



TECHNISCHE
UNIVERSITÄT
WIEN

Computer Graphics
193.180 (VU 4,0) Semester: 2025W

Final Demo

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Campfire spot

Overview

Our project is about creating a peaceful campfire scene using a particle system to bring it to life. The scene also features two sizeable logs for sitting, a tent, and numerous procedurally generated trees.

For the final demo, a GPU particle system for the campfire and L-system trees were implemented, as well as omnidirectional shadow mapping with a point light source located in the center of the campfire.

Our project was based on the *model_loader* example of Auto-Vk-Toolkit. The framework loads and renders all meshes of a *.glTF* file with given textures. The tree meshes are procedurally generated using a stochastic L-system. Branches are composed of cylinder and sphere meshes, while leaves use quad meshes rendered with alpha testing. The campfire is simulated by a GPU particle system using a compute shader. A basic Lambertian diffuse lighting model with omnidirectional shadow mapping is used in the scene as the illumination model. The point light source additionally slightly varies in position and intensity to give the impression of a real campfire. The user can follow along with the automatic camera or observe the scene using a manual Quake camera.

Technical Basis

The technologies used remained mostly the same as originally planned, except for some libraries, which were ultimately not needed because the Auto-Vk-Toolkit already included them, or provided an alternative.

- **Programming Languages:**

- CPU Programming: C++
- GPU Programming: GLSL for Vulkan shaders

- **Graphics API:** Vulkan

- **Framework:** [Auto-Vk-Toolkit](#)

- **3D Modeling:** **Blender** was used to create the scene, with assets sourced from Fab. The final scene was then exported to a *.glTF* file. Licensing for all external assets complies with their respective terms of use. More information about the textures used can be found in the [section](#) at the end of this document.

- **Libraries:**

- [tinycltf](#) for loading *.glTF* models

- [assimp](#) for loading glTF models (included in Auto-Vk-Toolkit)
- [ImGui](#) for user interface (included in Auto-Vk-Toolkit)
- [GLFW](#), [STB](#) (included in Auto-Vk-Toolkit)
- [glm](#) for mathematics (matrix and vector operations)
- [VMA](#) Vulkan Memory Allocator for efficient GPU memory management

The final demo was tested on an **NVIDIA GeForce GTX 1660 Super** graphics card and an **NVIDIA GeForce RTX 4070 Super** graphics card.

Controls

The automatic camera is enabled by default and continuously loops along a predefined path. Pressing **R** resets the path to the start. Pressing **F1** switches to the Quake camera mode and back, while pressing **F2** toggles the Info and Fire settings panels.

Quake camera

- **Mouse** for looking around
- **WASD** for movement
- **Escape** to release cursor to interact with the panels

Models and Textures

The models are made by us in Blender. The textures that are currently in use (except the leaf) are free Quixel Megascans textures from Fab, and are licensed under the Fab Standard License which allows use, modification, and distribution within projects. The leaf texture was sourced from the Total Textures Repository.

- [Uncut Grass](#)
- [Forest Floor](#)
- [Swamp Water](#)
- [Tree Bark](#)
- [Oak Veneer](#)
- [Rough Rock](#)
- [Ground Rubble](#)
- [Leaf](#)