The God Core
A Science Fiction Video Game Developed in C++

Author: Jeremy Greenburg
Mentor: Dr. Joshua Guerin
Second Reader: Bob Bradley

February 8, 2017

Contents

1 Preamble

2 Programming

2.1 The Language

2.2 APIs

2.2.1 OpenGL

OpenGL, or the Open Graphics Library, is one of the most popular graphics libraries out there. It gives access to linear algebra functions for matrix manipulation (which is important, as 3D graphics relies heavily upon matrix transformations), keyboard and mouse input, and windowing. I chose to use OpenGL over a different graphics library, such as Microsoft's DirectX, because it is open source and cross platform, which would make porting my game to a different Operating System a much easier task if I ever decide to in the future.

2.2.2 SOIL

SOIL, or the Simple OpenGL Interface Library, is a small extension to OpenGL that I picked up along the way. It is a texture library that can load .jpg and .png images and bind them to an OpenGL texture, making it very simple to incorporate such images into my game.

2.2.3 FMOD

I chose FMOD as the base for my game's audio as it is a simple, lightweight, and free to use sound API, and most other audio APIs that I looked at lacked support for MP3 files.

2.2.4 SQlite

I decided to use SQLite for my database because it is a lightweight simplified version of a SQL database, allowing the game data to be stored and embedded in the application without taking much room or take a great deal of time to perform a query.

2.3 Game Engine

I crafted the engine of my game in C++ over two years starting in my second semester sophomore year and ending the first semester of my senior year. It consists of 53 C++ files and was developed in Microsoft Visual Studio. The code can be found in the Appendix of this writeup or it can be located on GitHub at *https://github.com/Jerrgree/The-God-Core-Source*. The game can also be installed at GitHub.

2.3.1 Rectangles and Triangles

Rectangles and triangles are the two fundamental polygons that build up my game. Rectangles in particular make up the walls, floors, ceilings, doors, terminals, and most of the HUD and menu. They started as simply two arrays- one that holds all 9 (for triangles) or 12 (for rectangles) values describing the coordinates in the game that they inhabit, as well as a 4 value vector containing the objects RGBA values.

For collision purposes, when a rectangle class is expanded with the ability to calculate and store its norm and Plane equation (Form $ax + by + cz + d = 0$).

This equation is calculated using the any three corners of the rectangle (Calling them A, B, and C) as follows:

$$\vec{AB} = \begin{vmatrix} Bx - Ax \\ By - Ay \\ Bz - Az \end{vmatrix} \vec{AC} = \begin{vmatrix} Cx - Ax \\ Cy - Ay \\ Cz - Az \end{vmatrix}$$
$$a = \vec{AB}_2 * \vec{AC}_3 - \vec{AB}_3 * \vec{AC}_2$$
$$b = \vec{AB}_3 * \vec{AC}_1 - \vec{AB}_1 * \vec{AC}_3$$
$$c = \vec{AB}_1 * \vec{AC}_2 - \vec{AB}_2 * \vec{AC}_1$$
$$d = aAx + bAy + cAz$$

Formula obtained from http://keisan.casio.com/exec/system/1223596129

The norm of the plane can then be derived using the equation $\sqrt{a^2 + b^2 + c^2}$

2.3.2 In Game Terminals

In game terminals are each bound to a *terminal file*, a unique file that contains the contents of its respective terminal.

The terminal file is divided into two sections: the file names and the file contents. This is an example terminal file:

```
<FILES>
[01] Name1 -- TAG
[02] Name2 -- TAG2
[03] Name3 -- TAG3

<TAGS>
$HELP$
Type Read <num> to read the corresponding file
Type Clear to clear a file from the screen
Type Exit to exit the terminal
Type Help to see this message again
$END$

$TAG$
Content 1
$END$

$TAG2$
Content 2
$END$

$TAG3$
Content 3
$END$
```

The program parses the file by first separating the in game content (the bracketed number and name) that should be displayed to the user from it's tag. The tags are stored in an array, where its index is equal to the bracketed number. The help display is always stored at the 0th index.

Then, whenever the player types in a read command (E.G. Read 1), the program will send the terminal file and the correct tag to the text engine for the content to be displayed to the screen.

2.3.3 Triggers and Switches

Triggers are a more sophisticated way to implement interaction between two different objects. The implementation was designed to be abstracted away from object types so that, in theory, any arbitrary object could activate another, but in practice due to the few classes of objects in my game, it served as a way for terminals to power switches on.

The trigger class works by holding two void pointers, one for a triggering object and one for the target object. It also holds the object types (defined in GCTypes.h) of each object. Whenever an object is interacted with, every trigger in the game is attempted to be triggered **(trying to find better phrasing here)** and if the object is the same as the trigger pointer (no referencing needed as the pointers will always be equal), the target is dereferenced according to the appropriate type and activated.

It holds very similar function to a switch, the primary difference being that the switch is a tangible object in the game with the triggering object being itself, and the triggers being an intangible association between two objects. If I had more time in development, I would have liked to refactor much of the switch's internal functionality so that it is simply an object, with the actual interaction between the switch and it's target taking place as a trigger, but the conception and implementation of triggers came too late in development and implementing the switch change would require a good deal of code and data rewrites.

2.3.4 Camera Control

The CameraControl class is designed to control and manipulate the player's perspective as they navigate through the game. It contains two ordered triples of floating point numbers: The xyz location of the player, and the rotation along the x axis (looking left/right), the y axis (up/down), and the z axis (barrel roll). It also contains two additional floating point values, the movement speed and the turning speed.

The player can move forwards and backwards, as well as strafe left and right. To correctly formulate the player's movement, I had to envision a circle centered on the player with a radius of the player's movement speed. Based on the angle from the x and z rotation, the next place that the player move is simply a spot on the circumference of the circle based on the rotation angle, and moving forward can be derived from this formula:

$z := z \pm moveSpeed * \cos(radian(x\_angle))$

$x := x \mp moveSpeed * \sin(radian(x\_angle))$

Formula obtained from Robert De Yoso

Following that formula, it's simple to implement movement to the left, right by adding or subtracting 90°, and backwards movement by adding 180°.

Whenever OpenGL renders a new frame, the 'camera' is always returned to the origin of the map, so after drawing the level and before flushing the buffer, the Camera Control calls glTranslate to move the camera to the correct location, and then calls glRotate 3 times, once for each axis, to orient the camera in the correct direction.

2.3.5 Heads Up Display

The Heads Up Display is drawn after the level is draw, so that it overlays information to the player. It primarily is used to add a bit of flavor to the game by drawing the helmet for the player, but it also serves to display the developer console when activated.

The display also delivers a prompt to the user whenever they are in range of an object that can be interacted with.

2.3.6 2D

As multiple different objects required the ability to **2D IT UP CHANGE THIS SOON**, I extracted the ability to draw in 2D into it's own class and it was inherited whenever it was needed.

To convert OpenGL into 2D frame, I needed to first disable lighting, depth testing and depth masking. Next I pushed an *orthogonal* matrix onto OpenGL's matrix stack using the length and width of the screen so that all matrix transformations corresponded to a pixel on the screen. Re-enabeling 3D is as simple as popping the orthogonal matrix from the stack and re-enabling depth testing and masking.

2.3.7 Collision Engine

This determines when the player has collided with an object in the world. There are two types of collisions: player-object collisions and player-wall collisions.

Player object collisions are simple to detect, as both the player and the object can be placed within imaginary "bounding spheres" that extend around the player and object. Collision can be detected with this formula:

$\sqrt{(x_2 - x_1) + (y_2 - y_1) + (z_2 - z_1)} < r_2 + r_1$ If the distance between the two spheres is less than the sum of the radii of the two spheres, the they must be colliding.

Player-wall collisions were much harder to reconcile. Because walls tend to be long and thin, you can't simply place one within a bounding sphere, the resulting sphere would simply be too massive.

To rectify that, the collision is split into two phases: broad and narrow.

In the broad phase, we use the plane equation $ax + by + cz + d$ that is derived in the Rectangle section. We use the formula $\frac{ax+by+cz+d}{\sqrt{a^2+b^2+c^2}}$, where x, y, and z are the player's x, y, and z coordinates. If the resulting value is less than the radius of the player's bounding sphere, the player has hit that plane and we move onto the narrow phase.

In the narrow phase, each wall is aligned on an axis: x, y, or z. We simply take the largest and smallest values of the coordinates on that axis (for instance, if the wall is x aligned, we take the largest and smallest x value). If the sphere is in between the two values, the player has hit the wall. Otherwise, they hit the plane but not the wall.

2.3.8 MusicManager

To play background music, I used the FMOD low level API for C++. FMOD can dynamically load and play as multiple sounds, which can either be set to loop (such as background music) or not to loop (for sound effects). Proper memory management is important, as the individual sounds are dynamically created outside of the Music Manager class and must be allocated and deallocated properly to avoid memory leaks.

2.3.9 TextEngine

The Text Engine was constructed to handle displaying all text to the screen. It uses OpenGL's glutBitmapCharacter function to display clear, concise text.

Every function to display text takes two coordinates (the x,y coordinates on the screen to start displaying the text), and the RGB color values for the text. There are two functions for displaying text, the simpler one merely takes in a string and prints it on the corresponding location on the screen. The more complex function takes in a file and a content tag. The files are structured like so:

```
1 $TAG 1$
2 Content 1
3 $END$
4
5 $Tag 2$
6 Content 2
7 $END$
```

The Text Engine searches through the designated file line by line until it discovers the line containing the proper tag. Then, until it reaches the closing 'END' tag, it stores every line inside of a vector. Once it has retrieved all of the necessary content, it starts to display the text to the screen line by line, starting from the designated XY position and increasing the Y value for each line.

2.3.10 Game Saving and Loading

2.3.11 Keyboard

The Keyboard class primarily serves to encapsulate the OpenGL callbacks that receive keystrokes: the normal function that accepts all alphanumeric and punctuation, and the special function that handles function keys and escape. However, there is a minor bit of overhead that goes into deciding where the input goes.

Under normal circumstances, the only normal keystrokes accepted are the WASD keys for movement, the E key for interaction, and the ' ' key for toggling the development console.

When in either a terminal or the development console, all keys are immediately concatenated to an input string with the exception of the ' ' which will close the development console, or the enter key which will send the input string to it's appropriate destination to be parsed and interpreted, after which the input string is cleared so that a new command can be entered.

Also accepted are the up and down arrow keys, which will cycle through the console/terminals command history.

2.3.12 Level Loading and displaying

Loading each level involves a series of SQL queries through the SQLite API. Loading each level first involves opening a connection with the database, and retrieving all data from each table in the database in turn. All important data from the database is stored in a class of the appropriate type, unnecessary data is discarded, and in the end each class is pushed into a vector of the appropriate type.

The data is loaded in a strict order, due to some objects having dependencies on others (that is, some objects require other objects to already exist). Thus the first things that are loaded are purely independent objects, all doors, walls, and terminals. Next switches are loaded, because they require both doors and terminals to already exist. Finally, the triggers are loaded, because they require both switches and terminals.

When loading switches and triggers, the objects also need to be *bound* to their appropriate target. This is why doors, switches, and terminals all carry their ID's into the program with them, while triggers and walls discard their ID. Once all of the objects that need to be bound are loaded into the game, the game proceeds to bind them to their target. For each switch that needs to be bound, the game loops through either the list of terminals or the list of doors for the appropriate object and creates a pointer to that object inside of the switch, thus ensuring that the switch can toggle its target instantly without needing to search every time it is triggered. The triggers are bound similar, with the difference that each object must perform two searches, one for the triggering object and one for the target object.

If there is any data error in regards to binding — that is, and object attempts to bind to an object that does not exist, the error is considered fatal and the game immediately shuts down after logging the error.

The OpenGL display function calls upon the Level class to display all in game objects. This is a simple matter, because each object has it's own function to display itself. Thus it is a simple matter to loop through each vector and tell each object to display itself.

2.3.13 Console and Logging

3 Appendices

3.1 Source Code

3.1.1 main.cpp

```
1  /************************************************************\
2   * main.cpp                                                 *
3   * This file was created by Jeremy Greenburg                *
4   * As part of The God Core game for the University of       *
5   * Tennessee at Martin's University Scholars Organization   *
6   *                                                          *
7   * This file creates an OpenGL window to display the game   *
8   * and promptly passes control over to the GameManager object*
9  \************************************************************/
10
11 // Because doth openGL demandeth
12 #include <cstdlib>
13 // OpenGL API
14 #include <GL\glut.h>
15
16 // The Game manger
17 #include "GameManager.h"
18 GameManager Overlord;
19 // Save manager
20 #include "SaveManager.h"
21 // Return codes
22 #include "Return.h"
23 // System log
24 #include "Logger.h"
25
```

```
26 // Normal key presses
27 void normal(unsigned char key, int x, int y);
28
29 // For key releases
30 void key_up(unsigned char key, int x, int y);
31
32 // For Special keys
33 void special(int key, int x, int y);
34
35 // Mouse clicks
36 void mouse(int button, int state, int x, int y);
37
38 // Mouse movement
39 void motionPassive(int x, int y);
40
41 // Changing Window size (Not exactly working as hoped...
42 void changeSize(int w, int h);
43
44 // Initializes GLUT callbacks and returns true if core.sav exists (false otherwise
       )
45 bool initGame(int argc, char **argv);
46
47 // Manages the game's scenes
48 void manageScenes();
49
50 GLfloat light_diffuse[] = { 0.3f, 0.3f, 0.3f, 0.3f };
51 GLfloat light_position[] = { 0.0f, 0.0f, 0.0f, 0.0f }; // Currently nonexistant
       until I can figure out how lighting works
52 GLfloat mat_specular[] = { 1.0f, 1.0f, 1.0f, 1.0f };
53 GLfloat mat_shininess[] = { 75 };
54 GLfloat lmodel_ambient[] = { 0.6f, 0.6f, 0.6f, 1.0f };
55
56 using namespace std;
57
58 //****** FUNCTION DEFINITIONS ******\\
59
60 int main(int argc, char **argv)
61 {
62         Overlord.canContinue = initGame(argc, argv);
63
64         // Begin the game
65         glutMainLoop();
66
67         // If we ever get here, something bad happened
68
69         Logger log;
70         log.logLine("ERROR: GlutMainLoop exited early");
71
72         return EXIT_EARLY;
73 }
74
75 bool initGame(int argc, char **argv)
76 {
77         // Obliderate log file
78         Logger log;
79         log.nuke();
```

```
80
81          // Initialize GLUT
82          glutInit(&argc, argv);
83
84          // Create window
85          glutInitDisplayMode(GLUT_DOUBLE | GLUT_RGBA);
86          glutInitWindowPosition(50, 50);
87          glutInitWindowSize(500, 500);
88          glutCreateWindow("The God Core");
89
90          // register callbacks
91          glutDisplayFunc(manageScenes);
92          glutReshapeFunc(changeSize);
93          glutIdleFunc(manageScenes);
94          glutPassiveMotionFunc(motionPassive);
95          glutMouseFunc(mouse);
96          glutKeyboardFunc(normal);
97          glutKeyboardUpFunc(key_up);
98          glutSpecialFunc(special);
99
100         // Prebuilt function that works transparency
101         glBlendFunc(GL_SRC_ALPHA, GL_ONE_MINUS_SRC_ALPHA);
102
103         // Enable transparency
104         glEnable(GL_BLEND);
105         // Enable depth buffer
106         glEnable(GL_DEPTH_TEST);
107         // Let there be light!
108         glEnable(GL_LIGHTING);
109         // First light source
110         glEnable(GL_LIGHT0);
111
112         // Light properties
113         glMaterialfv(GL_FRONT, GL_SPECULAR, mat_specular);
114         glMaterialfv(GL_FRONT, GL_SHININESS, mat_shininess);
115         glColorMaterial(GL_FRONT_AND_BACK, GL_AMBIENT_AND_DIFFUSE);
116
117         // Light doesnt turn everything grey
118         glEnable(GL_COLOR_MATERIAL);
119
120         glLightfv(GL_LIGHT0, GL_DIFFUSE, light_diffuse);
121         glLightfv(GL_LIGHT0, GL_POSITION, light_position);
122         glLightModelfv(GL_LIGHT_MODEL_AMBIENT, lmodel_ambient);
123
124         glutWarpPointer(300, 300);
125
126         // Start in Fullscreen
127         glutFullScreen();
128
129         SaveManager SaveSystem;
130         return SaveSystem.checkSave();
131 }
132
133 // Everything below here is just passed along to the overlord
134
135 void mouse(int button, int state, int x, int y)
```

```
{
        Overlord.mouse(button, state, x, y);
}

void motionPassive(int x, int y)
{
        Overlord.motionPassive(x, y);
}

void changeSize(int w, int h)
{
        Overlord.changeSize(w, h);
}

void manageScenes()
{
        Overlord.manageScenes();
}

void normal(unsigned char key, int x, int y)
{
        Overlord.normal(key, x, y);
}

void key_up(unsigned char key, int x, int y)
{
        Overlord.key_up(key, x, y);
}

void special(int key, int x, int y)
{
        Overlord.special(key, x, y);
}
```

3.1.2 CameraControl.h

```
/*************************************************************\
 * CameraControl.h                                           *
 * This file was created by Jeremy Greenburg                 *
 * As part of The God Core game for the University of        *
 * Tennessee at Martin's University Scholars Organization    *
 *                                                           *
 * This file contains the declaration of the CameraControl   *
 * Class, which stores:                                      *
 *      The x, y, z ordered triple of the player's location  *
 *      The degree to which the player is turned, along      *
 *           the x, y, and z axes                            *
 * And contains methods to translate the player along        *
 * 3D space                                                  *
\*************************************************************/

#ifndef CAMERA_CONTROL_H
#define CAMERA_CONTROL_H

class CameraControl
{
private:
```

```
22          // Speeds for moving and rotating
23          double moveSpeed = 0.1f, turnSpeed = 0.5f;
24
25  public:
26          // Negatively adjusts angle and modifies lx
27          void lookLeft();
28          // Positively adjusts angle and modifies lx
29          void lookRight();
30          // Positively adjusts angle and modifies ly
31          void lookUp();
32          // Negatively adjusts angle and modifies ly
33          void lookDown();
34          // Translate the camera to the left
35          void strafeLeft();
36          // Translates the to the right
37          void strafeRight();
38          // Translates the camera forwards
39          void moveForward(int mod);
40          // Translate the camera backards
41          void moveBackward(int mod);
42          // Moves the camera positively along the Y axis
43          void moveUp();
44          // Moves the camera negatively along the Z axis
45          void moveDown();
46          // Flips the camera
47          void invertCam();
48          // If the player begins to run
49          void increaseSpeed();
50          // If the player begins to walk
51          void decreaseSpeed();
52          // Resets the camera to it's initial state
53          void resetCam();
54          // calls gluLookAt
55          void Display();
56
57          // Location of the camera
58          double x =0.0, y = 0.0, z = -1.0;
59          double prevx, prevz;
60          // Angles of rotation
61          double x_angle = 0.0, y_angle = 0.0, z_angle = -1.0;
62  };
63
64  #endif
```

3.1.3 CameraControl.cpp

```
1   /*************************************************************\
2    * CameraControl.cpp                                         *
3    * This file was created by Jeremy Greenburg                 *
4    * As part of The God Core game for the University of        *
5    * Tennessee at Martin's University Scholars Organization    *
6    *                                                           *
7    * This file contains the definition of the CameraControl    *
8    * Class. For more information, see CameraControl.h          *
9   \*************************************************************/
10
11  // Class definition
```

```
12 #include "CameraControl.h"
13
14 // For sin()
15 #include <cmath>
16
17 // glut is unhappy when cstdlib isn't here :/
18 #include <cstdlib>
19
20 // OpenGL API
21 #include <GL\glut.h>
22
23 // To display Suit Warnings
24 #include "TextEngine.h"
25
26 // To include Globals Variables
27 #include "Globals.h"
28
29 // For converting degrees to radians
30 const double PI = 3.14159;
31
32 // Takes in an angle, in degrees, and returns the angle in radians
33 double toRadian(double angle)
34 {
35         return angle * PI / 180;
36 }
37
38 void CameraControl::lookLeft()
39 {
40         if (!isPaused)
41         {
42                 x_angle -= 3 * turnSpeed;
43
44                 // To avoid potential underflow errors
45                 if (x_angle < 0)
46                 {
47                         x_angle += 360;
48                 }
49         }
50 }
51 void CameraControl::lookRight()
52 {
53         if (!isPaused)
54         {
55                 x_angle += 3 * turnSpeed;
56
57                 // To avoid potential overflow errors
58                 if (x_angle > 360)
59                 {
60                         x_angle -= 360;
61                 }
62         }
63 }
64
65 void CameraControl::lookUp()
66 {
67         if (!isPaused)
```

```
68          {
69                  y_angle -= 2 * turnSpeed;
70
71                  // To avoid potential underflow errors
72                  if (y_angle < 0)
73                  {
74                          y_angle += 360;
75                  }
76          }
77  }
78
79  void CameraControl::lookDown()
80  {
81          if (!isPaused)
82          {
83                  y_angle += 2 * turnSpeed;
84
85                  // To avoid potential overflow errors
86                  if (y_angle > 360)
87                  {
88                          y_angle -= 360;
89                  }
90          }
91  }
92
93  void CameraControl::strafeLeft()
94  {
95          prevz = z;
96          prevx = x;
97          // Angles + 90 degrees for an angle that is perpendicular to x_angle
98          z = z + moveSpeed * cos(toRadian(x_angle + 90));
99          x = x - moveSpeed * sin(toRadian(x_angle + 90));
100 }
101
102 void CameraControl::strafeRight()
103 {
104         prevz = z;
105         prevx = x;
106         // Angles - 90 degrees for an angle that is perpendicular to x_angle
107         z = z + moveSpeed * cos(toRadian(x_angle - 90));
108         x = x - moveSpeed * sin(toRadian(x_angle - 90));
109 }
110
111 void CameraControl::moveForward(int mod)
112 {
113         prevz = z;
114         prevx = x;
115         z = z + moveSpeed * mod * cos(toRadian(x_angle));
116         x = x - moveSpeed * mod * sin(toRadian(x_angle));
117 }
118
119 void CameraControl::moveBackward(int mod)
120 {
121         prevz = z;
122         prevx = x;
123         z = z - moveSpeed * mod * cos(toRadian(x_angle));
```

```
124         x = x + moveSpeed * mod * sin(toRadian(x_angle));
125 }
126
127 void CameraControl::moveUp()
128 {
129         y -= moveSpeed;
130 }
131
132 void CameraControl::moveDown()
133 {
134         y += moveSpeed;
135 }
136
137 void CameraControl::invertCam()
138 {
139         z_angle += 180;
140 }
141
142 void CameraControl::resetCam()
143 {
144         x = 0.0;
145         y = 0.0;
146         z = -1.0;
147         x_angle = 0.0;
148         y_angle = 0.0;
149         z_angle = 0.0;
150
151 }
152
153 void CameraControl::increaseSpeed()
154 {
155         moveSpeed *= 2;
156 }
157
158 void CameraControl::decreaseSpeed()
159 {
160         moveSpeed /= 2;
161 }
162
163 void CameraControl::Display()
164 {
165         // To stop eternal movement
166         glLoadIdentity();
167
168         // Rotate along proper axes
169         glRotatef(y_angle, 1, 0, 0);
170         glRotatef(x_angle, 0, 1, 0);
171         glRotatef(z_angle, 0, 0, 1);
172
173         // Translate along the Plane
174         glTranslatef(x, y, z);
175 }
```

3.1.4 CollisionEngine.h

```
1 /*************************************************************\
2  * CollisionEngine.h                                         *
```

```
 * This file was created by Jeremy Greenburg                 *
 * As part of The God Core game for the University of        *
 * Tennessee at Martin's University Scholars Organization    *
 *                                                           *
 * This file creates the decleration of the CollisionEngine  *
 * class, which uses sweet sweet math to determine how the   *
 * player interacts with his environment                     *
\***********************************************************/

#ifndef COLLISION_ENGINE_H
#define COLLISION_ENGINE_H

class CollisionEngine
{
private:
        // Determines if wall/door collision occured
        bool collideWalls();
        // Determines if other collision occured
        bool collideObjects();
        // Determines if an object can be interacted with
        void checkInteract();
public:
        // Master function that calls others
        bool collide();

};

#endif
```

3.1.5 CollisionEngine.cpp

```
/***********************************************************\
 * CollisionEngine.h                                       *
 * This file was created by Jeremy Greenburg                 *
 * As part of The God Core game for the University of        *
 * Tennessee at Martin's University Scholars Organization    *
 *                                                           *
 * This file contains the definition of the CollisionEngine  *
 * class. For more information, see SaveManager.h            *
\***********************************************************/

#include "CollisionEngine.h"

// For the Cam
#include "Globals.h"
// absolute value
#include <cmath>

// System Log
#include "Logger.h"

using namespace std;

const double PLAYER_RADIUS = 0.5;
const double INTERACT_RADIUS = 1; // Object interactivity radius
const double COLLIDE_RADIUS = 0.5;

```

```
27 void CollisionEngine::checkInteract()
28 {
29         activeSwitch = NULL;
30         activeTerminal = NULL;
31         // Auto don't work in these parts
32         for (unsigned int i = 0; i < switches.size(); i++)
33         {
34                 double distance = pow((switches[i].getX() + Cam.x), 2) + pow((
                        switches[i].getY() + Cam.y), 2) + pow((switches[i].getZ() + Cam
                        .z), 2);
35                 distance = sqrt(distance);
36                 double radii = (PLAYER_RADIUS + INTERACT_RADIUS);
37
38                 if (distance < radii && switches[i].checkIfOn())
39                 {
40                         interactivity = true;
41                         activeSwitch = &switches[i];
42                         return;
43                 }
44         }
45
46         for (unsigned int i = 0; i < terminals.size(); i++)
47         {
48                 double distance = pow((terminals[i].getX() + Cam.x), 2) + pow((
                        terminals[i].getY() + Cam.y), 2) + pow((terminals[i].getZ() +
                        Cam.z), 2);
49                 distance = sqrt(distance);
50                 double radii = (PLAYER_RADIUS + INTERACT_RADIUS);
51
52                 if (distance < radii && terminals[i].checkIfOn())
53                 {
54                         interactivity = true;
55                         activeTerminal = &terminals[i];
56                         return;
57                 }
58         }
59
60         interactivity = false;
61 }
62
63 bool CollisionEngine::collideObjects()
64 {
65         for (unsigned int i = 0; i < terminals.size(); i++)
66         {
67                 double distance = pow((terminals[i].getX() + Cam.x), 2) + pow((
                        terminals[i].getY() + Cam.y), 2) + pow((terminals[i].getZ() +
                        Cam.z), 2);
68                 distance = sqrt(distance);
69                 double radii = (PLAYER_RADIUS + COLLIDE_RADIUS);
70
71                 if (distance < radii && terminals[i].checkIfOn())
72                 {
73                         return true;
74                 }
75         }
76
```

```
77          return false;
78  }
79
80  bool CollisionEngine::collideWalls()
81  {
82          // Gotta check doors first
83          // And if you hit an open door
84          // You just ignore collision
85          // Because otherwise you can't fit
86          for (auto i : doors)
87          {
88                  double distance = fabs(Cam.x * i.a + Cam.y * i.b + Cam.z * i.c + i
                        .d); // Distance from door
89
90                  if ((distance / i.getNorm() < PLAYER_RADIUS) && i.isInBounds())
91                  {
92                          if (i.isOpen) return false;
93                          else return true;
94                  }
95          }
96
97          for (auto i : walls)
98          {
99                  double distance = fabs(Cam.x * i.a + Cam.y * i.b + Cam.z * i.c + i
                        .d); // Distance from wall
100
101                 if ((distance / i.getNorm() < PLAYER_RADIUS) && i.isInBounds())
                        return true;
102         }
103
104         return false;
105 }
106
107 bool CollisionEngine::collide()
108 {
109         if (!collision)
110         {
111                 return false;
112         }
113
114         checkInteract();
115         return (collideWalls() || collideObjects());
116 }
```

3.1.6 Console.h

```
1  /*************************************************************\
2   * Connsole.h                                                *
3   * This file was created by Jeremy Greenburg                 *
4   * As part of The God Core game for the University of        *
5   * Tennessee at Martin's University Scholars Organization    *
6   *                                                           *
7   * This file contains the declaration of the Console Class,  *
8   * As well as the Trip struct for holding three integers     *
9   * The Developer Console takes input from the user and       *
10  * Activates various effects based upon what the user has    *
11  * Typed in.                                                 *
```

```
12 \************************************************************/
13
14 #ifndef CONSOLE_H
15 #define CONSOLE_H
16
17 // To act as a circular buffer for console history
18 #include <deque>
19 // Stores actual console input
20 #include <vector>
21 // std::string
22 #include <string>
23 // For processing text
24 #include "TextEngine.h"
25
26 // Windows API
27 #include <shlobj.h>
28
29
30 // To make rgb calues easier to store
31 #include "Triple.h"
32
33 class Console
34 {
35 private:
36         /***** Variables for the console itself ****/
37
38         // Triples for good color, bad color, and nuetral colors
39         Triple VALID_COLOR, INVALID_COLOR, NEUTRAL_COLOR;
40         // What the console "says" (aka what appears on screen)
41         std::deque<std::string> console_log;
42         // The colors of said strings
43         std::deque<Triple> console_color;
44         // Contains the actual player input
45         std::vector<std::string> console_input;
46         // The current (finished) input being processed
47         std::string currentInput;
48         // The current (unfinished) input being type
49         std::string currentText;
50         // Console History
51         TextEngine log;
52
53         // Path to core.sav
54         char CHAR_PATH[MAX_PATH];
55         std::string SAVE_PATH;
56
57         bool isActive;
58
59         // The bottom of the console
60         const int SCREENBOTTOM = 500;
61
62         // Prints the current input and console_history
63         void printInput();
64         // Processes completed input
65         void processInput();
66
67         // Command functions
```

```
68
69          // Toggles collision on and off
70          void toggleCollision();
71
72          // Toggles godMode on and off
73          void toggleGod();
74
75          // Decrpyts the entry in core.sav
76          void decrpytSave();
77
78          // Shutdowns program
79          void halt();
80
81          // Clears the console log
82          void clear();
83
84          // Writes input to core.sav
85          void writeToSave(std::string input);
86
87          // Reads a bit from the file
88          void readFromFile(std::string input);
89
90          // Changes the currently played track
91          void playSong(std::string input);
92
93  public:
94          // Initializes VALID_COLOR, INVALID_COLOR, NEUTRAL_COLOR, and SAVE_PATH
95          Console();
96          // Manages console functions if input has been provided
97          void activate(std::string input, std::string text);
98          // Manages console function if input is still being provided
99          void activate(std::string text);
100         // Returns the console_input[count]
101         std::string getHist(int count);
102         // Returns console_input.size()
103         int getHistNum();
104
105 };
106
107 #endif
```

3.1.7 Console.cpp

```
1  /*************************************************************\
2   * Console.cpp                                               *
3   * This file was created by Jeremy Greenburg                 *
4   * As part of The God Core game for the University of        *
5   * Tennessee at Martin's University Scholars Organization    *
6   *                                                           *
7   * This file contains the definition of the Console class    *
8   * For more information, see Console.cpp                     *
9  \*************************************************************/
10
11 // File I/O
12 #include <fstream>
13
14 // Class declaration
```

```
15 #include "Console.h"
16
17 // For saving and loading
18 #include "SaveManager.h"
19
20 // System log
21 #include "Logger.h"
22
23 // Contains global environment variables
24 #include "Globals.h"
25
26 // Return codes
27 #include "Return.h"
28
29 using namespace std;
30
31 Console::Console()
32 {
33         // Green!
34         VALID_COLOR = makeTrip(0, 1, 0);
35         // Red!
36         INVALID_COLOR = makeTrip(1, 0, 0);
37         // Gray!
38         NEUTRAL_COLOR = makeTrip(1, 1, 1);
39
40         // Get path to documents
41         HRESULT ret = SHGetFolderPath(NULL, CSIDL_PERSONAL, NULL,
               SHGFP_TYPE_CURRENT, CHAR_PATH);
42         // Assign to SAVE_PATH
43         SAVE_PATH = CHAR_PATH;
44         // Concatenate save file
45         SAVE_PATH += "\\The God Core\\core.sav";
46 }
47
48 void Console::activate(string input, string text)
49 {
50         currentInput = input;
51         // This should be empty. But just incase.
52         currentText = text;
53
54         processInput();
55         printInput();
56 }
57
58 void Console::activate(string text)
59 {
60         currentText = text;
61
62         printInput();
63 }
64
65 void Console::printInput()
66 {
67         deque<string>::iterator it = console_log.begin();
68         deque<Triple>::iterator jt = console_color.begin();
69         // Iterates through the console's current log and prints it to the screen
```

```
70          for (it; it != console_log.end(); it++, jt++)
71          {
72                  //                                              Index of it
73                  log.printString(0, 10 + 10 * (it - console_log.begin()),
74                          jt->a, jt->b, jt->c, *it);
75          }
76
77          // Prints whatever the user is typing
78          log.printString(0, SCREENBOTTOM / 2.4, 1, 1, 1, currentText);
79  }
80
81  void Console::processInput()
82  {
83          // TODO: Break this behemoth up into little, managable functions
84
85          if (currentInput == "TogClip")
86                  toggleCollision();
87
88          else if (currentInput == "TogGod")
89                  toggleGod();
90
91          else if (currentInput.substr(0, 5) == "Save ")
92                  writeToSave(currentInput.substr(5)); // Save everything after "
                        Save "
93
94          else if (currentInput == "Decrypt")
95                  decrpytSave();
96
97          else if (currentInput.substr(0, 5) == "Read ")
98                  readFromFile(currentInput.substr(5)); // Read everything after "
                        Read "
99
100         else if (currentInput == "Halt")
101                 halt();
102
103         else if (currentInput == "Clear")
104                 clear();
105
106         else if (currentInput.substr(0, 5) == "Play ")
107                 playSong(currentInput.substr(5)); // Process everything after "
                        Play "
108
109         else if (currentInput == "Goto Main")
110         {
111                 isInMain = true;
112                 isInConsole = false;
113                 HUD.toggleConsole();
114         }
115
116         // Invalid command
117         else
118         {
119                 console_log.push_back("ERROR: Do not recognize \"" + currentInput
                        + '\"');
120                 console_color.push_back(INVALID_COLOR);
121         }
```

```
122
123         // Clears the top of the console if too much history is added
124         if (console_log.size() > 9)
125         {
126                 console_log.pop_front();
127                 console_color.pop_front();
128         }
129
130         // Store the current input
131         console_input.push_back(currentInput);
132 }
133
134 void Console::writeToSave(string input)
135 {
136         // Writes whatever is in input to the save file.
137         // Probably not going to be good for loading purposes
138
139         SaveManager Jesus;
140
141         Jesus.saveLevel();
142
143         console_log.push_back("Saved: " + input);
144         console_color.push_back(VALID_COLOR);
145 }
146
147 void Console::readFromFile(string input)
148 {
149         // Syntax = Read core.sav
150         if (input == "core.sav")
151         {
152                 ifstream infile(SAVE_PATH);
153
154                 string text;
155
156                 // For now, core.sav only has one line. Hopefully I'll update this
                        when I change that
157                 infile >> text;
158
159                 console_log.push_back(text);
160                 console_color.push_back(VALID_COLOR);
161         }
162
163         // Syntax = Read TAG FILE
164         else
165         {
166                 // There should be a space seperating the file and the tag. We
                        find that space
167                 size_t pos = input.find(' ');
168
169                 // If there ain't no space
170                 if (pos == string::npos)
171                 {
172                         console_log.push_back("ERROR: No tag detected");
173                         console_color.push_back(INVALID_COLOR);
174                 }
175
```

```
176                 // Hooray! There's a space
177                 else
178                 {
179                         string tag = input.substr(0, pos);
180                         string file = input.substr(pos + 1); // +1 to avoid the
                                space
181
182                         const char* TEXT_PATH = "Resources\\Text\\";
183                         string fullPath = TEXT_PATH + file;
184
185                         // Simply to test for the file's existence
186                         ifstream infile(fullPath);
187
188                         string text;
189                         getline(infile, text);
190
191                         // If there ain't no file
192                         if (!infile)
193                         {
194                                 console_log.push_back("ERROR: File \"" + file +
                                        "\" not found");
195                                 console_color.push_back(INVALID_COLOR);
196                         }
197
198                         // Hooray! There's a file
199                         else
200                         {
201                                 console_log.push_back("Reading \"" + file + "\"
                                        with tag \"" + tag + '\"');
202                                 console_color.push_back(VALID_COLOR);
203
204                                 vector<string> readText = log.getText(file, tag);
205
206                                 vector<string>::iterator it;
207
208                                 for (it = readText.begin(); it != readText.end();
                                        it++)
209                                 {
210                                         // Push everything we found into the log
211                                         console_log.push_back(*it);
212                                         console_color.push_back(NEUTRAL_COLOR);
213
214                                         // So we don't grow too much, keep bounds
                                                checking
215                                         if (console_log.size() > 9)
216                                         {
217                                                 console_log.pop_front();
218                                                 console_color.pop_front();
219                                         }
220                                 }
221                         }
222
223                         infile.close();
224                 }
225         }
226 }
```

```
227
228 void Console::toggleCollision()
229 {
230         console_log.push_back("Noclip toggled.");
231         console_color.push_back(VALID_COLOR);
232
233         collision = !collision;
234 }
235
236 void Console::toggleGod()
237 {
238         console_log.push_back("God Mode toggled.");
239         console_color.push_back(VALID_COLOR);
240
241         godMode = !godMode;
242 }
243
244 void Console::decrpytSave()
245 {
246         SaveManager Jesus;
247
248         console_log.push_back(Jesus.readSave());
249         console_color.push_back(VALID_COLOR);
250 }
251
252 void Console::halt()
253 {
254         Logger log;
255         log.logLine("Exiting via console");
256         exit(EXIT_OK);
257 }
258
259 void Console::clear()
260 {
261         console_log.clear();
262         console_color.clear();
263         console_input.clear();
264 }
265
266 void Console::playSong(string input)
267 {
268         int sNum = getSongNum(input);
269
270         if (sNum == -1) // Invalid input
271         {
272                 console_log.push_back("ERROR: " + input + " not a valid song file
                    ");
273                 console_color.push_back(INVALID_COLOR);
274         }
275
276         else // Valid input
277         {
278                 songNum = sNum;
279                 changeSong = true;
280                 string song = getSongName(sNum);
281                 console_log.push_back("Now playing " + song);
```

```
282                 console_color.push_back(VALID_COLOR);
283         }
284 }
285
286 string Console::getHist(int count)
287 {
288         int size = console_input.size();
289         if (console_input.empty())
290         {
291                 return "";
292         }
293
294         // If, somehow, a fool manages to get a variable that is out of bounds
295
296         else if (count >= size)
297         {
298                 return console_input.back();
299         }
300
301         else if (count < 0)
302         {
303                 return console_input.front();
304         }
305
306         else
307         {
308                 return console_input[size - count - 1];
309         }
310 }
311
312 int Console::getHistNum()
313 {
314         return console_input.size();
315 }
```

3.1.8 Cylinder.h

```
1  #ifndef CYLINDER_H
2  #define CYLINDER_H
3
4  #include <cstdlib>
5
6  #include <GL\glut.h>
7
8  class Cylinder
9  {
10 private:
11         double baseRadius, topRadius, height;
12         int stacks, slices;
13         double translate[3], rotate[3], color[4];
14         GLUquadric *quad;
15 public:
16         Cylinder(double _baseRadius, double _topRadius, double _height, int
               _stacks, int _slices,
17                 const double(&_translate)[3], const double(&_rotate)[3], const
                       double (&_color)[4]);
18
```

```
19          void Display();
20          ~Cylinder();
21  };
22
23  #endif
```

3.1.9 Cylinder.cpp

```
1   #include "Cylinder.h"
2
3   // For copying
4   #include <iterator>
5   #include <utility>
6
7   using namespace std;
8
9   Cylinder::Cylinder(double _baseRadius, double _topRadius, double _height, int
        _stacks, int _slices,
10          const double(&_translate)[3], const double(&_rotate)[3], const double(&
                _color)[4])
11  {
12          baseRadius = _baseRadius;
13          topRadius = _topRadius;
14          height = _height;
15          stacks = _stacks;
16          slices = _slices;
17
18          copy(begin(_color), end(_color), color);
19          copy(begin(_translate), end(_translate), translate);
20          copy(begin(_rotate), end(_rotate), rotate);
21
22          quad = gluNewQuadric();
23  }
24
25  Cylinder::~Cylinder()
26  {
27          //gluDeleteQuadric(quad);
28  }
29
30  void Cylinder::Display()
31  {
32          glColor4d(color[0], color[1], color[2], color[3]);
33
34          glPushMatrix();
35
36          glTranslated(translate[0], translate[1], translate[2]);
37          glRotated(rotate[0], 1, 0, 0);
38          glRotated(rotate[1], 0, 1, 0);
39          glRotated(rotate[2], 0, 0, 1);
40
41          gluCylinder(quad, baseRadius, topRadius, height, slices, stacks);
42
43          glPopMatrix();
44  }
```

3.1.10 Door.h

```
/************************************************************\
 * Door.h                                                   *
 * This file was created by Jeremy Greenburg                *
 * As part of The God Core game for the University of       *
 * Tennessee at Martin's University Scholars Organization   *
 *                                                          *
 * This file contains the declaration of the Door class     *
 * It's mostly a fancy wrapper for a Plane with a bit       *
 * Of added functionality                                   *
\************************************************************/

#ifndef DOOR_H
#define DOOR_H

// Class decleration
#include "Plane.h"
// std::string
#include <string>

// Figure out a way to bind a controller to the door to activate it.
class Door
{
private:
        // Name, so a switch can find it
        std::string id;
        // The physical door
        Plane rect;
public:
        // Is the door open?
        bool isOpen;
        // Plane's a, b, c, and d.
        // For easier access
        double a, b, c, d;

        // Takes in the initial Plane and name
        Door(Plane _rect, std::string _id);
        // Calls rect.Display()
        void Display();
        // Returns rect.getNorm()
        double getNorm();
        // Returns id
        std::string getID();
        // Returns rect.isInBounds()
        bool isInBounds();
};

#endif
```

3.1.11 Door.cpp

```
/************************************************************\
 * Door.cpp                                                 *
 * This file was created by Jeremy Greenburg                *
 * As part of The God Core game for the University of       *
 * Tennessee at Martin's University Scholars Organization   *
 *                                                          *
 * This file contains the defintion of the Door class.      *
```

```
 * for more information, see Door.h                          *
\************************************************************/

// Class declaration
#include "Door.h"

using namespace std;

Door::Door(Plane _rect, std::string _id) : rect(_rect), id(_id)
{
        isOpen = false;
        a = rect.a;
        b = rect.b;
        c = rect.c;
        d = rect.d;
};

void Door::Display()
{
        if (!isOpen) rect.Display();
}

double Door::getNorm()
{
        return rect.getNorm();
}

string Door::getID()
{
        return id;
}

bool Door::isInBounds()
{
        return rect.isInBounds();
}
```

3.1.12 GameManager.h

```
/************************************************************\
 * GameManager.h                                             *
 * This file was created by Jeremy Greenburg                 *
 * As part of The God Core game for the University of        *
 * Tennessee at Martin's University Scholars Organization    *
 *                                                           *
 * This file contains the declaration of the GameManger class*
 * Which oversees and manages the flow of the game           *
\************************************************************/

#ifndef GAMEMANAGER_H
#define GAMEMANAGER_H

//****** LIBRARIES AND CLASSES ******\\

// For the keyboard functionality
#include "Keyboard.h"

```

```
19 // glut really wants cstdlib here
20 #include <cstdlib>
21
22 // For arrays of strings
23 #include <string>
24 #include <vector>
25
26 // OpenGL API
27 #include <GL\glut.h>
28
29 // Standard I/O for debugging
30 #include <iostream>
31
32 // To manage background music
33 #include "MusicManager.h"
34
35 // To manage saving and loading
36 #include "SaveManager.h"
37
38 class GameManager
39 {
40 private:
41         // Variables
42
43         // Objects
44         MusicManager SoundSystem;
45         Keyboard board;
46
47         // Because the main menu is dumb, we have to know when to get a click
48         bool processClick = false;
49
50         // When in the main menu, mouse coords of a click
51         int mouse_x, mouse_y;
52
53         // Functions
54
55 public:
56
57         // Captures mouse clicks
58         void mouse(int button, int state, int x, int y);
59         // Captures mouse motion
60         void motionPassive(int x, int y);
61         // CHanges window size
62         void changeSize(int w, int h);
63         // Manages scene display
64         void manageScenes();
65         // Sample drawing function
66         void draw();
67         // Normal key presses
68         void normal(unsigned char key, int x, int y);
69         // Key releases
70         void key_up(unsigned char key, int x, int y);
71         // Special keys
72         void special(int key, int x, int y);
73         // To manage playing and releasing music
74         void manageMusic();
```

```
75
76          // Wether or not core.sav exists
77          bool canContinue;
78
79  };
80
81  #endif
```

3.1.13 GameManager.cpp

```
1   /************************************************************\
2    * GameManager.cpp                                          *
3    * This file was created by Jeremy Greenburg                *
4    * As part of The God Core game for the University of       *
5    * Tennessee at Martin's University Scholars Organization   *
6    *                                                          *
7    * This file contains the defintion of the GameManager class.*
8    * for more information, see GameManager.h                  *
9   \************************************************************/
10
11  // Class declaration
12  #include "GameManager.h"
13  // Globals
14  #include "Globals.h"
15  // Level
16  #include "Level.h"
17  // Main Menu
18  #include "MainMenu.h"
19
20  #include "Logger.h"
21
22  using namespace std;
23
24  void GameManager::mouse(int button, int state, int x, int y)
25  {
26          if (button == GLUT_RIGHT_BUTTON)
27          {
28                  if (state == GLUT_DOWN)
29                  {
30
31                  }
32
33                  else
34                  {
35
36                  }
37          }
38
39          else if (button == GLUT_LEFT_BUTTON)
40          {
41                  if (state == GLUT_DOWN)
42                  {
43                          if (isPaused)
44                          {
45                                  isPaused = pause.getClick(x, y);
46                                  bool yes = false;
47                          }
```

```
48
49                          else if (isInMain)
50                          {
51                                  mouse_x = x;
52                                  mouse_y = y;
53                                  processClick = true;
54                          }
55
56                          Logger log;
57                          vector<string> output = { "X: ", to_string(x), " ", "Y:",
                                to_string(y) };
58                          log.logLine(output);
59                  }
60
61                  else
62                  {
63
64                  }
65          }
66  }
67
68  void GameManager::motionPassive(int x, int y)
69  {
70          static int _x = 0, _y = 0;
71
72          // If nothing else is happening basically
73          if (!isPaused && !isInConsole && !isInTerminal && !isInMain)
74          {
75                  if (x > _x)
76                  {
77                          Cam.lookRight();
78                          _x = x;
79                  }
80
81                  else if (x < _x)
82                  {
83                          Cam.lookLeft();
84                          _x = x;
85                  }
86
87                  if (y < _y)
88                  {
89                          Cam.lookUp();
90                          _y = y;
91                  }
92
93                  else if (y > _y)
94                  {
95                          Cam.lookDown();
96                          _y = y;
97                  }
98
99                  // Loop around to the other side of the screen
100
101                 bool updateMouse = false;
102                 int newY = y, newX = x;
```

```
103                 if (y == 0 || y > 700)
104                 {
105                         updateMouse = true;
106                         newY = 300;
107                         _y = 300;
108                 }
109
110                 if (x == 0 || x > 700)
111                 {
112                         updateMouse = true;
113                         newX = 300;
114                         _x = 300;
115                 }
116
117                 if (updateMouse)
118                 {
119                         glutWarpPointer(newX, newY);
120                 }
121         }
122 }
123
124 void GameManager::changeSize(int w, int h)
125 {
126         // Don't want to divide by zero
127         if (h == 0)
128                 h = 1;
129
130         double ratio = w * 1.0 / h;
131
132         // Use the Projection Matrix
133         glMatrixMode(GL_PROJECTION);
134
135         // Reset Matrix
136         glLoadIdentity();
137
138         // Set the viewport to be the entire window
139         glViewport(0, 0, w, h);
140
141         // Set the correct perspective.
142         gluPerspective(45, ratio, 1, 100);
143
144         // Get Back to the Modelview
145         glMatrixMode(GL_MODELVIEW);
146 }
147
148 void GameManager::draw()
149 {
150         if (loading)
151         {
152                 lvl.loadLevel(curr_level);
153
154                 loading = false;
155
156                 // Save current progress after loading level
157                 SaveManager Jesus; // saves
158                 Jesus.saveLevel();
```

```
159         }
160
161         else
162         {
163                 lvl.displayLevel();
164         }
165 }
166
167 void GameManager::manageScenes()
168 {
169         // If we need to change the song, we can do it here
170         if (changeSong)
171         {
172                 manageMusic();
173         }
174
175         // Clears the previous drawing
176         glClear(GL_COLOR_BUFFER_BIT | GL_DEPTH_BUFFER_BIT);
177
178         if (isPaused)
179         {
180                 glutSetCursor(GLUT_CURSOR_LEFT_ARROW);
181                 pause.display();
182         }
183
184         else if (isInTerminal)
185         {
186                 activeTerminal->DisplayScreen();
187         }
188
189         else if (isInMain)
190         {
191                 // Enable using textures (pictures)
192                 glutSetCursor(GLUT_CURSOR_LEFT_ARROW);
193                 static MainMenu MM;
194
195                 // For some reason, MM breaks horribly when it's a global or class
                        member
196                 // So we'll just handle mouse clicks in the display function
197                 // Rather than the mouse click function
198                 // Because I'm a competent programmer
199                 if (processClick)
200                 {
201                         MM.getClick(mouse_x, mouse_y);
202                         processClick = false;
203                 }
204
205                 MM.display();
206         }
207
208         // glutSetCursor(GLUT_CURSOR_LEFT_ARROW); Keypads maybe?
209
210         else
211         {
212                 // Enable using textures (pictures)
213                 glutSetCursor(GLUT_CURSOR_NONE);
```

```
214                 draw();
215
216                 // Moves the camera to the correct position
217                 Cam.Display();
218                 if (goDim)
219                 {
220                         HUD.goDim(30);
221                         goDim = false;
222                 }
223
224                 else if (goDark)
225                 {
226                         HUD.goDark(30);
227                         goDark = false;
228                 }
229
230                 // Prompt the user to interact if we should
231                 if (interactivity) HUD.displayWarning("INTERACT");
232                 else HUD.displayWarning("");
233
234                 // Prints the HUD
235                 HUD.DisplayHUD();
236         }
237
238         // Displays the current drawing
239         glutSwapBuffers();
240 }
241
242 void GameManager::manageMusic()
243 {
244         // All variables need to persist between frames
245         static SoundClass background;
246
247         SoundSystem.releaseSound(background);
248         changeSong = false;
249
250         // Because you can never have too much bounds checking
251         if (songNum >= 0 && songNum <= 9)
252         {
253                 std::string song = getSongName(songNum);
254                 SoundSystem.makeSound(&background, song.c_str());
255                 SoundSystem.playSound(background);
256         }
257 }
258
259 // Normal key presses
260 void GameManager::normal(unsigned char key, int x, int y)
261 {
262         board.normal(key, x, y);
263 }
264
265 // Key releases
266 void GameManager::key_up(unsigned char key, int x, int y)
267 {
268         board.key_up(key, x, y);
269 }
```

```
270
271 // Special keys
272 void GameManager::special(int key, int x, int y)
273 {
274         board.special(key, x, y);
275 }
```

3.1.14 GCTypes.h

```
 1 /************************************************************\
 2  * GCTypes.h                                                *
 3  * This file was created by Jeremy Greenburg                *
 4  * As part of The God Core game for the University of       *
 5  * Tennessee at Martin's University Scholars Organization   *
 6  *                                                          *
 7  * This file contains integer types corresponding to various *
 8  * In game object types                                     *
 9 \************************************************************/
10
11 #ifndef GC_TYPES_H
12 #define GC_TYPES_H
13
14 // Object Types
15
16 #define T_NULL 0                // Nothing
17 #define T_DOOR 1                // Door
18 #define T_TERMINAL 2    // Terminal
19 #define T_SWITCH 3              // Switch
20 #define T_LEVEL_END 4   // Switch that ends level
21
22 typedef int GCtype;
23
24 #endif
```

3.1.15 Globals.h

```
 1 /************************************************************\
 2  * Globals.h                                                *
 3  * This file was created by Jeremy Greenburg                *
 4  * As part of The God Core game for the University of       *
 5  * Tennessee at Martin's University Scholars Organization   *
 6  *                                                          *
 7  * This file contains the declaration of the Globals        *
 8  * All of them.                                             *
 9  * Thers a lot of them                                      *
10 \************************************************************/
11
12 #ifndef GLOBALS_H
13 #define GLOBALS_H
14
15 // ALLLLLLL the classes
16 #include "HeadsUpDisplay.h"
17 #include "CameraControl.h"
18 #include "PauseScreen.h"
19 #include "Level.h"
20 #include "Terminal.h"
21 #include "Door.h"
```

```
22 #include "Switch.h"
23 #include "Plane.h"
24 #include "Trigger.h"
25 #include "Cylinder.h"
26
27 // Remember that if you're doing anything else, globals are bad.
28 // But we're in the hellscape that is graphics
29 // There are no rules here
30 // Only madness dwells here
31
32 // Typedefs make life easy
33 typedef std::vector<Plane> vr;
34 typedef std::vector<Door> vd;
35 typedef std::vector<Switch> vs;
36 typedef std::vector<Terminal> vt;
37 typedef std::vector<Trigger> vtr;
38 typedef std::vector<Cylinder> vc;
39
40 // Pointers to various interactive objects
41 extern Switch *activeSwitch;
42 extern Terminal *activeTerminal;
43
44 // Vectors containing all of the level's assets
45 extern vr walls;
46 extern vd doors;
47 extern vs switches;
48 extern vt terminals;
49 extern vtr triggers;
50 extern vc cylinders;
51
52 extern bool
53         // Are we colliding / Can we die?
54         collision, godMode,
55         // Go dim or go dark?
56         goDim, goDark,
57         // Dunno if I actually need this one
58         loading,
59         // Is in varius different stages of non-normal play
60         isInConsole, isPaused, isInTerminal, isInMain,
61         // Should we change the song?
62         changeSong,
63         // Is something in interaction range?
64         interactivity;
65
66 // Number of song to change to
67 extern int songNum;
68
69 // Current level (int and string)
70 extern int levelNum;
71 extern std::string curr_level;
72
73 // Constant strings of the song names
74 extern const char *SONG0, *SONG1, *SONG2, *SONG3, *SONG4, *SONG5,
75                                         *SONG6, *SONG7, *SONG8, *SONG9;
76
77 // Lots of global objects
```

```
78 extern HeadsUpDisplay HUD;
79 extern CameraControl Cam;
80 extern PauseScreen pause;
81 extern Level lvl;
82
83 // Converts a songname to an integer
84 int getSongNum(std::string input);
85 // Converts an integer to a songname
86 std::string getSongName(int input);
87 // Converts a level name to an integer
88 int getLevelNum(std::string input);
89 // Converts level_num to a string in curr_level
90 std::string getLevelString(int input);
91
92 #endif
```

3.1.16 Globals.cpp

```
1  /*************************************************************\
2   * Globals.cpp                                               *
3   * This file was created by Jeremy Greenburg                 *
4   * As part of The God Core game for the University of        *
5   * Tennessee at Martin's University Scholars Organization    *
6   *                                                           *
7   * This file instantiates the global variables               *
8  \*************************************************************/
9
10 #include "Globals.h"
11
12 vr walls;
13 vd doors;
14 vs switches;
15 vt terminals;
16 vtr triggers;
17 vc cylinders;
18
19 Switch *activeSwitch = NULL;
20 Terminal *activeTerminal = NULL;
21
22 bool collision = true;
23 bool godMode = false;
24 bool goDim = false;
25 bool goDark = false;
26 bool loading = true;
27 bool isInConsole = false;
28 bool isPaused = false;
29 bool isInTerminal = false;
30 bool isInMain = true;
31 bool changeSong = true;
32 bool interactivity = false;
33
34 int songNum = 0;
35
36 int levelNum = 0;
37 //int levelNum = 2;
38 std::string curr_level = "LEVELZERO";
39 //std::string curr_level = "LEVELTWO";
```

```
40
41  const char* SONG0 = "Dark Fog.mp3";
42  const char* SONG1 = "Mismer.mp3";
43  const char* SONG2 = "One Sly Move.mp3";
44  const char* SONG3 = "Hypnothis.mp3";
45  const char* SONG4 = "Cold Hope.mp3";
46  const char* SONG5 = "Spacial Harvest.mp3";
47  const char* SONG6 = "Lightless Dawn.mp3";
48  const char* SONG7 = "Zombie Flood.mp3";
49  const char* SONG8 = "Get on my Level.mp3";
50  const char* SONG9 = "Story of Life.mp3";
51
52  HeadsUpDisplay HUD;
53  CameraControl Cam;
54  PauseScreen pause;
55  Level lvl;
56
57  int getSongNum(std::string input)
58  {
59          if (input == SONG0 || input == "0")
60                  return 0;
61          if (input == SONG1 || input == "1")
62                  return 1;
63          if (input == SONG2 || input == "2")
64                  return 2;
65          if (input == SONG3 || input == "3")
66                  return 3;
67          if (input == SONG4 || input == "4")
68                  return 4;
69          if (input == SONG5 || input == "5")
70                  return 5;
71          if (input == SONG6 || input == "6")
72                  return 6;
73          if (input == SONG7 || input == "7")
74                  return 7;
75          if (input == SONG8 || input == "8")
76                  return 8;
77          if (input == SONG9 || input == "9")
78                  return 9;
79          return -1; // Invalid song
80  }
81
82  std::string getSongName(int input)
83  {
84          std::string ret;
85          switch (input)
86          {
87          case 0: ret = SONG0;
88                  break;
89          case 1: ret = SONG1;
90                  break;
91          case 2: ret = SONG2;
92                  break;
93          case 3: ret = SONG3;
94                  break;
95          case 4: ret = SONG4;
```

```
96                  break;
97          case 5: ret = SONG5;
98                  break;
99          case 6: ret = SONG6;
100                 break;
101         case 7: ret = SONG7;
102                 break;
103         case 8: ret = SONG8;
104                 break;
105         case 9: ret = SONG9;
106                 break;
107         default: ret = "\0";;
108                 break;
109         }
110
111         return ret;
112 }
113
114 int getLevelNum(std::string input)
115 {
116         if (input == "LEVELZERO" || input == "LEVELZERO\n")
117                 return 0;
118         if (input == "LEVELONE" || input == "LEVELONE\n")
119                 return 1;
120         if (input == "LEVELTWO")
121                 return 2;
122         if (input == "LEVELTHREE")
123                 return 3;
124         if (input == "LEVELFOUR")
125                 return 4;
126         if (input == "LEVELFIVE")
127                 return 5;
128         if (input == "LEVELSIX")
129                 return 6;
130         if (input == "LEVELSEVEN")
131                 return 7;
132         if (input == "LEVELEIGHT")
133                 return 8;
134         if (input == "LEVELNINE")
135                 return 9;
136         return -1; // Invalid song
137 }
138
139 std::string getLevelString(int input)
140 {
141         std::string ret;
142         switch (input)
143         {
144         case 0: ret = "LEVELZERO";
145                 break;
146         case 1: ret = "LEVELONE";
147                 break;
148         case 2: ret = "LEVELTWO";
149                 break;
150         case 3: ret = "LEVELTHREE";
151                 break;
```

```
152         case 4: ret = "LEVELFOUR";
153                 break;
154         case 5: ret = "LEVELFIVE";
155                 break;
156         case 6: ret = "LEVELSIX";
157                 break;
158         case 7: ret = "LEVELSEVEN";
159                 break;
160         case 8: ret = "LEVELEIGHT";
161                 break;
162         case 9: ret = "LEVELNINE";
163                 break;
164         default: ret = "ERROR";;
165                 break;
166         }
167
168         return ret;
169 }
```

3.1.17 HeadsUpDisplay.h

```
1  /************************************************************\
2   * HeadsUpDisplay.h                                         *
3   * This file was created by Jeremy Greenburg                *
4   * As part of The God Core game for the University of       *
5   * Tennessee at Martin's University Scholars Organization   *
6   *                                                          *
7   * This file contains the declaration of the HeadsUpDisplay *
8   * Class, which created an Orthoganl Matrix infront of the  *
9   * Screen which allows for a 2D Heads Up Display to be      *
10  * Printed before the user at any time                      *
11  * It also passes input to the developer console            *
12  \************************************************************/
13
14  #ifndef HEADSUPDISPLAY
15  #define HEADSUPDISPLAY
16
17  // Base class for 2D operations
18  #include "TwoD.h"
19
20  // For displaying text in the HUD
21  #include "TextEngine.h"
22  // The Developer Console
23  #include "Console.h"
24
25  class HeadsUpDisplay : public TwoD
26  {
27  private:
28          // Duration of time to dim screen (Goes from black to clear as time
                progresses)
29          int dimTime = 0;
30          // Duration of time to go dark (completely black)
31          int darkTime = 0;
32          // Wether or not to dim
33          bool dimNow = false;
34          // Wether or not to darken
35          bool darkNow = false;
```

```
36          // Wether or not we are in developer console
37          bool devConsole = false;
38
39          // Tag to current alert
40          std::string currentAlert;
41          // Text to print to the screen
42          std::string currentText;
43          // What the user is typing
44          std::string currentInput;
45
46          // To Display text
47          TextEngine helmet;
48          // Dev Console
49          Console dev;
50
51          // Draws an info bar at the top of the screen
52          void drawHelmetBounds();
53          // Displays suit alerts
54          void DisplayAlerts();
55          // Draws the Heads Up Display
56          void drawHUD();
57          // Manages the dimming of the screen
58          void dim();
59          // Manages the darkening of the screen
60          void dark();
61          // Draws the box which stores the info text
62          void drawInfoBox();
63          // Draws the developer console window
64          void drawConsole();
65          // Displays standard info in the top left corner
66          void displayInfo(char* tag);
67
68
69  public:
70          // Manages the HUD
71          void DisplayHUD();
72
73          /****           ALTERATION FUNCTIONS            *****\
74          \**** Should always be called before DisplayHud *****/
75
76          // Tells the HUD how long to dim
77          void goDim(int time);
78
79          //Tells the HUD how long to go dark
80          void goDark(int time);
81
82          // Flips dev_console
83          void toggleConsole();
84
85          // Takes in a tag to print to screen
86          void displayWarning(std::string warning);
87
88          // Takes in a string to print to screen
89          void printToConsole(std::string text);
90
91          // Signifies a completed input to the console
```

```
92          void inputString(std::string text);
93
94          // Returns an item of the console's log
95          std::string getHist(int count);
96
97          // Returns the number of items in the console's log
98          int getHistNum();
99  };
100
101 #endif
```

3.1.18 HeadsUpDiplay.cpp

```
1   /*************************************************************\
2    * HeadsUpDisplay.cpp                                        *
3    * This file was created by Jeremy Greenburg                 *
4    * As part of The God Core game for the University of        *
5    * Tennessee at Martin's University Scholars Organization    *
6    *                                                           *
7    * This file contains the definition of the HeadsUpDisplay   *
8    * Class. For more information, see HeadsUpDisplay.h         *
9   \*************************************************************/
10
11  // Class Declaration
12  #include "HeadsUpDisplay.h"
13
14  // OpenGL API
15  #include <gl\glut.h>
16
17  // For counting seconds
18  #include <ctime>
19
20  // For displaying Planes
21  #include "Plane.h"
22
23  // For displaying triangles
24  #include "Triangle.h"
25
26  using namespace std;
27
28  void HeadsUpDisplay::drawHelmetBounds()
29  {
30          // Helmet bounds are black
31          double colors[4] = { 0, 0, 0, 1 };
32
33          // The top of the helmet
34          double top_vertices[9] =
35          {
36                  SCREENRIGHT, SCREENTOP, -1,
37                  SCREENLEFT, SCREENTOP, -1,
38                  SCREENRIGHT / 2.0, SCREENBOTTOM / 20.0, -1
39          };
40
41          // The left of the hemlet
42          double left_vertices[9] =
43          {
44                  SCREENLEFT, SCREENBOTTOM, -1,
```

```
45                  SCREENLEFT, SCREENTOP, -1,
46                  SCREENRIGHT / 20.0, 3 * SCREENBOTTOM / 5.0, -1
47          };
48
49          // The back of the helmet
50          double right_vertices[9] =
51          {
52                  SCREENRIGHT, SCREENBOTTOM, -1,
53                  SCREENRIGHT, SCREENTOP, -1,
54                  19 * SCREENRIGHT / 20.0, 3 * SCREENBOTTOM / 5.0, -1
55          };
56
57          Triangle top_helm{ top_vertices, colors };
58          Triangle left_helm{ left_vertices, colors };
59          Triangle right_helm{ right_vertices, colors };
60
61          top_helm.Display2D();
62          left_helm.Display2D();
63          right_helm.Display2D();
64  }
65
66  void HeadsUpDisplay::DisplayAlerts()
67  {
68          helmet.openFile(.45 * SCREENRIGHT, .5 * SCREENBOTTOM,
69                  1, 1, 1,
70                  "suitAlerts.log", currentAlert);
71  }
72
73  void HeadsUpDisplay::dim()
74  {
75          static int startTime;
76          static bool timeSet = false;
77          if (dimNow)
78          {
79                  if (!timeSet)
80                  {
81                          startTime = time(NULL);
82                          timeSet = true;
83                  }
84
85                  int currentTime = time(NULL);
86                  int timeElapsed = currentTime - startTime;
87                  if (timeElapsed < dimTime)
88                  {
89                          // A black square that grows more transparent as time
                               passes
90                          double colors[4] = { 0, 0, 0, (double)(dimTime -
                               timeElapsed) / dimTime };
91                          double dimVert[12] =
92                          {
93                                  SCREENLEFT, SCREENTOP, -1,
94                                  SCREENLEFT, SCREENBOTTOM, -1,
95                                  SCREENRIGHT, SCREENBOTTOM, -1,
96                                  SCREENRIGHT, SCREENTOP, -1
97                          };
98
```

```
99                          Plane black{ dimVert, colors };
100                         black.Display2D();
101                 }
102
103                 else
104                 {
105                         dimNow = false;
106                         timeSet = false;
107                 }
108         }
109 }
110
111 void HeadsUpDisplay::dark()
112 {
113         static int startTime;
114         static bool timeSet = false;
115         if (darkNow)
116         {
117                 if (!timeSet)
118                 {
119                         startTime = time(NULL);
120                         timeSet = true;
121                 }
122
123                 int currentTime = time(NULL);
124                 int timeElapsed = currentTime - startTime;
125                 if (timeElapsed < darkTime)
126                 {
127                         // A black square that obscures vision
128                         double colors[4] = { 0, 0, 0, 1 };
129                         double dimVert[12] =
130                         {
131                                 SCREENLEFT, SCREENTOP, -1,
132                                 SCREENLEFT, SCREENBOTTOM, -1,
133                                 SCREENRIGHT, SCREENBOTTOM, -1,
134                                 SCREENRIGHT, SCREENTOP, -1
135                         };
136
137                         Plane black{ dimVert, colors };
138                         black.Display2D();
139                 }
140
141                 else
142                 {
143                         darkNow = false;
144                         timeSet = false;
145                 }
146         }
147 }
148
149 void HeadsUpDisplay::drawConsole()
150 {
151         double colors[4] = { .1, .1, .1, .9 };
152         double vertices[12] =
153         {
154                 SCREENLEFT, SCREENTOP, -1,
```

```
155                 SCREENLEFT, SCREENBOTTOM / 5, -1,
156                 SCREENRIGHT, SCREENBOTTOM / 5, -1,
157                 SCREENRIGHT, SCREENTOP, -1
158         };
159
160         Plane console_tab{ vertices, colors };
161         console_tab.Display2D();
162
163         if (currentInput != "")
164         {
165                 dev.activate(currentInput, currentText);
166                 currentInput.clear();
167         }
168
169         else
170         {
171                 dev.activate(currentText);
172         }
173 }
174
175 void HeadsUpDisplay::drawInfoBox()
176 {
177         double colors[4] = { 0, 1, 1, .5 };
178         double vertices[12] =
179         {
180                 SCREENLEFT, SCREENTOP, -1,
181                 SCREENLEFT, SCREENBOTTOM / 10, -1,
182                 SCREENRIGHT / 10, SCREENBOTTOM / 10, -1,
183                 SCREENRIGHT / 10, SCREENTOP, -1
184         };
185
186         Plane info{ vertices, colors };
187         info.Display2D();
188 }
189
190 void HeadsUpDisplay::displayInfo(char* tag)
191 {
192         helmet.openFile(SCREENLEFT, SCREENTOP +  20, 1, 1, 1,
193                 "suitAlerts.log", "INFO-WELL");
194 }
195
196 void HeadsUpDisplay::goDim(int time)
197 {
198         dimTime = time;
199         dimNow = true;
200 }
201
202 void HeadsUpDisplay::goDark(int time)
203 {
204         darkTime = time;
205         darkNow = true;
206 }
207
208 void HeadsUpDisplay::displayWarning(std::string warning)
209 {
210         currentAlert = warning;
```

```
211 }
212
213 void HeadsUpDisplay::printToConsole(std::string text)
214 {
215         currentText = text;
216 }
217
218 void HeadsUpDisplay::inputString(std::string text)
219 {
220         currentInput = text;
221 }
222
223 void HeadsUpDisplay::toggleConsole()
224 {
225         devConsole = !devConsole;
226 }
227
228 void HeadsUpDisplay::drawHUD()
229 {
230         drawHelmetBounds();
231
232         if (dimNow)
233         {
234                 dim();
235         }
236
237         else if (darkNow)
238         {
239                 dark();
240         }
241
242         drawInfoBox();
243         displayInfo("SUIT-WELL");
244
245         if (devConsole)
246         {
247                 drawConsole();
248         }
249
250         if (currentAlert != "")
251         {
252                 DisplayAlerts();
253         }
254 }
255
256 string HeadsUpDisplay::getHist(int count)
257 {
258         return dev.getHist(count);
259 }
260
261 int HeadsUpDisplay::getHistNum()
262 {
263         return dev.getHistNum();
264 }
265
266 void HeadsUpDisplay::DisplayHUD()
```

```
{
        prepare2D();

        drawHUD();

        prepare3D();
}
```

3.1.19 Keyboard.h

```
/*************************************************************\
 * Keyboard.h                                                *
 * This file was created by Jeremy Greenburg                 *
 * As part of The God Core game for the University of        *
 * Tennessee at Martin's University Scholars Organization    *
 *                                                           *
 * This file contains the declaration of the Keyboard class, *
 * which logs keypresses from the user and determines,       *
 * depending on the context, what action to take such.       *
\*************************************************************/

#ifndef KEYBOARD_H
#define KEYBOARD_H

// std::string
#include <string>

class Keyboard
{
private:
        // Signals to recieve a part of the console's history
        bool getPrev, getNext;

public:
        // Normal keys
        void normal(unsigned char key, int x, int y);
        // To read console input
        void inputConsole(unsigned char key, int x, int y);
        // To read terminal input
        void inputTerminal(unsigned char key, int x, int y);
        // To interact with the world
        void interact(unsigned char key, int x, int y);
        // If a key is released
        void key_up(unsigned char key, int x, int y);
        // Special keys (functions, arrows, ect.)
        void special(int key, int x, int y);
        // Manages interactivity
        void interact();
};

#endif
```

3.1.20 Keyboard.cpp

```
/*************************************************************\
 * Keyboard.cpp                                              *
 * This file was created by Jeremy Greenburg                 *
```

```
 * As part of The God Core game for the University of        *
 * Tennessee at Martin's University Scholars Organization    *
 *                                                           *
 * This file contains the defintion of the Keyboard class.   *
 * for more information, see Keyboard.h                      *
\***********************************************************/

// Class decleration
#include "Keyboard.h"

// std::string
#include <string>

// glut really wants cstdlib here
#include <cstdlib>

// OpenGL API
#include <GL\glut.h>

// To recieve and manage global variables
#include "Globals.h"
// Collision detection
#include "CollisionEngine.h"

// Return codes
#include "Return.h"
// System log
#include "Logger.h"

using namespace std;

void Keyboard::normal(unsigned char key, int x, int y)
{
        // If we are currently capturing input
        if (isInConsole)
        {
                inputConsole(key, x, y);
        }

        // If we're in a computer
        else if (isInTerminal)
        {
                inputTerminal(key, x, y);
        }

        // Otherwise (as long we aren't in a menu)
        else if (!isPaused && !isInMain)
        {
                interact(key, x, y);
        }

        else
        {
                switch (key)
                {
                        // Escape
```

```
60                  case 27:
61                          isPaused = false;
62                          //pause.reset();
63                          break;
64                  }
65          }
66
67  }
68
69  void Keyboard::inputConsole(unsigned char key, int x, int y)
70  {
71          // User string input
72          static string input;
73          // Number in console history
74          static int count = 0;
75
76          // Up arrow, recieves the next older entry in the console's history
77          if (getPrev)
78          {
79                  input = HUD.getHist(count);
80
81                  if (count < HUD.getHistNum() - 1)
82                  {
83                          count++;
84                  }
85
86                  getPrev = false;
87          }
88
89          // Down arrow, recieves the next newer entry in the console's history
90          else if (getNext)
91          {
92                  input = HUD.getHist(count);
93
94                  if (count > 0)
95                  {
96                          count--;
97                  }
98
99                  getNext = false;
100         }
101
102         // Enter key, process and clear input
103         else if (key == 13)
104         {
105                 HUD.inputString(input);
106                 input.clear();
107                 count = 0;
108         }
109
110         // Tilda, close the console
111         else if (key == '~' || isInConsole == false)
112         {
113                 input.clear();
114                 isInConsole = false;
115                 HUD.toggleConsole();
```

```
116                     count = 0;
117             }
118
119             // Backspace. Self explanatory
120             else if (key == 8 && !input.empty())
121             {
122                     input.pop_back();
123             }
124
125             // Otherwise, type normally
126             else
127             {
128                     input += key;
129             }
130
131             // Print what's been typed so far
132             HUD.printToConsole(input);
133     }
134
135     // Pretty much a copy pasta of inputConsole because I'm a terrible programmer
136     // I'll try to combine em in the future, I swear
137     // Just adjust all of these to do terminally stuff I guess
138     void Keyboard::inputTerminal(unsigned char key, int x, int y)
139     {
140             // TODO: Fix terminal input with active Terminal hijibis
141
142             // User string input
143             static string input;
144             // Number in console history
145             static int count = 0;
146
147             // Up arrow, recieves the next older entry in the console's history
148             if (getPrev)
149             {
150                     input = activeTerminal->getHist(count);
151
152                     if (count < activeTerminal->getHistNum() - 1)
153                     {
154                             count++;
155                     }
156
157                     getPrev = false;
158             }
159
160             // Down arrow, recieves the next newer entry in the console's history
161             else if (getNext)
162             {
163                     input = activeTerminal->getHist(count);
164
165                     if (count > 0)
166                     {
167                             count--;
168                     }
169
170                     getNext = false;
171             }
```

```
172
173         // Enter key, process and clear input
174         else if (key == 13)
175         {
176                 activeTerminal->getInput(input);
177                 input.clear();
178                 count = 0;
179         }
180
181         // Backspace. Self explanatory
182         else if (key == 8 && !input.empty())
183         {
184                 input.pop_back();
185         }
186
187         // Otherwise, type normally
188         else
189         {
190                 input += key;
191         }
192
193         // Print what's been typed so far
194         activeTerminal->getText(input); // Drawing handled elsewhere?
195 }
196
197 void Keyboard::interact(unsigned char key, int x, int y)
198 {
199         CollisionEngine col;
200         // Speed at which the player moves
201         int speedMod = 1;
202
203         int modKey = glutGetModifiers();
204
205         if (modKey == GLUT_ACTIVE_SHIFT)
206         {
207                 speedMod = 2;
208         }
209
210         else
211         {
212                 speedMod = 1;
213         }
214
215         switch (key)
216         {
217         case 'w':
218         case 'W':
219                 Cam.moveForward(speedMod);
220                 if (col.collide())
221                 {
222                         Cam.moveBackward(speedMod);
223                 }
224                 break;
225         case 'a':
226         case 'A':
227                 Cam.strafeRight();
```

```
228                 if (col.collide())
229                 {
230                         Cam.strafeLeft();
231                 }
232                 break;
233         case 's':
234         case 'S':
235                 Cam.moveBackward(speedMod);
236                 if (col.collide())
237                 {
238                         Cam.moveForward(speedMod);
239                 }
240                 break;
241         case 'd':
242         case 'D':
243                 Cam.strafeLeft();
244                 if (col.collide())
245                 {
246                         Cam.strafeRight();
247                 }
248                 break;
249         case 'e':
250         case 'E':
251                 interact();
252                 break;
253         case '~':
254                 isInConsole = true;
255                 HUD.toggleConsole();
256                 break;
257
258                 // Enter
259         case 13:
260                 //goDim = true;
261                 break;
262
263                 // Escape
264         case 27:
265                 isPaused = true;
266                 break;
267         }
268 }
269
270 void Keyboard::key_up(unsigned char key, int x, int y)
271 {
272         // I'm sure I'll do something smart here
273 }
274
275 void Keyboard::special(int key, int x, int y)
276 {
277         Logger log;
278         // We start in fullscreen
279         static bool fullScreen = true;
280         switch (key)
281         {
282         case GLUT_KEY_F1:
283                 fullScreen = !fullScreen;
```

```
284                 break;
285
286         case GLUT_KEY_F2:
287                 // Only way to exit main loop.
288                 log.logLine("Exiting via F2");
289                 exit(EXIT_OK);
290                 break;
291
292         case GLUT_KEY_F3:
293                 Cam.resetCam();
294                 break;
295
296         case GLUT_KEY_F4:
297                 isInMain = !isInMain;
298                 break;
299
300         case GLUT_KEY_F5:
301                 log.logCamCoords();
302                 break;
303
304         case GLUT_KEY_UP:
305                 if (isInConsole || isInTerminal)
306                 {
307                         getPrev = true;
308                         getNext = false;
309
310                         // To ensure that the input is updated BEFORE next key
                            press
311                         normal(0, 0, 0);
312                 }
313                 break;
314
315         case GLUT_KEY_DOWN:
316                 if (isInConsole || isInTerminal)
317                 {
318                         getNext = true;
319                         getPrev = false;
320
321                         // To ensure that the input is updated BEFORE next key
                            press
322                         normal(0, 0, 0);
323                 }
324                 break;
325         }
326
327         if (fullScreen)
328         {
329                 glutFullScreen();
330         }
331
332         else
333         {
334                 glutReshapeWindow(1367, 767);
335                 glutPositionWindow(50, 50);
336         }
337 }
```

```
338
339 void Keyboard::interact()
340 {
341         // Only do things if we actually can
342         if (interactivity)
343         {
344                 if (activeSwitch != NULL)
345                 {
346                         activeSwitch->toggleTarget();
347
348                         for (unsigned int i = 0; i < triggers.size(); i++)
349                         {
350                                 triggers[i].tryToTrigger(activeSwitch, T_SWITCH);
351                         }
352                 }
353
354                 else if (activeTerminal != NULL)
355                 {
356                         isInTerminal = true;
357
358                         for (unsigned int i = 0; i < triggers.size(); i++)
359                         {
360                                 triggers[i].tryToTrigger(activeTerminal,
                                    T_TERMINAL);
361                         }
362                 }
363         }
364 }
```

3.1.21 Level.h

```
1  /*************************************************************\
2   * Level.h                                                   *
3   * This file was created by Jeremy Greenburg                 *
4   * As part of The God Core game for the University of        *
5   * Tennessee at Martin's University Scholars Organization    *
6   *                                                           *
7   * This file contains the declaration of the Level class     *
8   * Which loads all level assets from a sqlite database       *
9   * (data.db)                                                 *
10  \*************************************************************/
11
12  #ifndef LEVEL_H
13  #define LEVEL_H
14
15  // std;:string
16  #include <string>
17  // std::vector
18  #include <vector>
19  // Planes for walls/doors/such else
20  #include "Plane.h"
21
22  // SQLite API
23  #include "sqlite3.h"
24
25  // Glut API
26  #include <GL\glut.h>
```

```
27
28 class Level
29 {
30 private:
31         // Used to load cylinders
32         GLUquadricObj *quadratic;
33         // The current level being loaded
34         std::string currLevel;
35
36         // Look, the names are self-explanatory
37         void loadWalls(sqlite3 *db);
38         void loadDoors(sqlite3 *db);
39         void loadCylinders(sqlite3 *db);
40         void loadSwitches(sqlite3 *db);
41         void loadTerminals(sqlite3 *db);
42         void loadTriggers(sqlite3 *db);
43
44         // Binds the triggering object and target object to a single trigger
45         bool bindTrigger(std::string id, std::string trigger, std::string
               triggerType);
46         bool bindTarget(std::string id, std::string target, std::string targetType
               );
47 public:
48         // Manages the loading of the level
49         void loadLevel(std::string levelName);
50         // Draws the level
51         void displayLevel();
52 };
53
54 #endif
```

3.1.22 Level.cpp

```
1  /*************************************************************\
2   * Level.cpp                                                 *
3   * This file was created by Jeremy Greenburg                 *
4   * As part of The God Core game for the University of        *
5   * Tennessee at Martin's University Scholars Organization    *
6   *                                                           *
7   * This file contains the defintion of the Level class.      *
8   * for more information, see Keyboard.h                      *
9  \*************************************************************/
10
11 // Class declaration
12 #include "Level.h"
13 // To use Planes
14 #include "Plane.h"
15 // Vectors to plop stuff in
16 #include "Globals.h"
17 // Return codes
18 #include "Return.h"
19 // System log
20 #include "Logger.h"
21 // Oject Types
22 #include "GCTypes.h"
23
24 #include <iostream>
```

```
25
26  using namespace std;
27
28  void Level::loadWalls(sqlite3 *db)
29  {
30          walls.clear();
31          // Prepared Statement
32          sqlite3_stmt *stm;
33          // SQL command
34          string cmd;
35          // Connection Error Test
36          int err;
37          cmd = "SELECT * FROM walls WHERE LEVEL = \"" + currLevel + "\"";
38
39          err = sqlite3_prepare(db, cmd.c_str(), -1, &stm, 0);
40
41          if (err != SQLITE_OK)
42          {
43                  Logger log;
44                  vector<string> output = { "FATAL ERROR: failed to load walls from
                        ", currLevel };
45                  log.logLine(output);
46                  exit(STATEMENT_ERROR);
47          }
48
49          // While we still get rows of output
50          while (sqlite3_step(stm) == SQLITE_ROW)
51          {
52                  double x1, x2, x3, x4,
53                          y1, y2, y3, y4,
54                          z1, z2, z3, z4,
55                          r, g, b, a;
56                  string axis;
57
58                  x1 = sqlite3_column_double(stm, 2);
59                  x2 = sqlite3_column_double(stm, 3);
60                  x3 = sqlite3_column_double(stm, 4);
61                  x4 = sqlite3_column_double(stm, 5);
62
63                  y1 = sqlite3_column_double(stm, 6);
64                  y2 = sqlite3_column_double(stm, 7);
65                  y3 = sqlite3_column_double(stm, 8);
66                  y4 = sqlite3_column_double(stm, 9);
67
68                  z1 = sqlite3_column_double(stm, 10);
69                  z2 = sqlite3_column_double(stm, 11);
70                  z3 = sqlite3_column_double(stm, 12);
71                  z4 = sqlite3_column_double(stm, 13);
72
73                  r = sqlite3_column_double(stm, 14);
74                  g = sqlite3_column_double(stm, 15);
75                  b = sqlite3_column_double(stm, 16);
76                  a = sqlite3_column_double(stm, 17);
77
78                  axis = reinterpret_cast<const char*>(sqlite3_column_text(stm, 18))
                        ;
```

```
79
80                  char ax;
81                  if (axis == "x") ax = 'x';
82                  else if (axis == "y") ax = 'y';
83                  else if (axis == "z") ax = 'z';
84                  else ax = 0;
85
86                  double verts[12] =
87                  {
88                          x1, y1, z1,
89                          x2, y2, z2,
90                          x3, y3, z3,
91                          x4, y4, z4
92                  };
93                  double colors[4] = { r, g, b, a };
94
95                  Plane rect(verts, colors, ax);
96
97                  walls.push_back(rect);
98          }
99
100         /*
101         Logger log;
102         vector<string> output = { "Loaded walls on", currLevel };
103         log.logLine(output);
104         */
105
106         // Deconstructs the statement
107         sqlite3_finalize(stm);
108 }
109
110 void Level::loadDoors(sqlite3 *db)
111 {
112         doors.clear();
113         // Prepared Statement
114         sqlite3_stmt *stm;
115         // SQL command
116         string cmd;
117         // Connection Error Test
118         int err;
119         cmd = "SELECT * FROM doors WHERE LEVEL = \"" + currLevel + "\"";
120
121         err = sqlite3_prepare(db, cmd.c_str(), -1, &stm, 0);
122
123         if (err != SQLITE_OK)
124         {
125                 Logger log;
126                 vector<string> output = { "FATAL ERROR: Can't load doors while
                        loading", currLevel };
127                 log.logLine(output);
128
129                 exit(STATEMENT_ERROR);
130         }
131
132         // While we still get rows of output
133         while (sqlite3_step(stm) == SQLITE_ROW)
```

```
134         {
135                 double x1, x2, x3, x4,
136                        y1, y2, y3, y4,
137                        z1, z2, z3, z4,
138                        r, g, b, a;
139                 string id;
140                 string axis;
141
142                 id = reinterpret_cast<const char*>(sqlite3_column_text(stm, 0));
143                 x1 = sqlite3_column_double(stm, 2);
144                 x2 = sqlite3_column_double(stm, 3);
145                 x3 = sqlite3_column_double(stm, 4);
146                 x4 = sqlite3_column_double(stm, 5);
147
148                 y1 = sqlite3_column_double(stm, 6);
149                 y2 = sqlite3_column_double(stm, 7);
150                 y3 = sqlite3_column_double(stm, 8);
151                 y4 = sqlite3_column_double(stm, 9);
152
153                 z1 = sqlite3_column_double(stm, 10);
154                 z2 = sqlite3_column_double(stm, 11);
155                 z3 = sqlite3_column_double(stm, 12);
156                 z4 = sqlite3_column_double(stm, 13);
157
158                 r = sqlite3_column_double(stm, 14);
159                 g = sqlite3_column_double(stm, 15);
160                 b = sqlite3_column_double(stm, 16);
161                 a = sqlite3_column_double(stm, 17);
162
163                 a = sqlite3_column_double(stm, 17);
164
165                 axis = reinterpret_cast<const char*>(sqlite3_column_text(stm, 18))
                        ;
166
167                 char ax;
168                 if (axis == "x") ax = 'x';
169                 else if (axis == "y") ax = 'y';
170                 else if (axis == "z") ax = 'z';
171                 else ax = 0;
172
173                 double verts[12] =
174                 {
175                         x1, y1, z1,
176                         x2, y2, z2,
177                         x3, y3, z3,
178                         x4, y4, z4
179                 };
180                 double colors[4] = { r, g, b, a };
181
182                 Plane rect(verts, colors, ax);
183
184                 doors.push_back(Door(rect, id));
185         }
186
187         Logger log;
188         vector<string> output = { "Loaded doors on", currLevel };
```

```
189         log.logLine(output);
190
191         // Deconstructs the statement
192         sqlite3_finalize(stm);
193 }
194
195 void Level::loadCylinders(sqlite3 *db)
196 {
197         cylinders.clear();
198         // Prepared Statement
199         sqlite3_stmt *stm;
200         // SQL command
201         string cmd;
202         // Connection Error Test
203         int err;
204         cmd = "SELECT * FROM cylinders WHERE LEVEL = \"" + currLevel + "\"";
205
206         err = sqlite3_prepare(db, cmd.c_str(), -1, &stm, 0);
207
208         if (err != SQLITE_OK)
209         {
210                 Logger log;
211                 vector<string> output = { "FATAL ERROR: Can't load cylinders while
                        loading", currLevel };
212                 log.logLine(output);
213
214                 exit(STATEMENT_ERROR);
215         }
216
217         // While we still get rows of output
218         while (sqlite3_step(stm) == SQLITE_ROW)
219         {
220                 double xt, yt, zt,
221                         xr, yr, zr,
222                         r, g, b, a,
223                         baseRadius, topRadius, height;
224                 int stacks, slices;
225
226
227                 xt = sqlite3_column_double(stm, 1);
228                 yt = sqlite3_column_double(stm, 2);
229                 zt = sqlite3_column_double(stm, 3);
230
231                 xr = sqlite3_column_double(stm, 4);
232                 yr = sqlite3_column_double(stm, 5);
233                 zr = sqlite3_column_double(stm, 6);
234
235                 baseRadius = sqlite3_column_double(stm, 7);
236                 topRadius = sqlite3_column_double(stm, 8);
237                 height = sqlite3_column_double(stm, 9);
238
239                 stacks = sqlite3_column_int(stm, 10);
240                 slices = sqlite3_column_int(stm, 11);
241
242                 r = sqlite3_column_double(stm, 12);
243                 g = sqlite3_column_double(stm, 13);
```

```
244                 b = sqlite3_column_double(stm, 14);
245                 a = sqlite3_column_double(stm, 15);
246
247
248                 double translate[3] = { xt, yt, zt };
249                 double rotate[3] = { xr, yr, zr };
250                 double colors[4] = { r, g, b, a };
251
252                 cylinders.push_back(Cylinder(baseRadius, topRadius, height, stacks
                        , slices, translate, rotate, colors));
253         }
254
255         Logger log;
256         vector<string> output = { "Loaded cylinders on", currLevel };
257         log.logLine(output);
258
259         // Deconstructs the statement
260         sqlite3_finalize(stm);
261 }
262
263
264 void Level::loadSwitches(sqlite3 *db)
265 {
266         switches.clear();
267         // Prepared Statement
268         sqlite3_stmt *stm;
269         // SQL command
270         string cmd;
271         // Connection Error Test
272         int err;
273         cmd = "SELECT * FROM switches WHERE LEVEL = \"" + currLevel + "\"";
274
275         err = sqlite3_prepare(db, cmd.c_str(), -1, &stm, 0);
276
277         if (err != SQLITE_OK)
278         {
279                 Logger log;
280                 vector<string> output = { "FATAL ERROR: Can't load switches while
                        loading", currLevel };
281                 log.logLine(output);
282
283                 exit(STATEMENT_ERROR);
284         }
285
286         // While we still get rows of output
287         while (sqlite3_step(stm) == SQLITE_ROW)
288         {
289                 double xt, yt, zt,
290                         xr, yr, zr;
291                 string target, s_type, id;
292                 int i_type;
293                 bool isOn;
294
295                 id = reinterpret_cast<const char*>(sqlite3_column_text(stm, 0));
296                 target = reinterpret_cast<const char*>(sqlite3_column_text(stm, 2)
                        );
```

```
297                 xt = sqlite3_column_double(stm, 3);
298                 yt = sqlite3_column_double(stm, 4);
299                 zt = sqlite3_column_double(stm, 5);
300
301                 xr = sqlite3_column_double(stm, 6);
302                 yr = sqlite3_column_double(stm, 7);
303                 zr = sqlite3_column_double(stm, 8);
304
305                 s_type = reinterpret_cast<const char*>(sqlite3_column_text(stm, 9)
                        );
306
307                 isOn = (bool)sqlite3_column_int(stm, 10);
308
309                 double translate[3] = { xt, yt, zt };
310                 double rotate[3] = { xr, yr, zr };
311
312                 if (s_type == "DOOR")
313                         i_type = T_DOOR;
314                 else if (s_type == "TERMINAL")
315                         i_type = T_TERMINAL;
316                 else if (s_type == "LEVEL_END")
317                         i_type = T_LEVEL_END;
318                 else
319                 {
320                         Logger log;
321                         vector<string> output = { "Failed to evaluate string type
                                entry: ", s_type, "for switch ", id };
322                         log.logLine(output);
323
324                         exit(DATA_ENTRY_ERROR);
325                 }
326
327                 switches.push_back(Switch(translate, rotate, i_type, id, isOn));
328
329                 bool assigned = false;
330
331                 if (s_type == "LEVEL_END")
332                 {
333                         assigned = true;
334
335                         Logger log;
336                         vector<string> output = { "Switch ", id, " bound to end
                                level" };
337                         log.logLine(output);
338                 }
339
340                 else if (s_type == "DOOR")
341                 {
342                         for (unsigned int i = 0; i < doors.size(); i++)
343                         {
344                                 if (doors[i].getID() == target)
345                                 {
346                                         Logger log;
347                                         vector<string> output = { "Binding switch
                                                ", id, " to door", target };
348                                         log.logLine(output);
```

```
349
350                                         switches[switches.size() - 1].assign(&(
                                                doors[i]));
351
352                                         assigned = true;
353                                 }
354                         }
355                 }
356
357                 else if (s_type == "TERMINAL")
358                 {
359                         for (unsigned int i = 0; i < terminals.size(); i++)
360                         {
361                                 if (terminals[i].getID() == target)
362                                 {
363                                         Logger log;
364                                         vector<string> output = { "Binding switch
                                                ", id, " to terminal", target };
365                                         log.logLine(output);
366
367                                         switches[switches.size() - 1].assign(&(
                                                terminals[i]));
368
369                                         assigned = true;
370                                 }
371                         }
372                 }
373
374                 if (!assigned)
375                 {
376                         Logger log;
377                         vector<string> output = { "Failed to bind switch ", id, "
                                to a ", s_type };
378                         log.logLine(output);
379
380                         exit(BINDING_ERROR);
381                 }
382         }
383
384         Logger log;
385         vector<string> output = { "Loaded switches on", currLevel };
386         log.logLine(output);
387
388         // Deconstructs the statement
389         sqlite3_finalize(stm);
390 }
391
392 void Level::loadTerminals(sqlite3 *db)
393 {
394         terminals.clear();
395         // Prepared Statement
396         sqlite3_stmt *stm;
397         // SQL command
398         string cmd;
399         // Connection Error Test
400         int err;
```

```
401         cmd = "SELECT * FROM terminals WHERE LEVEL = \"" + currLevel + "\"";
402
403         err = sqlite3_prepare(db, cmd.c_str(), -1, &stm, 0);
404
405         if (err != SQLITE_OK)
406         {
407                 Logger log;
408                 vector<string> output = { "FATAL ERROR: Can't load terminals while
                        loading", currLevel };
409                 log.logLine(output);
410
411                 exit(STATEMENT_ERROR);
412         }
413
414         // While we still get rows of output
415         while (sqlite3_step(stm) == SQLITE_ROW)
416         {
417                 double xt, yt, zt,
418                         xr, yr, zr;
419                 string file, id;
420                 id = reinterpret_cast<const char*>(sqlite3_column_text(stm, 0));
421                 file = reinterpret_cast<const char*>(sqlite3_column_text(stm, 2));
422                 xt = sqlite3_column_double(stm, 3);
423                 yt = sqlite3_column_double(stm, 4);
424                 zt = sqlite3_column_double(stm, 5);
425
426                 xr = sqlite3_column_double(stm, 6);
427                 yr = sqlite3_column_double(stm, 7);
428                 zr = sqlite3_column_double(stm, 8);
429
430                 double translate[3] = { xt, yt, zt };
431                 double rotate[3] = { xr, yr, zr };
432
433                 Logger log;
434                 log.logLine(id);
435
436                 terminals.push_back(Terminal(translate, rotate, file, id));
437         }
438
439
440         Logger log;
441         vector<string> output = { "Loaded terminals on", currLevel };
442         log.logLine(output);
443
444         // Deconstructs the statement
445         sqlite3_finalize(stm);
446 }
447
448 void Level::loadTriggers(sqlite3 *db)
449 {
450         triggers.clear();
451         // Prepared Statement
452         sqlite3_stmt *stm;
453         // SQL command
454         string cmd;
455         // Connection Error Test
```

```
456         int err;
457         cmd = "SELECT * FROM triggers WHERE LEVEL = \"" + currLevel + "\"";
458 
459         err = sqlite3_prepare(db, cmd.c_str(), -1, &stm, 0);
460 
461         if (err != SQLITE_OK)
462         {
463                 Logger log;
464                 vector<string> output = { "FATAL ERROR: Can't load triggers while
                        loading", currLevel };
465                 log.logLine(output);
466 
467                 exit(STATEMENT_ERROR);
468         }
469 
470         // While we still get rows of output
471         while (sqlite3_step(stm) == SQLITE_ROW)
472         {
473                 string target, trigger, targetType, triggerType, id;
474                 int i_targetType, i_triggerType;
475 
476                 id = reinterpret_cast<const char*>(sqlite3_column_text(stm, 0));
477                 trigger = reinterpret_cast<const char*>(sqlite3_column_text(stm,
                        2));
478                 target = reinterpret_cast<const char*>(sqlite3_column_text(stm, 3)
                        );
479                 triggerType = reinterpret_cast<const char*>(sqlite3_column_text(
                        stm, 4));
480                 targetType = reinterpret_cast<const char*>(sqlite3_column_text(stm
                        , 5));
481 
482                 if (triggerType == "SWITCH")
483                         i_triggerType = T_SWITCH;
484                 else if (triggerType == "TERMINAL")
485                         i_triggerType = T_TERMINAL;
486                 else
487                 {
488                         Logger log;
489                         vector<string> output = { "Failed to evaluate string
                                trigger type entry: ", triggerType, "for trigger ", id
                                };
490                         log.logLine(output);
491 
492                         exit(DATA_ENTRY_ERROR);
493                 }
494 
495                 if (targetType == "SWITCH")
496                         i_targetType = T_SWITCH;
497                 else if (targetType == "TERMINAL")
498                         i_targetType = T_TERMINAL;
499                 else
500                 {
501                         Logger log;
502                         vector<string> output = { "Failed to evaluate string
                                trigger type entry: ", targetType, "for trigger ", id
                                };
```

```
503                         log.logLine(output);
504
505                         exit(DATA_ENTRY_ERROR);
506                 }
507
508                 triggers.push_back(Trigger(i_triggerType, i_targetType));
509
510                 bool assigned = bindTrigger(id, trigger, triggerType) &&
                        bindTarget(id, target, targetType);
511
512                 if (!assigned)
513                 {
514                         Logger log;
515                         vector<string> output = { "Failed to bind trigger ", id };
516                         log.logLine(output);
517
518                         exit(BINDING_ERROR);
519                 }
520         }
521
522         Logger log;
523         vector<string> output = { "Loaded trigger on", currLevel };
524         log.logLine(output);
525
526         // Deconstructs the statement
527         sqlite3_finalize(stm);
528 }
529
530 bool Level::bindTrigger(string id, string trigger, string triggerType)
531 {
532         if (triggerType == "SWITCH")
533         {
534                 for (unsigned int i = 0; i < switches.size(); i++)
535                 {
536                         if (switches[i].getID() == trigger)
537                         {
538                                 Logger log;
539                                 vector<string> output = { "Binding trigger ", id,
                                        " to trigger-switch", trigger };
540                                 log.logLine(output);
541
542                                 triggers[triggers.size() - 1].bindTrigger(&(
                                        switches[i]));
543
544                                 return true;
545                         }
546                 }
547         }
548
549         else if (triggerType == "TERMINAL")
550         {
551                 for (unsigned int i = 0; i < terminals.size(); i++)
552                 {
553                         if (terminals[i].getID() == trigger)
554                         {
555                                 Logger log;
```

```
556                                 vector<string> output = { "Binding trigger ", id,
                                        " to trigger-terminal", trigger };
557                                 log.logLine(output);
558
559                                 triggers[triggers.size() - 1].bindTrigger(&(
                                        terminals[i]));
560
561                                 return true;
562                         }
563                 }
564         }
565
566         return false;
567 }
568
569 bool Level::bindTarget(string id, string target, string targetType)
570 {
571
572         if (targetType == "SWITCH")
573         {
574                 for (unsigned int i = 0; i < switches.size(); i++)
575                 {
576                         if (switches[i].getID() == target)
577                         {
578                                 Logger log;
579                                 vector<string> output = { "Binding trigger ", id,
                                        " to target-switch", target };
580                                 log.logLine(output);
581
582                                 triggers[triggers.size() - 1].bindTarget(&(
                                        switches[i]));
583
584                                 return true;
585                         }
586                 }
587         }
588
589         else if (targetType == "TERMINAL")
590         {
591                 for (unsigned int i = 0; i < terminals.size(); i++)
592                 {
593                         if (terminals[i].getID() == target)
594                         {
595                                 Logger log;
596                                 vector<string> output = { "Binding trigger ", id,
                                        " to target-terminal", target };
597                                 log.logLine(output);
598
599                                 triggers[triggers.size() - 1].bindTarget(&(
                                        terminals[i]));
600
601                                 return true;
602                         }
603                 }
604         }
605
```

```
606         return false;
607 }
608
609 void Level::loadLevel(std::string levelName)
610 {
611         Logger log;
612         vector<string> output = { "Starting to load", levelName };
613         log.logLine(output);
614
615         if (quadratic == NULL)
616         {
617                 quadratic = gluNewQuadric();
618         }
619
620         currLevel = levelName;
621
622         // Connection to SQL database
623         sqlite3 *db;
624         // 1 if error with DB
625         int connectErr = sqlite3_open("Data.db", &db);
626
627         if (connectErr != SQLITE_OK)
628         {
629                 Logger log;
630                 log.logLine("FATAL ERROR: Can't access database");
631
632                 exit(DATABASE_ERROR);
633         }
634
635         loadWalls(db);
636         loadDoors(db);
637         loadCylinders(db);
638         loadTerminals(db);
639
640         // Loading switches must be after doors/terminals to properly bind
641         loadSwitches(db);
642
643         // Loading triggers must be done last to properly bind
644         loadTriggers(db);
645
646         // Closes the database
647         sqlite3_close(db);
648
649         output[0] = "Finished loading";
650         log.logLine(output);
651
652         Cam.resetCam();
653
654         // Get out of wall
655         for (unsigned int i = 0; i < 10; i++)
656         {
657                 Cam.moveForward(1);
658         }
659 }
660
661 void Level::displayLevel()
```

```
{
        for (auto i : walls)
        {
                i.Display();
        }

        for (auto i : doors)
        {
                i.Display();
        }

        for (auto i : cylinders)
        {
                i.Display();
        }

        for (auto i : switches)
        {
                i.Display();
        }

        for (auto i : terminals)
        {
                i.Display();
        }
}
```

3.1.23 Logger.h

```
/************************************************************\
 * Logger.h                                                 *
 * This file was created by Jeremy Greenburg                *
 * As part of The God Core game for the University of       *
 * Tennessee at Martin's University Scholars Organization   *
 *                                                          *
 * This file contains the declaration of the Logger class   *
 * Which writes messages to output.log because it's more    *
 * Reliable than stdout                                     *
\************************************************************/

#ifndef LOGGER_H
#define LOGGER_H

#include <shlobj.h>

// std::vector
#include <vector>
// std::string
#include <string>

class Logger
{
private:
        // Path to the log file
        char CHAR_PATH[MAX_PATH];
        std::string LOG_PATH;

```

```
29 public:
30         Logger();
31         // Erases the log file, called at the beggining of the program
32         void nuke();
33         // Writes to the log, either multiple lines or one line
34         void logLine(std::vector<std::string> input);
35         void logLine(std::string input);
36         // Writes the Camera Coordinates to the log file
37         void logCamCoords();
38
39 };
40
41 #endif
```

3.1.24 Logger.cpp

```
1  /************************************************************\
2   * Logger.cpp                                               *
3   * This file was created by Jeremy Greenburg                *
4   * As part of The God Core game for the University of       *
5   * Tennessee at Martin's University Scholars Organization   *
6   *                                                          *
7   * This file contains the defintion of the Logger class.    *
8   * for more information, see Logger.h                       *
9  \************************************************************/
10
11 // Class declaration
12 #include "Logger.h"
13 // For Cam coords
14 #include "Globals.h"
15 // File I/O
16 #include <fstream>
17
18 #include <iostream>
19
20 using namespace std;
21
22 Logger::Logger()
23 {
24         HRESULT ret = SHGetFolderPath(NULL, CSIDL_PERSONAL, NULL,
              SHGFP_TYPE_CURRENT, CHAR_PATH);
25         LOG_PATH = CHAR_PATH;
26         LOG_PATH += "\\The God Core\\output.log";
27 }
28
29 void Logger::nuke()
30 {
31         ofstream outfile(LOG_PATH); // Nukes everything within
32 }
33
34 void Logger::logLine(vector<string> input)
35 {
36         ofstream outfile(LOG_PATH, ios::app);
37
38         string output;
39
40         for (auto i : input)
```

```
41          {
42                  output += i;
43                  output += " ";
44          }
45          outfile << output << std::endl;
46  }
47
48  void Logger::logLine(string input)
49  {
50          ofstream outfile(LOG_PATH, ios::app);
51
52          outfile << input << std::endl;
53  }
54
55  void Logger::logCamCoords()
56  {
57          ofstream outfile(LOG_PATH, ios::app);
58
59          outfile << "Player Coordinates:\n";
60          outfile << "X: " << -Cam.x << endl;
61          outfile << "Y: " << -Cam.y << endl;
62          outfile << "Z: " << -Cam.z << endl;
63  }
```

3.1.25 MainMenu.h

```
1  /************************************************************\
2   * MainMenu.h                                               *
3   * This file was created by Jeremy Greenburg                *
4   * As part of The God Core game for the University of       *
5   * Tennessee at Martin's University Scholars Organization   *
6   *                                                          *
7   * This file contains the decleration of the MainMenu class *
8   * Which uses the Simple OpenGL Interface Library to load a *
9   * png picture of the main menu, as well as provide button  *
10  * Interactivity                                            *
11  \************************************************************/
12
13  #ifndef MAIN_MENU_H
14  #define MAIN_MENU_H
15
16  // For loading pictures
17  #include <SOIL.h>
18  // Inherit 2D functionality
19  #include "TwoD.h"
20
21  // Make OpenGL happy
22  #include <cstdlib>
23  // openGL API
24  #include <GL\glut.h>
25
26  class MainMenu : public TwoD
27  {
28  public:
29          // Loads the picture up in memory
30          MainMenu();
31          // Handles drawing to the screen
```

```
32          void display();
33          // Handles and processes mouse clicks
34          void getClick(double x, double y);
35
36  private:
37          // Draws the main picture
38          void drawMainPic();
39          // DEBUG: draws boxes around all buttons
40          void drawClickBoxes();
41          // What the picture is bound to
42          GLint texture;
43  };
44
45  #endif
```

3.1.26 MainMenu.cpp

```
1   /*************************************************************\
2    * MainMenu.cpp                                              *
3    * This file was created by Jeremy Greenburg                 *
4    * As part of The God Core game for the University of        *
5    * Tennessee at Martin's University Scholars Organization    *
6    *                                                           *
7    * This file contains the defintion of the MainMenu class.   *
8    * for more information, see MainMenu.h                      *
9   \*************************************************************/
10
11  // Class declaration
12  #include "MainMenu.h"
13  // isInMain
14  #include "Globals.h"
15  // Return codes
16  #include "Return.h"
17  // System log
18  #include "Logger.h"
19
20  #include "SaveManager.h"
21
22  using namespace std;
23
24  MainMenu::MainMenu()
25  {
26          texture = SOIL_load_OGL_texture
27                          (
28                                  "Resources\\Images\\Main.png",   // Image to load
29                                  SOIL_LOAD_AUTO,                                  //
                                        ???
30                                  SOIL_CREATE_NEW_ID,
31                                  SOIL_FLAG_MIPMAPS | SOIL_FLAG_NTSC_SAFE_RGB |
                                        SOIL_FLAG_COMPRESS_TO_DXT // !?!?!?!
32                          );
33
34          if (texture == 0)
35          {
36                  Logger log;
37                  vector<string> output = {"FATAL ERROR: SOIL cannot load image",
                        SOIL_last_result()};
```

```
38                  log.logLine(output);
39                  exit(SOIL_ERROR);
40          }
41  }
42
43  void MainMenu::drawMainPic()
44  {
45          glEnable(GL_TEXTURE_2D);
46
47          glBindTexture(GL_TEXTURE_2D, texture); // Prepares the texture for usage
48
49          glColor3d(1, 1, 1);
50          glBegin(GL_QUADS);
51          glTexCoord2d(0, 0);     glVertex2d(SCREENLEFT, SCREENTOP);
52          glTexCoord2d(0, 1); glVertex2d(SCREENLEFT, SCREENBOTTOM);
53          glTexCoord2d(1, 1); glVertex2d(SCREENRIGHT, SCREENBOTTOM);
54          glTexCoord2d(1, 0);     glVertex2d(SCREENRIGHT, SCREENTOP);
55
56          glEnd();
57
58          glDisable(GL_TEXTURE_2D);
59
60  }
61
62  void MainMenu::drawClickBoxes()
63  {
64          glColor3d(1, 0, 0);
65
66          // Start a new game
67          glBegin(GL_LINE_LOOP);
68          glVertex2d(SCREENRIGHT / 20.0, SCREENBOTTOM / 2.2);
69          glVertex2d(SCREENRIGHT / 20.0, SCREENBOTTOM / 1.9);
70          glVertex2d(SCREENRIGHT / 3.0, SCREENBOTTOM / 1.9);
71          glVertex2d(SCREENRIGHT / 3.0, SCREENBOTTOM / 2.2);
72          glEnd();
73
74          // Load game
75          glBegin(GL_LINE_LOOP);
76          glVertex2d(SCREENRIGHT / 10.0, SCREENBOTTOM / 1.57);
77          glVertex2d(SCREENRIGHT / 10.0, SCREENBOTTOM / 1.75);
78          glVertex2d(SCREENRIGHT / 3.5, SCREENBOTTOM / 1.75);
79          glVertex2d(SCREENRIGHT / 3.5, SCREENBOTTOM / 1.57);
80          glEnd();
81
82          // Options
83          glBegin(GL_LINE_LOOP);
84          glVertex2d(SCREENRIGHT / 8.5, SCREENBOTTOM / 1.35);
85          glVertex2d(SCREENRIGHT / 8.5, SCREENBOTTOM / 1.45);
86          glVertex2d(SCREENRIGHT / 3.9, SCREENBOTTOM / 1.45);
87          glVertex2d(SCREENRIGHT / 3.9, SCREENBOTTOM / 1.35);
88          glEnd();
89
90          // Exit
91
92          glBegin(GL_LINE_LOOP);
93          glVertex2d(SCREENRIGHT / 8.5, SCREENBOTTOM / 1.35);
```

```
94          glVertex2d(SCREENRIGHT / 8.5, SCREENBOTTOM / 1.45);
95          glVertex2d(SCREENRIGHT / 3.9, SCREENBOTTOM / 1.45);
96          glVertex2d(SCREENRIGHT / 3.9, SCREENBOTTOM / 1.35);
97          glEnd();
98  }
99
100 void MainMenu::getClick(double x, double y)
101 {
102         // Start new game
103         if (x >= SCREENRIGHT / 20.0 && x <= SCREENRIGHT / 3.0)
104         {
105                 if (y >= SCREENBOTTOM / 2.2 && y <= SCREENBOTTOM / 1.9)
106                 {
107                         isInMain = false;
108                         songNum++;
109                         changeSong = true;
110                 }
111         }
112
113         // Load Game
114         if (x >= SCREENRIGHT / 10.0 && x <= SCREENRIGHT / 3.5)
115         {
116                 if (y >= SCREENBOTTOM / 1.75 && y <= SCREENBOTTOM / 1.57)
117                 {
118                         SaveManager Jesus; // Jesus Saves
119                         if (!Jesus.loadGame()); // null
120                         else isInMain = false;
121
122                 }
123         }
124
125         // Options
126         if (x >= SCREENRIGHT / 8.5 && x <= SCREENRIGHT / 3.9)
127         {
128                 if (y >= SCREENBOTTOM / 1.45 && y <= SCREENBOTTOM / 1.35)
129                 {
130                         //
131                 }
132         }
133
134         // Exit
135         /*
136         if (x >= SCREENRIGHT / 20.0 && x <= SCREENRIGHT / 3.0)
137         {
138                 if (y >= SCREENBOTTOM / 2.2 && y <= SCREENBOTTOM / 1.9)
139                 {
140                         exit(0);
141                 }
142         }*/
143 }
144
145 void MainMenu::display()
146 {
147         prepare2D();
148
149         drawMainPic();
```

```
150
151         // Disable once finished
152         drawClickBoxes();
153
154         glEnd();
155
156         prepare3D();
157 }
```

3.1.27 MusicManager.h

```
1  /************************************************************\
2   * MusicManager.h                                           *
3   * This file was created by Jeremy Greenburg                *
4   * As part of The God Core game for the University of       *
5   * Tennessee at Martin's University Scholars Organization   *
6   *                                                          *
7   * This file contains the declaration of the MusicManager   *
8   * Class, which uses the FMOD API to load .mp3 files into   *
9   * Memory, play them when called, and release the memory    *
10  * When the song is no longer needed.                       *
11 \************************************************************/
12
13 #ifndef MUSICMANAGER_H
14 #define MUSICMANAGER_H
15
16 // FMOD API
17 #include <fmod.hpp>
18
19 // Creates new type for ease of use
20 typedef FMOD::Sound* SoundClass;
21
22 class MusicManager
23 {
24 private:
25         // Pointer to dynamic system memory to load music
26         FMOD::System *m_pSystem;
27
28         // The path to the music folder
29         static const char* MUSIC_PATH;
30
31 public:
32         // Loads the song in memory
33         void makeSound(SoundClass *psound, const char *song);
34         // Plays the song (Always loops)
35         void playSound(SoundClass pSound, bool bLoop = true);
36         // Releases the song
37         void releaseSound(SoundClass psound);
38         // Initializes FMOD
39         MusicManager();
40 };
41
42 #endif
```

3.1.28 MusicManager.cpp

```
1  /************************************************************\
```

```
 * FILENAME                                                    *
 * This file was created by Jeremy Greenburg                   *
 * As part of The God Core game for the University of          *
 * Tennessee at Martin's University Scholars Organization      *
 *                                                             *
 * This file contains the definition of the MusicManager       *
 * Class. For more information, see MusicManager.h             *
\*************************************************************/

// Class definition
#include "MusicManager.h"

// Because concatenating char*'s are really hard
#include <string>

// Return codes
#include "Return.h"

// System log
#include "Logger.h"

using namespace std;

// Initialize the constant member of the class
const char* MusicManager::MUSIC_PATH = "Resources\\Music\\";

MusicManager::MusicManager()
{
        Logger log;
        if (FMOD::System_Create(&m_pSystem) != FMOD_OK)
        {
                log.logLine("FATAL ERROR: FMOD unable to create system");
                exit(FMOD_ERROR);
        }

        int driverCount = 0;
        m_pSystem->getNumDrivers(&driverCount);

        // If you have no driver, you have bigger problems to worry about
        if (driverCount == 0)
        {
                // Report Error
                log.logLine("ERROR: FMOD unable to detect drivers");
                exit(FMOD_ERROR);
        }

        log.logLine("FMOD succesfully initialized");
        // Initialize our Instance with 36 Channels
        m_pSystem->init(36, FMOD_INIT_NORMAL, NULL);
}

void MusicManager::makeSound(SoundClass *psound, const char *song)
{
        // MUSIC_PATH is placed in a nice string. Good string. Strings are friends
        string fullPath = MUSIC_PATH;
        // Now there is a full path to the song
```

```
58          fullPath += song;
59
60          m_pSystem->createSound(fullPath.c_str(), FMOD_DEFAULT, 0, psound);
61  }
62
63  void MusicManager::playSound(SoundClass pSound, bool bLoop)
64  {
65          if (!bLoop)
66                  pSound->setMode(FMOD_LOOP_OFF);
67          else
68          {
69                  pSound->setMode(FMOD_LOOP_NORMAL);
70                  pSound->setLoopCount(-1);
71          }
72
73          m_pSystem->playSound(pSound, NULL , false, 0);
74  }
75
76  void MusicManager::releaseSound(SoundClass pSound)
77  {
78          pSound->release();
79  }
```

3.1.29 PauseScreen.h

```
1   /*************************************************************\
2    * PauseScreen.h                                             *
3    * This file was created by Jeremy Greenburg                 *
4    * As part of The God Core game for the University of        *
5    * Tennessee at Martin's University Scholars Organization    *
6    *                                                           *
7    * This file contains the declaration of the PauseScreen     *
8    * class, which contains the rules for drawing the Pause     *
9    * Screen, as well as mechanics for detecting button clicks  *
10   * and rules for when each button is clicked.                *
11   *                                                           *
12   * The PauseScreen class is inherited from the Screen class  *
13   * to take advantage of it's native drawing functions as well*
14   * as its native variables, but redefines the getClick       *
15   * function to allow for PauseScreen's differing mechanics   *
16  \*************************************************************/
17
18  #ifndef PAUSESCREEN_H
19  #define PAUSESCREEN_H
20
21  // 2D functionallity
22  #include "TwoD.h"
23  // std::string
24  #include <string>
25  // std::vector
26  #include <vector>
27
28  class PauseScreen : public TwoD
29  {
30  private:
31          int num_of_buttons, activeButton;
32          std::vector <std::string> buttonNames;
```

```
33
34
35  public:
36          // Initializes variables
37          PauseScreen();
38
39          // Displays the pause screen
40          void display();
41          /*
42           * Detects where the player clicks on the screen and responds accordingly.
43           * Returns false if the player clicks the exit button (indicating that the
                 screen should close)
44           * Returns true otherwise (indicating that the screen should remain open
45           */
46          bool getClick(int x, int y);
47
48          // Performs an action depending on which button has been clicked
49          void doStuff();
50  };
51
52  #endif
```

3.1.30 PauseScreen.cpp

```
1   /************************************************************\
2    * PauseScreen.h                                            *
3    * This file was created by Jeremy Greenburg                *
4    * As part of The God Core game for the University of       *
5    * Tennessee at Martin's University Scholars Organization   *
6    *                                                          *
7    * This file contains the definition of the PauseScreen class*
8    * For more information, see PauseScreen.h                  *
9   \************************************************************/
10
11  // Class declaration
12  #include "PauseScreen.h"
13
14  // SaveManager class
15  #include "SaveManager.h"
16
17  // Global variables
18  #include "Globals.h"
19
20  // Return codes
21  #include "Return.h"
22
23  PauseScreen::PauseScreen()
24  {
25          num_of_buttons = 4;
26          activeButton = -1;
27
28          buttonNames.push_back("Inventory");
29          buttonNames.push_back("Save");
30          buttonNames.push_back("Load");
31          buttonNames.push_back("Quit");
32  }
33
```

```
34
35  bool PauseScreen::getClick(int x, int y)
36  {
37          // The left and right bounds of a button
38          if (x > SCREENLEFT + 20 &&
39                  x < SCREENRIGHT / 10)
40          {
41                  for (int i = 0; i < num_of_buttons; i++)
42                  {
43                          // If y is in the particular bounds of a button
44                          if (y > SCREENBOTTOM / num_of_buttons * (i + .1)
45                                  &&
46                                  y < SCREENBOTTOM / num_of_buttons * (i + 1))
47                          {
48                                  if (activeButton == i)
49                                          activeButton = -1;
50                                  else
51                                          activeButton = i;
52                          }
53                  }
54          }
55
56          else if (
57                  // The bounds of the exit button
58                  x > 19 * SCREENRIGHT / 20 && y < SCREENBOTTOM / 20
59                  )
60          {
61                  // Exit button, close window
62                  return false;
63          }
64
65          // Not exit button, keep window
66          return true;
67  }
68
69  void PauseScreen::doStuff()
70  {
71          // Inventory
72          if (activeButton == 0)
73          {
74                  // Inventory here
75          }
76
77          // Save
78          else if (activeButton == 1)
79          {
80                  //SaveManager Jesus; // Jesus saves
81                  //Jesus.saveLevel(curr_level);
82          }
83
84          // Load
85          else if (activeButton == 2)
86          {
87                  //SaveManager Jesus; // Jesus... loads?
88                  loading = true;
89
```

```
90                  //curr_level = Jesus.loadGame();
91          }
92
93          // Quit
94          else if (activeButton == 3)
95          {
96                  exit(EXIT_OK);
97          }
98  }
99
100 void PauseScreen::display()
101 {
102         prepare2D();
103
104         // We're gonna have specialized actions for this main menu
105         //drawExit();
106         //drawSideBar();
107         //drawButtons();
108         doStuff();
109
110         prepare3D();
111 }
```

3.1.31 Plane.h

```
1   /************************************************************\
2    * Plane.h                                                  *
3    * This file was created by Jeremy Greenburg                *
4    * As part of The God Core game for the University of       *
5    * Tennessee at Martin's University Scholars Organization   *
6    *                                                          *
7    * This file contains the declaration of the Plane class    *
8    * Which is used to hold the details of a 2D Plane and      *
9    * draw  it to the screen                                   *
10  \************************************************************/
11
12  #ifndef Plane_H
13  #define Plane_H
14
15  class Plane
16  {
17  private:
18          // Arrays containing the color and vertices of the Plane
19          double color[4];
20          // What axis is it aligned on (x y z)
21          char axis;
22          // The vertices of the corners
23          double vertices[12];
24  public:
25
26          // Paramaterized constructor, as there cannot be a Plane without vertices
27          // Can take an axis or can ignore exis
28          Plane(const double(&new_vertices)[12], const double(&new_color)[4], char
                _axis);
29          Plane(const double(&new_vertices)[12], const double(&new_color)[4]);
30
31          // Part of the plane equation, calculated in constructor
```

```
32          double a, b, c, d;
33
34          // Determines if the player is in the bounds of the Plane (based on axis)
35          bool isInBounds();
36
37          // Returns the plane norm (Perpindicular line)
38          double getNorm();
39
40          // Print a Plane in 3D
41          void Display();
42          // Print a Plane in 2D
43          void Display2D();
44  };
45
46  #endif
```

3.1.32 Plane.cpp

```
1   /************************************************************\
2    * Plane.cpp                                                *
3    * This file was created by Jeremy Greenburg                *
4    * As part of The God Core game for the University of       *
5    * Tennessee at Martin's University Scholars Organization   *
6    *                                                          *
7    * This file contains the definition of the Plane class     *
8    * For more information, see Plane.h                        *
9   \************************************************************/
10
11  #include "Plane.h"
12
13  // For std::copy
14  #include <iterator>
15  #include <utility>
16
17  // max and min
18  #include <algorithm>
19
20  // OpenGL API
21  #include <GL\glut.h>
22
23  // For Cam coords
24  #include "Globals.h"
25
26  using namespace std;
27
28  Plane::Plane(const double (&new_vertices)[12], const double (&new_color)[4], char
        _axis)
29  {
30          // Copies the color
31          copy(begin(new_color), end(new_color), color);
32
33          // Copies the vertices
34          copy(begin(new_vertices), end(new_vertices), vertices);
35
36
37          // Somedays I wonder what I'm even doing \\
```

```
38          // When I forget what all this means: http://keisan.casio.com/exec/system
                /1223596129 \\
39
40          // Calculate vector equation ax + by + cz + d = 0
41          // Get two vectors from three of the corners
42          double AB[] = { vertices[3] - vertices[0], vertices[4] - vertices[1],
                vertices[5] - vertices[2] };
43          double AC[] = { vertices[6] - vertices[0], vertices[7] - vertices[1],
                vertices[8] - vertices[2] };
44          // Cross Product of AB and AC
45          a = (AB[1] * AC[2]) - (AB[2] * AC[1]);
46          b = (AB[2] * AC[0]) - (AB[0] * AC[2]);
47          c = (AB[0] * AC[1]) - (AB[1] * AC[0]);
48          d = (a * vertices[0] + b * vertices[1] + c * vertices[2]);
49
50          axis = _axis;
51  }
52
53  Plane::Plane(const double(&new_vertices)[12], const double(&new_color)[4])
54  {
55          // Copies the color
56          copy(begin(new_color), end(new_color), color);
57
58          // Copies the vertices
59          copy(begin(new_vertices), end(new_vertices), vertices);
60
61
62          // Somedays I wonder what I'm even doing \\
63                  // When I forget what all this means: http://keisan.casio.com/exec
                        /system/1223596129 \\
64
65  // Calculate vector equation ax + by + cz + d = 0
66  // Get two vectors from three of the corners
67          double AB[] = { vertices[3] - vertices[0], vertices[4] - vertices[1],
                vertices[5] - vertices[2] };
68          double AC[] = { vertices[6] - vertices[0], vertices[7] - vertices[1],
                vertices[8] - vertices[2] };
69          // Cross Product of AB and AC
70          a = (AB[1] * AC[2]) - (AB[2] * AC[1]);
71          b = (AB[2] * AC[0]) - (AB[0] * AC[2]);
72          c = (AB[0] * AC[1]) - (AB[1] * AC[0]);
73          d = (a * vertices[0] + b * vertices[1] + c * vertices[2]);
74
75          axis = 0;
76  }
77
78  void Plane::Display()
79  {
80          // Set's OpenGL's color to the color of the Plane
81          glColor4f(color[0], color[1], color[2], color[3]);
82
83          glBegin(GL_QUADS);
84          glVertex3d(vertices[0], vertices[1], vertices[2]);
85          glVertex3d(vertices[3], vertices[4], vertices[5]);
86          glVertex3d(vertices[6], vertices[7], vertices[8]);
87          glVertex3d(vertices[9], vertices[10], vertices[11]);
```

```
88          glEnd();
89  }
90
91  void Plane::Display2D()
92  {
93          glColor4f(color[0], color[1], color[2], color[3]);
94
95          glBegin(GL_QUADS);
96          glVertex2d(vertices[0], vertices[1]);
97          glVertex2d(vertices[3], vertices[4]);
98          glVertex2d(vertices[6], vertices[7]);
99          glVertex2d(vertices[9], vertices[10]);
100         glEnd();
101 }
102
103 bool Plane::isInBounds()
104 {
105         if (axis == 'x')
106         {
107                 vector<double> X = { vertices[0], vertices[3], vertices[6],
                        vertices[9] };
108                 double maxX = *max_element(X.begin(), X.end());
109                 double minX = *min_element(X.begin(), X.end());
110
111                 return (-Cam.x <= maxX && -Cam.x >= minX);
112
113         }
114
115         else if (axis == 'y')
116         {
117                 vector<double> Y = { vertices[1], vertices[4], vertices[7],
                        vertices[10] };
118                 double maxY = *max_element(Y.begin(), Y.end());
119                 double minY = *min_element(Y.begin(), Y.end());
120
121                 return (-Cam.y <= maxY && -Cam.x >= minY);
122         }
123
124         else if (axis == 'z')
125         {
126                 vector<double> Z = { vertices[2], vertices[5], vertices[8],
                        vertices[11] };
127                 double maxZ = *max_element(Z.begin(), Z.end());
128                 double minZ = *min_element(Z.begin(), Z.end());
129
130                 return (-Cam.z <= maxZ && -Cam.z >= minZ);
131         }
132         else return false;
133 }
134
135 double Plane::getNorm()
136 {
137         return sqrt(a * a + b * b + c * c);
138 }
```

3.1.33 Return.h

```
/*************************************************************\
 * Return.h                                                  *
 * This file was created by Jeremy Greenburg                 *
 * As part of The God Core game for the University of        *
 * Tennessee at Martin's University Scholars Organization    *
 *                                                           *
 * This file contains varius return codes for when things    *
 * Go horribly wrong (and they do)                           *
 * (just hopefully not during my senior defense)             *
\*************************************************************/

#ifndef RETURN_H
#define RETURN_H

#define EXIT_OK 0
#define EXIT_EARLY 1 // If we exit OpenGL main loop early
#define FMOD_ERROR 2 // Fmod can't load sound
#define DATABASE_ERROR 3 // sqlite can't load database
#define STATEMENT_ERROR 4 // sqlite statement fails to execute
#define SOIL_ERROR 5 // SOIl fails to load image
#define DATA_ENTRY_ERROR 6
#define BINDING_ERROR 7
#define FILE_NOT_FOUND 8

#endif
```

3.1.34 Resource.h

```
/*************************************************************\
 * Return.h                                                  *
 * This file was created by Jeremy Greenburg                 *
 * As part of The God Core game for the University of        *
 * Tennessee at Martin's University Scholars Organization    *
 *                                                           *
 * This file contains varius return codes for when things    *
 * Go horribly wrong (and they do)                           *
 * (just hopefully not during my senior defense)             *
\*************************************************************/

#ifndef RETURN_H
#define RETURN_H

#define EXIT_OK 0
#define EXIT_EARLY 1 // If we exit OpenGL main loop early
#define FMOD_ERROR 2 // Fmod can't load sound
#define DATABASE_ERROR 3 // sqlite can't load database
#define STATEMENT_ERROR 4 // sqlite statement fails to execute
#define SOIL_ERROR 5 // SOIl fails to load image
#define DATA_ENTRY_ERROR 6
#define BINDING_ERROR 7
#define FILE_NOT_FOUND 8

#endif
```

3.1.35 SaveManager.h

```
/*************************************************************\
```

```
 * SaveManager.h                                                *
 * This file was created by Jeremy Greenburg                    *
 * As part of The God Core game for the University of           *
 * Tennessee at Martin's University Scholars Organization       *
 *                                                              *
 * This file contains the declaration of the SaveManager        *
 * Class, which saves data by encrypting an array of strings    *
 * And writing them to core.sav, or by reading in an array of   *
 * Strings from core.sav and decrypting them                    *
\*************************************************************/

#ifndef SAVEMANAGER_H
#define SAVEMANAGER_H

// Windows API
#include <shlobj.h>

// Because concatenating char*'s is really hard
#include <string>

class SaveManager
{
private:
        // The path to core.sav
        char CHAR_PATH[MAX_PATH];
        std::string SAVE_PATH;

        // Takes an unencrypted string and returns an encrypted string
        std::string encrytData(std::string data);
        // Takes an encrypted string and returns a decrypted string
        std::string decryptData(std::string data);
public:
        SaveManager();
        // Writes the array of encrypted strings to core.sav
        void saveLevel();
        // Sets global variables to load game
        bool loadGame();
        // Returns the decrypted string in core.sav
        std::string readSave();
        // Returns true if core.save exists
        bool checkSave();
};

#endif
```

3.1.36 SaveManager.cpp

```
/*************************************************************\
 * SaveManager.cpp                                              *
 * This file was created by Jeremy Greenburg                    *
 * As part of The God Core game for the University of           *
 * Tennessee at Martin's University Scholars Organization       *
 *                                                              *
 * This file contains the definition of the SaveManager class   *
 * For more information, see SaveManager.h                      *
\*************************************************************/

```

```
11 // Class definition
12 #include "SaveManager.h"
13
14 // File I/O
15 #include <fstream>
16
17 #include "Globals.h"
18
19 #include "Logger.h"
20
21 using namespace std;
22
23 SaveManager::SaveManager()
24 {
25         HRESULT ret = SHGetFolderPath(NULL, CSIDL_PERSONAL, NULL,
              SHGFP_TYPE_CURRENT, CHAR_PATH);
26         SAVE_PATH = CHAR_PATH;
27         SAVE_PATH += "\\The God Core\\core.sav";
28 }
29
30 string SaveManager::encrytData(string data)
31 {
32         string ret_str;
33         for (unsigned int i = 0; i < data.length()*3; i+=3)
34         {
35                 ret_str += data[i/3] + 48;
36                 ret_str += data[i/3] - 48;
37                 ret_str += data[i/3] + 53;
38         }
39         return ret_str;
40 }
41
42 string SaveManager::decryptData(string data)
43 {
44         string ret_str;
45         for (unsigned int i = 0; i < data.length(); i+=3)
46         {
47                 ret_str += data[i] - 48;
48         }
49
50         return ret_str;
51 }
52
53 string SaveManager::readSave()
54 {
55         Logger log;
56
57         ifstream save(SAVE_PATH);
58         log.logLine("Checking Save integrity.");
59
60         string enc_data; // Encrypted Data
61         string dcr_data; // Decrypted Data
62         save >> enc_data;// Read encrypted data from file
63         dcr_data = decryptData(enc_data); // Decrypt data
64
65         vector<string> output{ "Decrypted Data: ", dcr_data };
```

```
66          log.logLine(output);
67
68          save.close();
69
70          return dcr_data;
71  }
72
73  void SaveManager::saveLevel()
74  {
75          ofstream save(SAVE_PATH);
76
77          string input = curr_level + " " + to_string(songNum);
78
79          string encr_str = encrytData(input);
80
81          save << encr_str;
82
83          save.close();
84  }
85
86  bool SaveManager::loadGame()
87  {
88          // might change to vector<string> later
89          string data = readSave();
90          size_t pos = data.find(' ');
91
92          if (pos == string::npos) return false;
93          string savedLevel = data.substr(0, pos);
94          int savedSong = stoi(data.substr(pos + 1));
95
96          int temp_levelNum = getLevelNum(savedLevel);
97
98          if (temp_levelNum == -1) return false;
99
100         levelNum = temp_levelNum;
101         curr_level = getLevelString(levelNum);
102         songNum = savedSong;
103
104         loading = true;
105         changeSong = true;
106
107         return true;
108 }
109
110 bool SaveManager::checkSave()
111 {
112         ifstream save(SAVE_PATH);
113
114         if (save)
115         {
116                 return true;
117         }
118
119         else
120         {
121                 return false;
```

```
122         }
123 }
```

3.1.37 Switch.h

```
 1 /*************************************************************\
 2  * Switch.h                                                  *
 3  * This file was created by Jeremy Greenburg                 *
 4  * As part of The God Core game for the University of        *
 5  * Tennessee at Martin's University Scholars Organization    *
 6  *                                                           *
 7  * This file contains the declaration of the Switch class    *
 8  * Which is bound to a Door via pointer and can open and     *
 9  * Close the door at will                                    *
10 \*************************************************************/
11
12 #ifndef SWITCH_H
13 #define SWITCH_H
14
15 // Door class
16 #include "Door.h"
17 #include "PoweredObject.h"
18 // Terminal Class
19 #include "Terminal.h"
20
21 // Types
22 #include "GCTypes.h"
23
24 class Switch  : public PoweredObject
25 {
26 private:
27         void* target; // The door that this switch activates
28         // Translation and rotation coordinates
29         double translate[3], rotate[3];
30
31         // One of the predefined types
32         GCtype targetType;
33
34         std::string id;
35
36 public:
37         // Initializes the translation and rotation matrices
38         Switch(const double(&_translate)[3], const double(&_rotate)[3], GCtype
              _type, std::string _id, bool _isOn);
39         // Binds the target pointer to an object
40         void assign(void* _target);
41         // Opens/Closes the door
42         void toggleTarget();
43         // Actually draws the switch
44         void Display();
45
46         std::string getID();
47
48         // Gets the translation coordinates
49         double getX();
50         double getY();
51         double getZ();
```

```
52 };
53
54 #endif
```

3.1.38 Switch.cpp

```
1  /*************************************************************\
2   * Switch.cpp                                                *
3   * This file was created by Jeremy Greenburg                 *
4   * As part of The God Core game for the University of        *
5   * Tennessee at Martin's University Scholars Organization    *
6   *                                                           *
7   * This file contains the definition of the Switch class     *
8   * For more information, see Switch.h                        *
9  \*************************************************************/
10
11 // Class decleration
12 #include "Switch.h"
13
14 // Allows copying arrays
15 #include <iterator>
16 #include <utility>
17 #include <algorithm>
18
19 #include "Globals.h"
20
21 // OpenGL API
22 #include <GL\glut.h>
23
24 using namespace std;
25
26 Switch::Switch(const double(&_translate)[3], const double(&_rotate)[3], GCtype
       _type, string _id, bool _isOn)
27 {
28         // Copies the color
29         copy(begin(_translate), end(_translate), translate);
30
31         // Copies the vertices
32         copy(begin(_rotate), end(_rotate), rotate);
33
34         targetType = _type;
35
36         target = NULL;
37
38         id = _id;
39
40         if (_isOn) activate();
41         else deactivate();
42
43 }
44
45 void Switch::assign(void* _target)
46 {
47         target = _target;
48 }
49
50 void Switch::toggleTarget()
```

```
51  {
52          switch (targetType)
53          {
54                  case T_DOOR:
55                  {
56                          Door* t = (Door*)target;
57                          t->isOpen = !t->isOpen;
58                          break;
59                  }
60                  case T_TERMINAL:
61                  {
62                          Terminal* t = (Terminal*)target;
63                          t->toggle();
64                          break;
65                  }
66                  case T_LEVEL_END:
67                  {
68                          levelNum++;
69                          curr_level = getLevelString(levelNum);
70                          loading = true;
71
72                          // TEMP
73                          songNum++;
74                          changeSong = true;
75                  }
76          }
77  }
78
79  void Switch::Display()
80  {
81          glPushMatrix();
82          glTranslated(translate[0], translate[1], translate[2]);
83          glRotated(rotate[0], 1, 0, 0);
84          glRotated(rotate[1], 0, 1, 0);
85          glRotated(rotate[2], 0, 0, 1);
86
87          glColor3d(0.9, 0.9, 0.9);
88          glutSolidCube(.1);
89
90          switch (targetType)
91          {
92          case T_DOOR:
93                  glColor3d(0, 1, 0);
94                  break;
95          case T_TERMINAL:
96                  glColor3d(1, 0, 0);
97                  break;
98          default:
99                  glColor3d(0, 0, 1);
100         }
101
102         // If powered off, recolor to black
103         if (!checkIfOn()) glColor3d(0, 0, 0);
104
105         glScaled(.5, .5, 1.5);
106         glutSolidCube(.1);
```

```
107
108         glPopMatrix();
109 }
110
111 string Switch::getID()
112 {
113         return id;
114 }
115
116 double Switch::getX()
117 {
118         return translate[0];
119 }
120
121 double Switch::getY()
122 {
123         return translate[1];
124 }
125
126 double Switch::getZ()
127 {
128         return translate[2];
129 }
```

3.1.39 Terminal.h

```
1  /************************************************************\
2   * Terminal.h                                               *
3   * This file was created by Jeremy Greenburg                *
4   * As part of The God Core game for the University of       *
5   * Tennessee at Martin's University Scholars Organization   *
6   *                                                          *
7   * This file contains the declaration of the Terminal class *
8   * Which draws and manages ingame computer terminals        *
9   * And has nothing to do with terminal illness I swear      *
10  \************************************************************/
11
12  #ifndef TERMINAL_H
13  #define TERMINAL_H
14
15  #include "TwoD.h" // To inherit 2D class
16  #include "PoweredObject.h"
17
18  #include <cstdlib>
19
20  // For loading pictures
21  #include <SOIL.h>
22
23  #include "TextEngine.h" // To display text to screen
24
25  #include <string>
26
27  #include <GL\glut.h>
28
29  class Terminal : public TwoD, public PoweredObject // Inherit 2D functionality and
        power functionality
30  {
```

```
31 private:
32         // text = what the user is typing, input = completed input
33         std::string currentInput, currentText, error, file;
34         std::vector<std::string> history, prompts, content;
35         std::string id;
36         // Where to print each item
37         const double INPUT_LINE = SCREENBOTTOM / 7.0;
38         const double ERROR_LINE = INPUT_LINE - 30;
39         const double PROMPT_START = INPUT_LINE + 30;
40         const double CONTENT_START = PROMPT_START + 100;
41
42         GLint bTexture;
43
44         int num;
45         // Print our text
46         TextEngine text;
47
48         // Translation and rotation matrices
49         double translate[3], rotate[3];
50
51         // Draws the actual terminal
52         void draw();
53
54         // Draws a standing terminal
55         void drawStanding();
56
57         // Draws a wall mounter terminal
58         void drawWallMounted();
59
60         void processInput();
61
62         void parseFile();
63
64         static const char* TERM_PATH;
65
66 public:
67         // Draws the 3D object in the world
68         void Display();
69         // Draws the 2D Terminal screen
70         void DisplayScreen();
71         // Shows the currently typed string
72         void getText(std::string text);
73         // Signifies a completed string to process
74         void getInput(std::string text);
75         // Returns an item in the terminal's log
76         std::string getHist(int count);
77         // Returns the number of items in the terminal's log
78         int getHistNum();
79
80         // Gets the translation coordinates
81         double getX();
82         double getY();
83         double getZ();
84
85         std::string getID();
86
```

```
87          Terminal(const double(&_translate)[3], const double(&_rotate)[3], std::
                string _file, std::string _id);
88
89  };
90
91  #endif
```

3.1.40 Terminal.cpp

```
1   /*************************************************************\
2    * Terminal.cpp                                              *
3    * This file was created by Jeremy Greenburg                 *
4    * As part of The God Core game for the University of        *
5    * Tennessee at Martin's University Scholars Organization    *
6    *                                                           *
7    * This file contains the definition of the Terminal class   *
8    * For more information, see CameraControl.h                 *
9   \*************************************************************/
10
11  //
12  // Class declaration
13  #include "Terminal.h"
14
15  // Planes
16  #include "Plane.h"
17
18  // For system logging
19  #include "Logger.h"
20
21  // Return codes
22  #include "Return.h"
23
24  // Global variables
25  #include "Globals.h"
26
27  // Logger
28  #include "Logger.h"
29
30  // File I/O
31  #include <fstream>
32
33  using namespace std;
34
35  const char* Terminal::TERM_PATH = "Resources\\Text\\";
36
37  void Terminal::getText(std::string text)
38  {
39          currentText = text;
40  }
41
42  void Terminal::getInput(std::string text)
43  {
44          currentInput = text;
45  }
46
47  string Terminal::getHist(int count)
48  {
```

```
49          int size = history.size();
50          if (history.empty())
51          {
52                  return "";
53          }
54
55          // If, somehow, a fool manages to get a variable that is out of bounds
56
57          else if (count >= size)
58          {
59                  return history.back();
60          }
61
62          else if (count < 0)
63          {
64                  return history.front();
65          }
66
67          else
68          {
69                  return history[size - count - 1];
70          }
71  }
72
73  int Terminal::getHistNum()
74  {
75          return history.size();
76  }
77
78  void Terminal::draw()
79  {
80          // Completely black background
81          double colors[4] = { 0, 0, 0, 1 };
82          double vertices[12] =
83          {
84                  SCREENLEFT, SCREENTOP, -1,
85                  SCREENLEFT, SCREENBOTTOM, -1,
86                  SCREENRIGHT, SCREENBOTTOM, -1,
87                  SCREENRIGHT, SCREENTOP, -1
88          };
89
90          Plane background{ vertices, colors};
91          background.Display2D();
92
93
94          // Gotta do the banner manually
95          glEnable(GL_TEXTURE_2D);
96
97          glBindTexture(GL_TEXTURE_2D, bTexture); // Prepares the texture for usage
98
99          glColor3d(1, 1, 1);
100         glBegin(GL_QUADS);
101         glTexCoord2d(0, 0);     glVertex2d(SCREENLEFT, SCREENTOP);
102         glTexCoord2d(0, 1); glVertex2d(SCREENLEFT, SCREENBOTTOM / 9.0);
103         glTexCoord2d(1, 1); glVertex2d(SCREENRIGHT, SCREENBOTTOM / 9.0);
104         glTexCoord2d(1, 0);     glVertex2d(SCREENRIGHT, SCREENTOP);
```

```
105
106         glEnd();
107
108         glDisable(GL_TEXTURE_2D);
109 }
110
111 void Terminal::DisplayScreen()
112 {
113         prepare2D();
114
115         draw();
116
117         // If we need to proces a command
118         if (currentInput != "")
119         {
120                 processInput();
121
122                 history.push_back(currentInput);
123
124                 currentInput.clear();
125         }
126
127         else
128         {
129                 // Print all prompts
130                 for (unsigned int i = 0; i < prompts.size(); i++)
131                 {
132                         text.printString(SCREENLEFT, PROMPT_START + 15 * i, 0, 1,
                                0, prompts[i]);
133                 }
134
135                 // Print an error
136                 text.printString(SCREENLEFT, ERROR_LINE, 1, 0, 0, error);
137                 // Echo user text
138                 text.printString(SCREENLEFT, INPUT_LINE, 0, 1, 0, ":> " +
                        currentText);
139
140                 // If needed, print content
141                 if (num != -1 && num < (signed int)content.size())
142                 {
143                         text.openFile(SCREENLEFT, CONTENT_START, 0, 1, 0, file,
                                content[num]);
144                 }
145         }
146
147         prepare3D();
148 }
149
150 void Terminal::processInput()
151 {
152         error = "";
153         if (currentInput == "exit" || currentInput == "Exit")
154         {
155                 isInTerminal = false;
156                 history.clear();
157         }
```

```
158
159         else if (currentInput == "clear" || currentInput == "Clear")
160         {
161                 num = -1;
162         }
163
164         else if (currentInput == "help" || currentInput == "Help")
165         {
166                 num = 0;
167         }
168
169         else
170         {
171                 string first, last;
172                 size_t pos = currentInput.find(" ");
173
174                 first = currentInput.substr(0, pos); // First half of string
175                 last = currentInput.substr(pos + 1); // Second half of string
176
177                 if (first == "read" || first == "Read")
178                 {
179                         num = atoi(last.c_str());
180                         if (num <= 0 || num >= (signed int)prompts.size())
181                         {
182                                 error = "ERROR: Invalid file number";
183                                 num = -1;
184                         }
185                 }
186
187                 else
188                 {
189                         error = "ERROR: Invalid Command: " + currentInput;
190                         num = -1;
191                 }
192         }
193 }
194
195 void Terminal::Display()
196 {
197         // Add two styles - Standing and wall mounted
198         glPushMatrix();
199
200         // Initial Positioning and rotation
201         glTranslated(translate[0], translate[1], translate[2]);
202         glRotated(rotate[0], 1, 0, 0);
203         glRotated(rotate[1], 0, 1, 0);
204         glRotated(rotate[2], 0, 0, 1);
205
206         //drawWallMounted();
207         drawStanding();
208
209         glPopMatrix();
210 }
211
212 void Terminal::drawStanding()
213 {
```

```
214         // Steel grey
215         glColor3d(.1, .1, .1);
216
217         // Draw Floor mount
218         glPushMatrix();
219         glTranslated(0, -1, 0);
220         glScaled(.5, .1, 1);
221         glutSolidCube(.5);
222         glPopMatrix();
223
224         // Draw leg
225         glPushMatrix();
226         glTranslated(0, -.6, 0);
227         glScaled(.1, .75, .1);
228         glutSolidCube(1);
229         glPopMatrix();
230
231         // Draw Monitor
232         glPushMatrix();
233         glScaled(.1, .5, .7);
234         glutSolidCube(1);
235
236         // Draw Screen
237         glPushMatrix();
238         // Change Screen based on power
239         if (checkIfOn())
240                 glColor3d(0, 1, 1);
241         else
242                 glColor3d(0, 0, 0);
243
244         glTranslated(-.3, 0, 0);
245         glutSolidCube(.7);
246
247         glPopMatrix();
248
249         glPopMatrix();
250 }
251
252 void Terminal::drawWallMounted()
253 {
254         glColor3d(0, 1, 1);
255         glutSolidSphere(1, 50, 50);
256 }
257
258 double Terminal::getX()
259 {
260         return translate[0];
261 }
262
263 double Terminal::getY()
264 {
265         return translate[1];
266 }
267
268 double Terminal::getZ()
269 {
```

```
270         return translate[2];
271 }
272
273 void Terminal::parseFile()
274 {
275         ifstream infile{ TERM_PATH + file};
276         string buff;
277
278         if (!infile)
279         {
280                 Logger log;
281                 vector<string> output = { "FATAL ERROR: File ", file, " NOT FOUND"
                        };
282                 log.logLine(output);
283                 exit(FILE_NOT_FOUND);
284         }
285
286         content.push_back("HELP"); // Help text is always the 0th tag in the
                terminals
287
288         getline(infile, buff);
289         prompts.push_back(buff); // Push back the file tag
290         getline(infile, buff);
291
292         while (buff != "<TAGS>")
293         {
294                 size_t pos = buff.find("--");
295                 if (pos != string::npos)
296                 {
297                         prompts.push_back(buff.substr(0, pos));
298                         content.push_back(buff.substr(pos + 3));
299                 }
300                 getline(infile, buff);
301         }
302
303 }
304
305 string Terminal::getID()
306 {
307         return id;
308 }
309
310 Terminal::Terminal(const double(&_translate)[3], const double(&_rotate)[3], string
        _file, string _id)
311 {
312         // Copies the color
313         copy(begin(_translate), end(_translate), translate);
314
315         // Copies the vertices
316         copy(begin(_rotate), end(_rotate), rotate);
317
318         bTexture = SOIL_load_OGL_texture
319                 (
320                         "Resources\\Images\\banner.png",   // Image to load
321                         SOIL_LOAD_AUTO,                                  // ???
322                         SOIL_CREATE_NEW_ID,
```

```
323                         SOIL_FLAG_MIPMAPS | SOIL_FLAG_COMPRESS_TO_DXT // !?!?!?!
324                         );
325
326         if (bTexture == 0)
327         {
328                 Logger log;
329                 vector<string> output = { "FATAL ERROR: SOIL cannot load terminal
                        banner", SOIL_last_result() };
330                 log.logLine(output);
331                 exit(SOIL_ERROR);
332         }
333
334         file = _file;
335
336         id = _id;
337
338         num = 0;
339
340         parseFile();
341 }
```

3.1.41 TextEngine.h

```
1  /*************************************************************\
2   * TextEngine.h                                              *
3   * This file was created by Jeremy Greenburg                 *
4   * As part of The God Core game for the University of        *
5   * Tennessee at Martin's University Scholars Organization    *
6   *                                                           *
7   * This file contains the declaration of the TextEngine class*
8   * Which uses glutBitmapCharacter to print strings into the  *
9   * OpenGL window.                                            *
10  \*************************************************************/
11
12  #ifndef TEXTENGINE_H
13  #define TEXTENGINE_H
14
15  // For string lengths in displaying text
16  #include <string>
17
18  // For multiple lines of text
19  #include <vector>
20
21  class TextEngine
22  {
23  private:
24          // The path to the game's text files (.log's)
25          static const char* TEXT_PATH;
26          // The offset between lines of characters
27          static const double LINE_OFFSET;
28
29          void displayText(
30                  // 2d start location of the text
31                  double x, double y,
32                  // rgb color of text
33                  double r, double g, double b,
34                  // glut font and text to be displayed
```

```
35                  void* font,
36                  std::vector<std::string> text);
37
38          // Searches a text file for text related to the tag, and returns all text
                within the tag
39          std::vector<std::string> findText(std::string fileName, std::string tag);
40
41  public:
42          // Takes the location to display the text, color of the text,
43          // The file to read from, and a tag to search for
44          void openFile(double x, double y, double r, double g, double b,
45                  std::string fileName, std::string tag);
46
47          // Takes in a string to display
48          void printString(double x, double y, double r, double g, double b,
49                  std::string text);
50
51          // Returns text from fileName specified by tag
52          std::vector<std::string> getText(std::string fileName, std::string tag);
53  };
54
55  #endif
```

3.1.42 TextEngine.cpp

```
1   /************************************************************\
2    * TextEngine.cpp                                           *
3    * This file was created by Jeremy Greenburg                *
4    * As part of The God Core game for the University of       *
5    * Tennessee at Martin's University Scholars Organization   *
6    *                                                          *
7    * This file contains the definition of the TextEngine class *
8    * For more information, see TextEngine.h                   *
9   \************************************************************/
10
11  // TextEngine declaration and std::string
12  #include "TextEngine.h"
13
14  // std::ifstream
15  #include <fstream>
16
17  // Standard I/O for debugging
18  #include <iostream>
19
20  // OpenGL API
21  #include <gl\glut.h>
22
23  using namespace std;
24
25  // Initializing the constants
26  const char* TextEngine::TEXT_PATH = "Resources\\Text\\";
27  const double TextEngine::LINE_OFFSET = 15;
28
29  void TextEngine::displayText(double x, double y,
30          double r, double g, double b,
31          void* font, vector<string> text)
32  {
```

```
33          vector<string>::iterator it;
34
35          // Iterates throguh the text vector and prints it to the screen
36          for (it = text.begin(); it != text.end(); it++)
37          {
38                  glColor3d(r, g, b);
39                  glRasterPos2d(x, y);
40
41                  for (unsigned int i = 0; i < it->length(); i++)
42                  {
43                          glutBitmapCharacter(font, (*it)[i]);
44                  }
45
46                  // Because glut does not print newlines
47                  y += LINE_OFFSET;
48          }
49  }
50
51  vector<string> TextEngine::findText(string fileName, string tag)
52  {
53          // The tags are listed between dollar signs
54          string fullTag = '$' + tag + '$';
55
56          string fullPath = TEXT_PATH + fileName;
57
58          ifstream infile(fullPath);
59
60          // Buffer to read in data
61          string buff;
62          // Array to store strings
63          vector<string> data;
64
65          // Find the string(s) to read in
66          getline(infile, buff);
67          while (infile && buff != fullTag)
68          {
69                  getline(infile, buff);
70          }
71
72          // Store the string(s)
73          getline(infile, buff);
74          while (infile && buff != "$END$")
75          {
76                  data.push_back(buff);
77                  getline(infile, buff);
78          }
79
80          infile.close();
81
82          return data;
83  }
84
85  void TextEngine::openFile(double x, double y,
86          double r, double g, double b,
87          string fileName, string tag)
88  {
```

```
89          vector<string> input = findText(fileName, tag);
90
91          displayText(x, y, r, g, b,
92                  GLUT_BITMAP_HELVETICA_12,
93                  input);
94  }
95
96  vector<string> TextEngine::getText(string fileName, string tag)
97  {
98          vector<string> input = findText(fileName, tag);
99
100         return input;
101 }
102
103 void TextEngine::printString(double x, double y, double r, double g, double b,
104         string text)
105 {
106         glColor3d(r, g, b);
107         glRasterPos2d(x, y);
108
109         for (unsigned int i = 0; i < text.length(); i++)
110         {
111                 glutBitmapCharacter(GLUT_BITMAP_HELVETICA_12, text[i]);
112         }
113
114         // Vertical spacing
115         y += LINE_OFFSET;
116 }
```

3.1.43 Triangle.h

```
1   /*************************************************************\
2    * Triangle.h                                                *
3    * This file was created by Jeremy Greenburg                 *
4    * As part of The God Core game for the University of        *
5    * Tennessee at Martin's University Scholars Organization    *
6    *                                                           *
7    * This file contains the declaration of the Triangle class  *
8    * Which is used to hold the details of a 2D Triangle and    *
9    * draw  it to the screen                                    *
10  \*************************************************************/
11
12  #ifndef TRIANGLE_H
13  #define TRIANGLE_H
14
15  class Triangle
16  {
17  private:
18          // Arrays containing the colors and the xyz vertices of the triangles
19          double color[4], vertices[9];
20  public:
21          // Takes in the vertices and color of the triangle
22          Triangle(const double(&new_vertices)[9], const double(&new_color)[4]);
23          // Print the triangle in 3D
24          void Display();
25          // Print the triangle in 2D
26          void Display2D();
```

```
27 };
28
29 #endif
```

3.1.44 Triangle.cpp

```
1  /*************************************************************\
2   * Triangle.h                                                *
3   * This file was created by Jeremy Greenburg                 *
4   * As part of The God Core game for the University of        *
5   * Tennessee at Martin's University Scholars Organization    *
6   *                                                           *
7   * This file contains the definition of the triangle class   *
8   * For more information, see Triangle.h                      *
9  \*************************************************************/
10
11 // Class declaration
12 #include "Triangle.h"
13
14 // For std::copy
15 #include <iterator>
16 #include <utility>
17
18 // OpenGL API
19 #include <GL\glut.h>
20
21 using namespace std;
22
23
24 Triangle::Triangle(const double(&new_vertices)[9], const double(&new_color)[4])
25 {
26         // Copies the color entry
27         copy(begin(new_color), end(new_color), color);
28
29         // Copies the vertices
30         copy(begin(new_vertices), end(new_vertices), vertices);
31 }
32
33 void Triangle::Display()
34 {
35         // Sets OpenGL's color to the triangle's color
36         glColor4f(color[0], color[1], color[2], color[3]);
37
38         // Draws the triangle
39         glBegin(GL_TRIANGLES);
40         glVertex3d(vertices[0], vertices[1], vertices[2]);
41         glVertex3d(vertices[3], vertices[4], vertices[5]);
42         glVertex3d(vertices[6], vertices[7], vertices[8]);
43         glEnd();
44 }
45
46 void Triangle::Display2D()
47 {
48         // Set's OpenGL's color to the triangle's color
49         glColor4f(color[0], color[1], color[2], color[3]);
50
51         // Draw's the triangle without the Z vertices
```

```
52          glBegin(GL_TRIANGLES);
53          glVertex2d(vertices[0], vertices[1]);
54          glVertex2d(vertices[3], vertices[4]);
55          glVertex2d(vertices[6], vertices[7]);
56          glEnd();
57  }
```

3.1.45 Trigger.h

```
1   /************************************************************\
2    * Trigger.h                                                *
3    * This file was created by Jeremy Greenburg                *
4    * As part of The God Core game for the University of       *
5    * Tennessee at Martin's University Scholars Organization   *
6    *                                                          *
7    * This file contains the declaration of the Trigger class  *
8    * Which can be bound to a trigger-object that, upon use,   *
9    * Will activate a designated target-object.                *
10  \************************************************************/
11
12  #ifndef TRIGGER_H
13  #define TRIGGER_H
14
15  #include "Terminal.h"
16  #include "Switch.h"
17
18  #include "GCTypes.h"
19
20  class Trigger
21  {
22  private:
23          void* trigger; // The object that activates the target
24          void* target;  // The object that is activated by the target
25
26          GCtype triggerType; // The type (defined from GCtypes.h) of the trigger
27          GCtype targetType;  // The type(defined from GCtypes.h) of the target
28
29          void activateTarget();
30
31  public:
32          // Get the object type of the trigger
33          int getTriggerType();
34          // Attempts to trigger the target
35          bool tryToTrigger(void* input, GCtype type);
36          // Binds the triggering object
37          void bindTrigger(void* _trigger);
38          // Binds the target object
39          void bindTarget(void* _target);
40          // Constructor takes in trigger type and target type
41          Trigger(GCtype _triggerType, GCtype _targetType);
42
43  };
44
45  #endif
```

3.1.46 Trigger.cpp

```
1  /*************************************************************\
2   * Trigger.cpp                                               *
3   * This file was created by Jeremy Greenburg                 *
4   * As part of The God Core game for the University of        *
5   * Tennessee at Martin's University Scholars Organization    *
6   *                                                           *
7   * This file contains the definition of the Trigger class    *
8   * For more information, see Trigger.h                       *
9  \*************************************************************/
10
11 #include <cstdlib>
12 #include "Trigger.h"
13
14 int Trigger::getTriggerType()
15 {
16         return triggerType;
17 }
18
19 void Trigger::activateTarget()
20 {
21         switch (targetType)
22         {
23                 case T_TERMINAL:
24                 {
25                         Terminal* t = (Terminal*)target;
26                         t->activate();
27                         break;
28                 }
29                 case T_SWITCH:
30                 {
31                         Switch* s = (Switch*)target;
32                         s->activate();
33                         break;
34                 }
35                 default:
36                 {
37                         break;
38                 }
39         }
40 }
41
42 bool Trigger::tryToTrigger(void* input, GCtype type)
43 {
44         // If this trigger is the correct type
45         if (triggerType != type) return false;
46
47         // If this trigger is the correct object
48         if (trigger != input) return false;
49
50         activateTarget();
51
52         return true;
53 }
54
55 void Trigger::bindTrigger(void* _trigger)
56 {
```

```
57          trigger = _trigger;
58  }
59
60  void Trigger::bindTarget(void* _target)
61  {
62          target = _target;
63  }
64
65  Trigger::Trigger(GCtype _triggerType, GCtype _targetType)
66  {
67          trigger = NULL;
68          target = NULL;
69          triggerType = _triggerType;
70          targetType = _targetType;
71  }
```

3.1.47 Triple.h

```
1   /************************************************************\
2    * Triple.h                                                 *
3    * This file was created by Jeremy Greenburg                *
4    * As part of The God Core game for the University of       *
5    * Tennessee at Martin's University Scholars Organization   *
6    *                                                          *
7    * This file contains the declaration of the Triple class   *
8    * Which is just a simple 3-tuple really                    *
9   \************************************************************/
10
11  #ifndef TRIPLE_H
12  #define TRIPLE_H
13
14  class Triple
15  {
16  public:
17          double a, b, c;
18  };
19
20  // For converting to a triple
21  Triple makeTrip(double _a, double _b, double _c);
22
23  #endif
```

3.1.48 Triple.cpp

```
1   /************************************************************\
2    * Triple.cpp                                               *
3    * This file was created by Jeremy Greenburg                *
4    * As part of The God Core game for the University of       *
5    * Tennessee at Martin's University Scholars Organization   *
6    *                                                          *
7    * This file contains the definition of the TwoD class      *
8    * For more information, see CameraControl.h                *
9   \************************************************************/
10
11  #include "Triple.h"
12
13  Triple makeTrip(double _a, double _b, double _c)
```

```
{
        Triple ret;
        ret.a = _a;
        ret.b = _b;
        ret.c = _c;

        return ret;
}
```

3.1.49 TwoD.h

```
/************************************************************\
 * TwoD.h                                                   *
 * This file was created by Jeremy Greenburg                *
 * As part of The God Core game for the University of       *
 * Tennessee at Martin's University Scholars Organization   *
 *                                                          *
 * This file contains the declaration of the TwoD class     *
 * Which is used to hold the data and functionality for     *
 * Drawing in 2D with OpenGL                                *
\************************************************************/

#ifndef TWOD
#define TWOD

class TwoD
{
protected:
        // The pixel boundaries of the screen
        const double SCREENTOP = 0, SCREENBOTTOM = 1080,
                SCREENLEFT = 0, SCREENRIGHT = 1920;

        // Prepares OpenGL draw in 2D
        void prepare2D();

        // "Resets" OpenGL to draw in 3D
        void prepare3D();

};

#endif
```

3.1.50 TwoD.cpp

```
/************************************************************\
 * TwoD.cpp                                                 *
 * This file was created by Jeremy Greenburg                *
 * As part of The God Core game for the University of       *
 * Tennessee at Martin's University Scholars Organization   *
 *                                                          *
 * This file contains the definition of the TwoD class      *
 * For more information, see TwoD.h                         *
\************************************************************/

#include "TwoD.h"

// OpenGL API
```

```
14 #include <gl\glut.h>
15
16 void TwoD::prepare2D()
17 {
18         // Disable depth testing
19         glDisable(GL_DEPTH_TEST);
20         // Disable writing to the z buffer
21         glDepthMask(GL_FALSE);
22         // Disables lighting
23         glDisable(GL_LIGHTING);
24
25         // Create an orthogonal matrix to write on
26         glMatrixMode(GL_PROJECTION);
27         glPushMatrix();
28         glLoadIdentity();
29         glOrtho(SCREENLEFT, SCREENRIGHT, SCREENBOTTOM, SCREENTOP, -1, 1);
30         glMatrixMode(GL_MODELVIEW);
31         glPushMatrix();
32         glLoadIdentity();
33 }
34
35 void TwoD::prepare3D()
36 {
37         // Discards the orthogonal matrices
38         glMatrixMode(GL_PROJECTION);
39         glPopMatrix();
40         glMatrixMode(GL_MODELVIEW);
41         glPopMatrix();
42
43         // Enable depth testing
44         glEnable(GL_DEPTH_TEST);
45         // Enables writing to the z buffer
46         glDepthMask(GL_TRUE);
47         // Renable lighting
48         glEnable(GL_LIGHTING);
49 }
```

3.2 Database

3.2.1 Walls

#	ID	LEVEL	X1	X2	X3	X4	Y1	Y2	Y3	Y4	Z1	Z2	Z3	Z4	R	G	B	A	Axis
1	lvlceiling	LEVELZERO	-5	-5	8	8	1	1	1	1	-4	1	1	-4	0.7	0.7	0.7	1	0
2	lvlfloor	LEVELZERO	-5	-5	8	8	-1	-1	-1	-1	-4	1	1	-4	0.7	0.7	0.7	1	0
3	room0lftwall	LEVELZERO	-5	-5	5	5	-1	1	1	-1	-4	-4	-4	-4	0.3	0.3	0.3	1	x
4	room0frntlftwall	LEVELZERO	5	5	5	5	-1	1	1	-1	-4	-4	-2.5	-2.5	0.3	0.3	0.3	1	z
5	room0frntrghtwall	LEVELZERO	5	5	5	5	-1	1	1	-1	-0.5	-0.5	1	1	0.3	0.3	0.3	1	z
6	room0backwall	LEVELZERO	-5	-5	-5	-5	-1	1	1	-1	-4	-4	1	1	0.3	0.3	0.3	1	z
7	room0rghtwall	LEVELZERO	-5	-5	5	5	-1	1	1	-1	1	1	1	1	0.3	0.3	0.3	1	x
8	room0frnttopwall	LEVELZERO	5	5	5	5	0.5	1	1	0.5	-2.5	-2.5	-0.5	-0.5	0.3	0.3	0.3	1	z
9	room1lftwall	LEVELZERO	5	5	8	8	-1	1	1	-1	-4	-4	-4	-4	0.3	0.3	0.3	1	x

Document generated with SQLiteStudio v3.0.7

3.2.2 Doors

3.2.3 Switches

3.2.4 Terminals

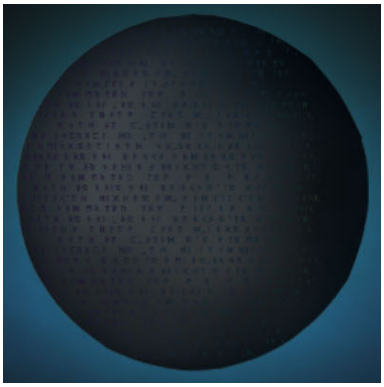
3.2.5 Triggers

3.3 Images

3.3.1 Main Menu

3.3.2 Terminal Banner

3.3.3 Game Icon



3.4 Music