirement of the assignment. It is a child of is teapot number two. They have a one to one relationship. It rotates about teapot twos z axis. It is designed to look like its “moon”.

As a child of pot two its global is gotten by multiplying its local by teapot twos global.

```
// child of pot 2
mat4 local4 = identity_mat4();
local4 = translate(local4, vec3(0.0, 8.0, 0.0));
local4 = rotate_z_deg(local4, rotatez / 2);
local4 = local4*Smat2;

mat4 global4 = global2*local4;

// update uniform & draw
glUniformMatrix4fv(matrix_location, 1, GL_FALSE, global4.m);
glDrawArrays(GL_TRIANGLES, 0, teapot_vertex_count);
```


Teapot Solar System
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