

Documentation

Group/Game Name: Harrowgard

Brief description of implementation: A First Person Fantasy Dungeon Crawler game with procedural dungeon generation. You need to find your way through the dungeon, defeat enemies along the way, and finally defeat the boss to finish the game. You might even find secret rooms such as the heal pool room or sword upgrade room!

Additional libraries:

- PhysX: <https://github.com/NVIDIA-Omniverse/PhysX>
- Tinyobj: <https://github.com/tinyobjloader/tinyobjloader>
- FastNoiseLite: <https://github.com/Auburn/FastNoiseLite/blob/master/Cpp/FastNoiseLite.h>
- Preliminary PTVF Framework. The following libraries were added by the framework:
 - Glm
 - Sdl
 - Spdlog
 - VulkanMemoryAllocator
 - ImGui

Gameplay:

Mandatory:

- 3D Geometry: Many rooms for the dungeon generation, 3d models for the sword, enemies, columns, crates, etc.
- Playable: WASD first person controller, left click to attack
- Advanced Gameplay: Enemy AI, dungeon generation
- Min 60 FPS and Framerate Independence: the game uses delta time for all movement, animations, etc.
- Win/Lose Condition: Health drops to 0 -> Game Over, Boss is defeated -> Win
- Intuitive controls: WASD and mouse
- Intuitive Camera: simple first person camera. Debug camera uses WASD and ctrl/space to descend/ascend
- Illumination model: a torch (point light) in the left hand of the player, a sun (directional light), but it's only visible from the garden room
HOW: phong shading provided in the framework
- Textures: Loading textures according to the .mtl files and procedural textures
HOW: tinyobjloader for loading .mtl file texture paths, and FastNoiseLite to generate noise for the procedural textures
- Moving Objects: Enemies
HOW: Enemies query the player position each frame and move towards him
- Documentation
- Adjustable Parameters: screen resolution and full screen
HOW: Simple config.txt file + parser

Optional:

- Collision Detection (Basic Physics): The actors (player and enemies) collide with the static geometry (and with other enemies)
HOW: physx tutorial in TUWEL, PhysX Documentation
- Advanced Physics: The sword interacts with the physx collider on the enemies
HOW: physx tutorial in TUWEL, PhysX Documentation
- Heads-up Display: Health bar, Game Over and Win text
HOW: just a spritesheet and 2d quads

Effects:

Lighting:

- Omnidirectional shadow Map with PCF: The torch casts a shadow in all directions, PCF is used to smoothen the shadow out
HOW: <https://learnopengl.com/Advanced-Lighting/Shadows/Shadow-Mapping>

Advanced Modelling:

- L-System: Plant models are generated on startup using a simple L System
HOW: <https://en.wikipedia.org/wiki/L-system> (specifically example 7)

Animation:

- Hierarchical Animation: keine Zeit D:

Texturing:

- Procedural Texture: A stone, wood and metal texture are generated procedurally
HOW: just building a texture image pixel by pixel using noise and nested loops with rules

Shading:

- Simple Normal Mapping: Both the procedurals and the loaded textures from the mtl files have normal maps
HOW: <https://learnopengl.com/Advanced-Lighting/Normal-Mapping>

Post Processing:

- Ambient Occlusion: Screen space ambient occlusion (using the gbuffer attachments)
HOW: <https://learnopengl.com/Advanced-Lighting/SSAO>

Other special features:

- Procedural Dungeon Generation
HOW: big brain
- Deferred Rendering
HOW: <https://learnopengl.com/Advanced-Lighting/Deferred-Shading>
- Distance-based fog
HOW: https://en.wikipedia.org/wiki/Distance_fog

Walk-through:

The player spawns in and walks through the dungeon. Each room can have anywhere from 1-4 connections to other rooms (including the room you came from), some are dead ends. Along the way, shadow enemies will try to kill you. Dodge them with WASD and attack them with the left mouse button. You will need to strike them with your sword 4 times to take them down. Each hit also knocks the enemy back.

Once they are dead and you have some breathing room, feel free to marvel at the great visual effects in this game:

- Shadows are cast by everything: the enemies, the pillars, etc.
- The stone texture on the floors and walls is generated procedurally
- If you see a crate, its wood texture was also procedurally generated
- The plants were generated with a L-System
- You can press O to toggle SSAO on/off. It's most clearly visible when looking at the base of a pillar
- Optionally, press I to enable the debug cam. This will disable the shadows and ambient occlusion to increase visibility

If your health is low by now, you might get lucky and encounter the heal pool room. The directional light brightens up the scene and if you look up, you'll be able to see the skybox. Alternatively, you might find yourself in the boss room. If you enter it, sooner or later, you'll either get to see the Win or Game Over screen. By pressing enter, you can restart the game and try a new dungeon!

If you didn't manage to defeat the boss, try looking for the sword upgrade room next time. There, you will find a chest which you open with E. The stronger sword inside should be a big help.