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Abstract

A detailed explanation of the game created for Milestone 2

Milestone 2 Documentation

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# Overview:

## Game’s Title:

The game is title Shrek’s Suburban Swap this is because …

## Theme:

The theme of the game is what if Shrek was evil; within Shrek’s suburban swap there are 2 unique zombies, ones that are slow, ones that are fast. There is also the Wicked Witch of the West, a flying enemy that will attack you from above. Finally, there is Shrek himself, after the violent murder of Fiona and his triplets he is on the hunt for human blood… and you’re the last human alive!!

## Game Genre:

The genre of the game is horror. This will be shown with the use of a flashlight, mostly dark settings, and large amounts of horrifying enemies.

## Gameplay:

The objectives are to kill as many zombies as you can before you (eventually) kill Shrek or get killed by Shrek OR to reach the end of the suburban cul-de-sac. The mechanics of this are quite unique. The movement of the character is purely mouse controlled but the speed at which you move is determined by the number of enemies you kill. The more you kill, the faster you move. Then if you don’t kill enough before the final battle with Shrek, you instantaneously die. There are 3 power-ups, one will decrease your speed, one will increase the damage of your shotgun, and the last power-up will play copyright free rock music.

## Table of Assets:

|  |  |  |  |
| --- | --- | --- | --- |
| Asset ID | URL of Asset | Date of Download | Licence for Use |
| 1: 8-bit font | [Link](https://fonts.google.com/specimen/Press+Start+2P?query=press+s) | 3/12/21 | Open Font License |
| 2.1: Menu Music | [Link](https://freesound.org/people/Lost_Dream/sounds/434976/) | 11/12/21 | Creative Commons 0 License |
| 2.2: Game Music | [Link](https://freesound.org/people/Lost_Dream/sounds/583563/) | 11/12/21 | Creative Commons 0 License |
| 2.3: Shotgun | [Link](https://freesound.org/people/Claiber7901/sounds/544677/) | 11/12/21 | Creative Commons 0 License |
| 2.4: Rock Music | [Link](https://freesound.org/people/Migfus20/sounds/559846/) | 11/12/21 | Creative Commons 0 License |
| 2.5: Enemy Sound | [Link](https://freesound.org/people/lalazzylee1/sounds/322459/) | 11/12/21 | Creative Commons 0 License |
| 3.1: Slow PNG | n/a | n/a | Created by me |
| 3.2: Damage PNG | n/a | n/a | Created by me |
| 3.3: Rock PNG | n/a | n/a | Created by me |
| 4.1: Road model | [Link](https://opengameart.org/content/suburb-asset-pt1) | 9/11/21 | Public Domain License |
| 4.2: Small House Model | [Link](https://opengameart.org/content/suburb-asset-pt1) | 9/11/21 | Public Domain License |
| 4.3: Modern House Model | [Link](https://opengameart.org/content/suburb-asset-pt1) | 9/11/21 | Public Domain License |
| 4.4: Road Turn Model | Created by Abdullah Sheikh Nawaz (Personal Friend) using Road Model 4.1 | 1/12/21 | Permission From Creator |
| 4.5: Shrek Model | Created by Abdullah Sheikh Nawaz (Personal Friend) | 7/12/21 | Permission From Creator |
| 4.6: Gun Model | Created by Archie Short, (Personal Friend and colleague)  Archie.Short@city.ac.uk | 30/11/21 | Permission From Creator |
| 4.7: Female Zombie Model | [Link](https://free3d.com/3d-model/female-zumbi-51687.html) | 9/12/21 | Public Domain License |
|  |  |  |  |
|  |  |  |  |

# Parts:

## Part 1:

### Basic Game Modelling:

#### 1.1 Final Intro-Screen:

Firstly, the final intro screen. This is a simple start screen that displays text telling you the name of the game, how to start playing and the controls. For the text in this screen, as well as all the other text in the game I added an 8-bit style font, reference to (1) in the table of assets. This font was also used to create assets for the HUD, this will be covered in part 1.4. The screen looks as such:

Text

Description automatically generated

#### 1.2 Primitive Game Objects & Skybox:

For this I created two more shapes, an octagonal prism, and a square-based diamond. For the octagonal prism I designed it based on the premise of give it 2 extra vertices, 1 in the centre of each octagon of the shape. An example is below:

Red lights in the dark

Description automatically generated with medium confidence

The red dots are the vertices. The reason I structed it this way is because the rendering is done using polygons, so being about to split the shape evenly into triangles makes the creating a lot easier and reducing the number of triangles used overwise with overlapping. This also makes the rendering more efficient as less calculations that must be performed. This does mean that the centre point of the object is either the middle vertex of the top or bottom octagon, but this is easily handled. The connecting 2-D shapes between the two octagons are just rectangles (or squares but in my application, rectangles), this is easily created with two triangles per rectangle around the shape. This shape was used to create a touch for the player.

The second shape was a square-based diamond, this was easy to create as this only has 6 vertices, 1 more than the triangle-based diamond made before. This shape will be used as one of the three powerup objects. The other two will be the triangle-based diamond and a sphere.

With the skybox, as I changed this in milestone 1, I have not change it for this game. Rather what I do is I set it to not render the skybox to give the game a much more horror feel and look.

//stop skybox after 4 seconds has past

if (m\_timer <= 4.f) engine::renderer::submit(mesh\_shader, m\_skybox, skybox\_tranform);

Once this if statement if false, the skybox will not render. I have also left the terrain as it is. I know this is rather boring but with time limitations this didn’t seem like a worth while change.

#### 1.3 Audio:

For the audio I have added multiple tracks. There is menu music(2.1), game music(2.2), shotgun(2.3),rock music(2.4), and main enemy sound effect(2.5). Audio 2.1 and 2.2 are tracks, 2.3,2.4 and 2.5 are all spatial sound effects. The menu music is stopped when the player initiates the game by pressing the enter button. Then the game music will play and will be paused and unpaused around the spatial sounds except the shotgun as this sound effect occurs so frequently.

Example:

m\_audio\_manager->pause("game music");

m\_audio\_manager->play\_spatialised\_sound("shrek",m\_3d\_camera.position(),m\_enemy.object()->position());

m\_audio\_manager->unpause("game music");

#### 1.4 HUD:

My HUD is a mixture of 2-D text and 2-D graphics. Within the 2-D text this displays the players health as well as the main enemy’s health. If the players health reaches 0 before the main enemies, the game is over, if the player manages to kill the main enemy before their own death, they win the game. However, with how the state machine works for the main enemy as well as the zombies, there is a timer counting down until the games end. Once the timer runs out, whoever has more health, the player, or the enemy, determines if the player wins or not. A screenshot of this:

Graphical user interface, website

Description automatically generated

As can be seen the powerup indicators as the bottom of the screen are transparent. This changes once the powerup has been collected:

Graphical user interface, website

Description automatically generated

And once the button is pressed to use the powerup, in this case D, the texture will return to transparent. This is done using enums within the HUD class created

## Part 2:

### Camera, Meshes, Lighting, and FX:

#### Camera:

The main camera for game play is the exact same as in milestone 1, a simple First-Person Shooter camera. Additionally, I have created a birds-eye view camera for looking around the map. This looks as such:

Graphical user interface

Description automatically generated

In this image the centre of the screen is the player’s character. All game activity is paused while in this camera mode as shooting in this mode would not work at all. This camera is useful and needed for the game as to see enemies that my lie ahead. Moreover, with more time the map would be a lot larger than it is, thus giving even more reason for this camera view as to see possibly missed powerups, special items or even alternative exists.

#### 1.2 Meshes:

The meshes used in this game are still the road (4.1), small house (4.2), and modern house (4.3) from milestone 1, but rendered a multitude of times over. Additionally, a road turn mesh (4.4), a Shrek mesh (4.5), a gun mesh (4.6), and a female zombie mesh (4.7) have been implemented. The Shrek mesh is used for the main enemy, the zombie for the side enemies, the gun for the shot gun, and the road turn as to implement another section of the map. These meshes have been transformed, rotated and lit. However, with the last part of lighting, as my lighting is stylistically limited to increase the sense of a horror game. As a result, the gun is mostly black as there isn’t much light hitting it, but where it is closest to the touch, the intended colours can be seen. Additionally, the gun and touch are mapped to follow the cameras front vector:

Graphical user interface, website

Description automatically generated

Graphical user interface, website

Description automatically generated

In the comparison of these 2 images, the touch and the gun are following the front vector of the camera.

#### 1.3 Lighting:

There are 2 lights within my game. The least impressive of which is the directional light. This light is only used to illuminate the map when the player is in birds-eye view. This can be seen in the image above. The second light is a spotlight attached to an octagonal prism in the shape of a touch. This is attached to the player and is bound to the cameras front vector and rotates with it in real time to give the perception that the character is holding a real touch and gun. This can be seen in the image above that the light is coming from the touch.

#### 1.4 FX:

For the FX I have only implemented 1 has I didn’t feel the need for anymore. The one I did add was cross fade as to visually show that the player has been hit by an enemy:

Graphical user interface

Description automatically generated

This image shows the cross fading being layered onto the 2-D camera as to show damage being taken. This is proven by the 10 less health points in the top left. Implementation of this was very easy, simply the activation for the cross-fade class is called when the collision is tested for the enemy and the player:

if (m\_zombies.at(i)->box().collision(m\_player.p\_box())) {//collision testing for zombies

m\_player.object()->set\_position(glm::vec3(pos.x, pos.y, pos.z) - (m\_player.object()->forward() \* 5.f \* (float)time\_step));//pushing player back after attack

m\_zombies.at(i)->object()->set\_position(m\_zombies.at(i)->object()->position() + (m\_3d\_camera.front\_vector() \* 5.f \* (float)time\_step));//doing same for zombie

m\_player.up\_health(m\_player.Health() - 1);//reducing player health

m\_cross\_fade->activate();//cross fade to show damage was taken

}

## Part 3:

### Physics, AI, and Gameplay:

#### Physics:

The main application of physics I have is the jump for Shrek, this method mimics projectile motion in 3-D:

void enemy::jumpToPlayer(const engine::timestep& time\_step) {

//Update acceleration to compensate for gravity

m\_object->set\_acceleration(glm::vec3(0.f, -9.81f, 0.f));

// Update physical quanitities

m\_last\_position = m\_object->position();

m\_object->set\_velocity(m\_object->velocity() + (m\_object->acceleration() + m\_instantaneous\_acceleration) \* (float)time\_step);

m\_object->set\_position(m\_object->position() + m\_object->velocity() \* (float)time\_step);

// Turn off instantaneous forces if contact time is surpassed

if (glm::length(m\_instantaneous\_acceleration) > 0 && m\_contact\_time > 0.05) {

m\_instantaneous\_acceleration = glm::vec3(0.f);

m\_instantaneous\_angular\_acceleration = glm::vec3(0.f);

m\_contact\_time = 0.f;

}

if (m\_object->position().y <= 0.f) {

m\_state = state::chasing;

}

m\_contact\_time += time\_step;

}

To visually show how this code works:

Diagram

Description automatically generated

I created this as it enables Shrek to jump into the path of the player, adding a layer of difficulty to game as well as having fun with physics.

#### AI:

I have 2 finite state machine-based enemies, the zombie enemies and shrek. The zombies have 4 states, idle, on guard, chasing, and attacking. A diagram to show how this machine works is as such:

Diagram

Description automatically generated

This state machine makes the zombie in idle patrol, this means they will more over a specified distance. While which testing for the player proximity is being testing, if close enough the on-guard state will be called. This will make the zombie look in the players direction. The second range for triggering chasing is not much smaller than the first range. As much they have a difficulty curve. Once the zombie bounding box and the players are touching the player will take damage and the state will more to attacking.

Shrek also has 4 states, but he is a little different. Shrek has idle, jumping, chasing, retreat.

The diagram for this is as follows:

Diagram

Description automatically generated

If the player is in the jumping range, Shrek will jump to the player and knock them back, doing damage. This happens as once the jump is preformed; the chasing state is instantly reached. If the player does 10 or more damage, then shrek will retreat to his original position.

#### Gameplay:

##### Powerups:

There are 3 power ups in the game. As when you kill zombies and do damage to shrek your movement speed increases, slow makes you go a little slower. Shrek has a lot of health and your default shotgun doesn’t do a lot of damage so there’s a damage increase powerup. The final powerup is rock music! When you want, if you have the powerup, rock music will start playing.

##### Timers:

There is a game timer, 180 seconds available to the player to either:

Kill all zombies and make it to the end of the street without dying to Shrek.

Kill Shrek.

Do more damage to Shrek than he has to you.

# Reflection:

The strengths of my game level have been the movement mechanics, the shotgun, sounds, the touch, and the birds-eye view camera. The movement mechanics because they are so unique, a horror game where if you jump or get scared you cannot stop playing or you will die. Additionally, increasing movement speed as you kill more and more enemies makes this even more of a challenge. The shotgun because the position of the mesh works perfectly, the buck-shot style spray was easy to implement. The sounds I was able to find fit well with the style of the game. I feel that it becomes darker and darker the more you play the game. If I was able to create more levels or more advanced levels, this would be a part I’d focus on a lot. The birds-eye view camera is something that isn’t common in horror games, it adds a level of competition between players of the game, who can see the next enemy and know where they are going to be, who can see the next powerup etc. I’m very proud of the touch, I feel that the shape creation was perfect and the spotlight tweaking make it look perfect for the horror game defaults.

The weaknesses of the game are the small amount of NPCs and their functionality, the size of the map and graphics. With the NPCs, if I had time to develop and apply large decision trees and give the NPCs tonnes of data to work with, the game would feel a lot more fluid and robust. Additionally, this would be more exciting to play as the challenge curve would be greater. With the size of the map it was lack of materials to create a map I liked and then make it larger. This would give more of a playground within the game and make it easier to hide enemies and powerups/collectables. The graphics, creating custom graphics and character models would make the style integration perfect and add the refinement the game needs.

To be able to do this I’d need at least a year. To learn and develop all the styles needed and then to apply them to perhaps a more optimised engine.