CIS565 Final Project

WebGPU glTF Viewer

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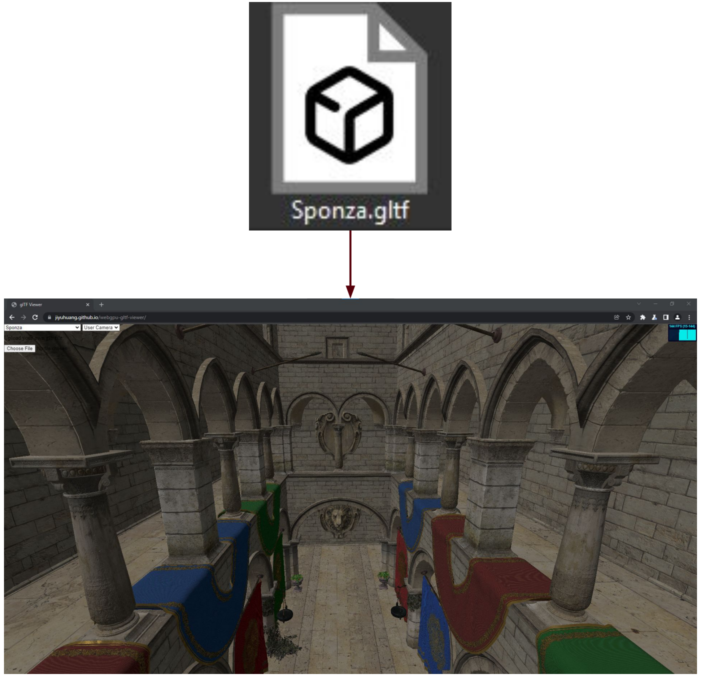
Penn Engineering

Background

- glTF:
  - Reduced file size and minimal runtime process for 3D content
  - PBR metallic-roughness model

- WebGPU:
  - a new web API that exposes capabilities of modern GPU hardware, based on modern graphics APIs (Vulkan, Metal, Direct3D 12)

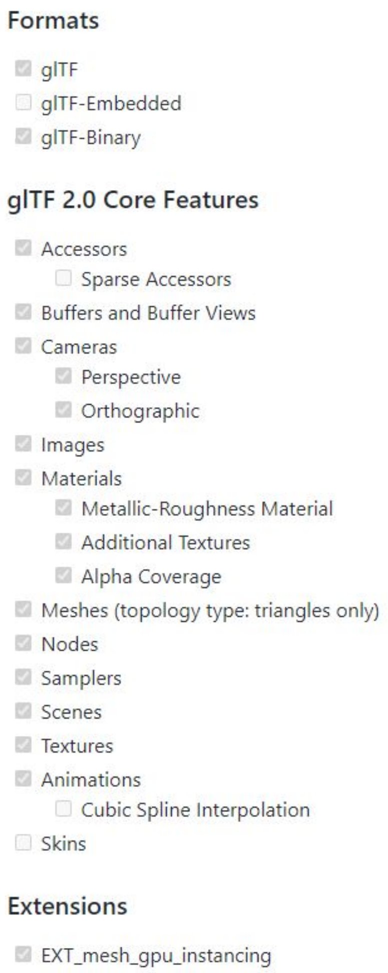


Live Demo: https://bit.ly/3rYw5Na

Current State of the Project

- Built from scratch with two dependencies: gl-matrix and stats.js
- Supports most of the glTF 2.0 core features except skinning and morph target animation
- Uses instanced rendering to reduce the number of draw calls

Feature list



Formats

- ☑ glTF
- ☐ glTF-Embedded
- ☑ glTF-Binary

glTF 2.0 Core Features

- ☑ Accessors
  - ☐ Sparse Accessors
- ☑ Buffers and Buffer Views
- ☑ Cameras
  - ☑ Perspective
  - ☑ Orthographic
- ☑ Images
- ☑ Materials
  - ☑ Metallic-Roughness Material
  - ☑ Additional Textures
  - ☑ Alpha Coverage
- ☑ Meshes (topology type: triangles only)
- ☑ Nodes
- ☑ Samplers
- ☑ Scenes
- ☑ Textures
- ☑ Animations
  - ☐ Cubic Spline Interpolation
- ☐ Skins

Extensions

- ☑ EXT_mesh_gpu_instancing

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Live Demo

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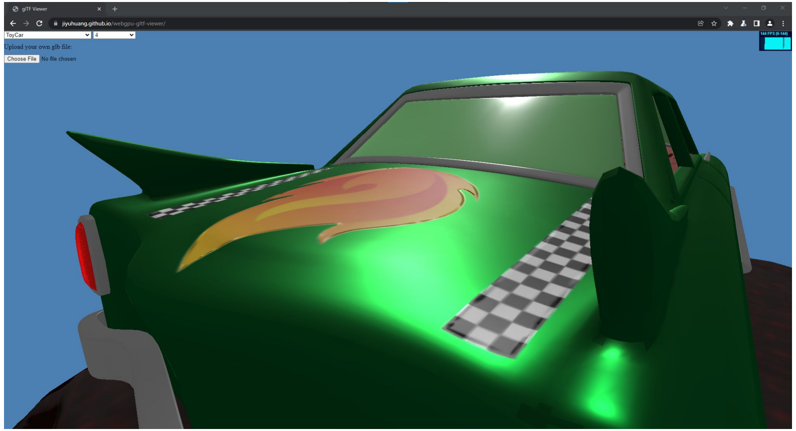
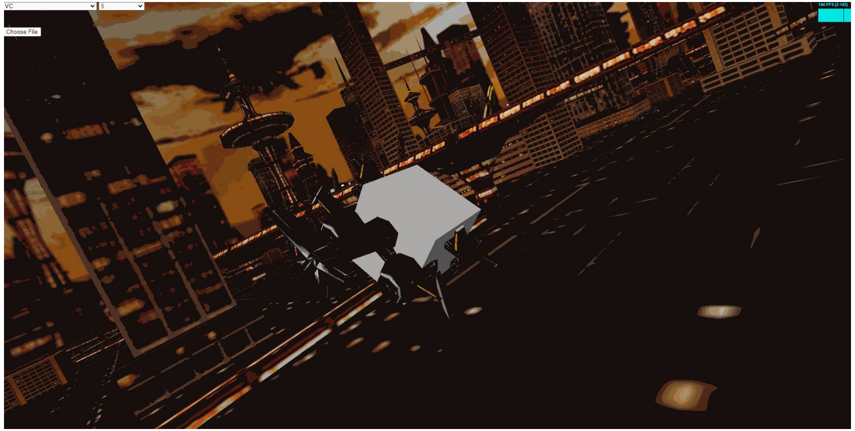
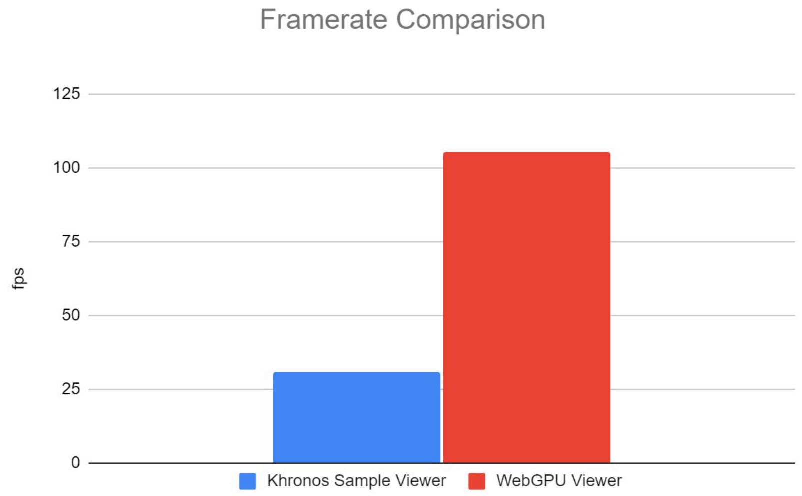
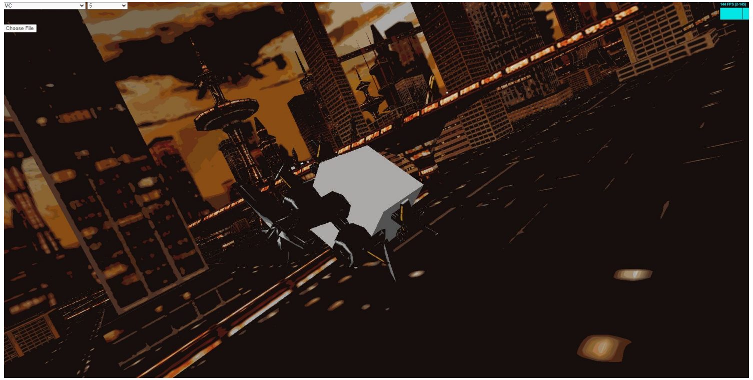

gITF Viewer
jiyuhuang.github.io/webgpu-gltf-viewer/
ToyCar
4
Upload your own glb file:
Choose File
No file chosen
144 FPS (6-144)



Performance Analysis

Comparing against Khronos glTF Sample Viewer *





Tested on Chrome Dev 98.0.4750.0
6x CPU throttling
Hardware: Windows 10, AMD Ryzen 7 5800H @ 3.20GHz 16GB, RTX 3070 Laptop 8GB

* WebGPU Viewer only supports a subset of features present in Khronos glTF Sample Viewer

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Next Steps

- Implement skinning and morph target animation
- Image-based lighting
- Material extension
- Support for Draco-compressed mesh

Open to feedbacks and contributions

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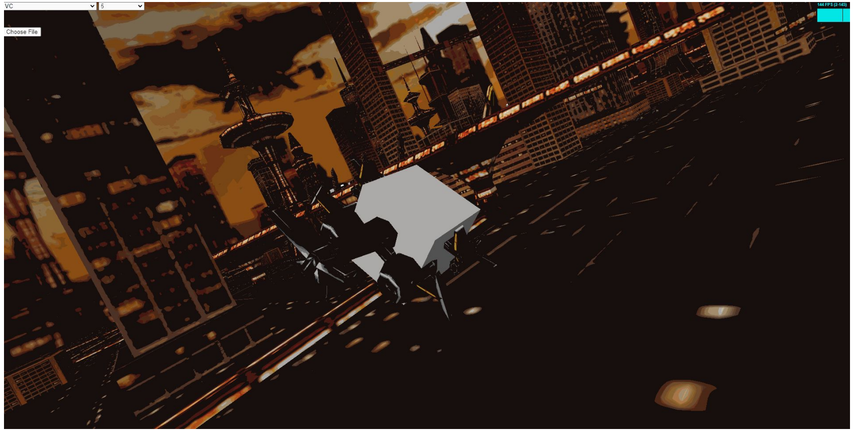
- Special thanks to Ashley, Matt, Wayne, Jonas and Charles for helping me practice the presentation
- Thanks to Shrek Shao for providing a list of resources for starting this project

Questions



glTF Viewer
jiyuhuang.github.io/webgpu-gltf-viewer/
Buggy
0
Upload your own glb file:
Choose File
No file chosen
144 FPS (15-144)

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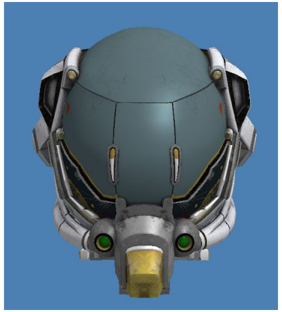
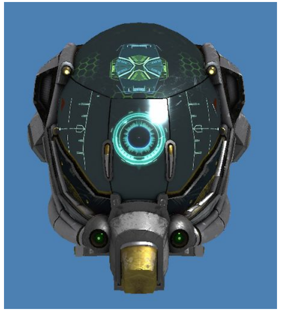
Appendix A. Physically-Based Rendering

Metallic-Roughness Model

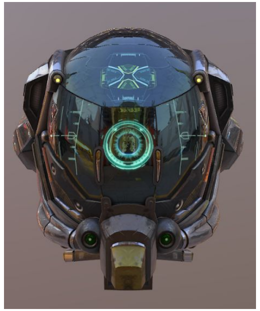
- Metals and dielectrics have different reflective properties
- "Roughness" refers to the surface characteristic for microfacet models
- Textures: color, metallic-roughness, normal, occlusion, emissive



Blinn-Phong



Metallic-Roughness



Reference
(Khronos glTF Sample Viewer)

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