Creation of virtual reality experiences for the web: shader programming for artists

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Project’s reference

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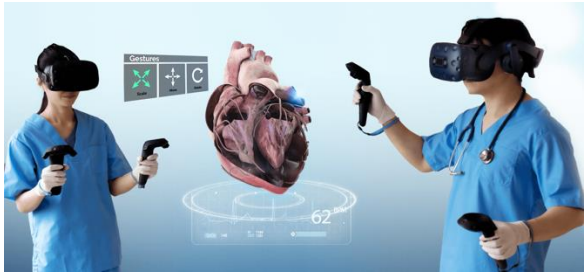
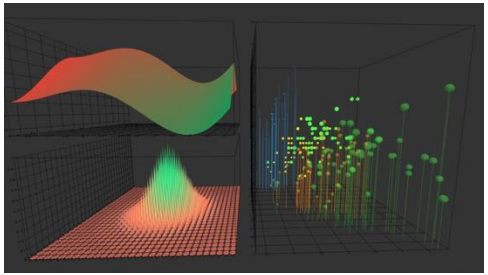
IEEE

Introduction

- Virtual Reality (VR) has established itself as a reliable and efficient tool for education and training, simulating environments that otherwise would be impossible or difficult to organise in a physical environment.



https://www.linkedin.com/pulse/vr-medicine-mullai-n/

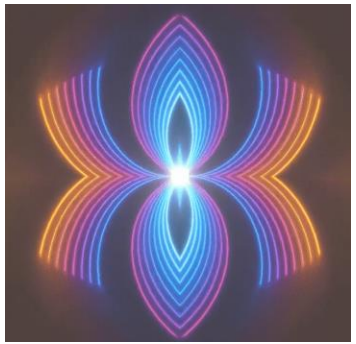


https://infodesign.aalto.fi/projects/vr-viz-visualization-system-for-data-visualization-in-vr/

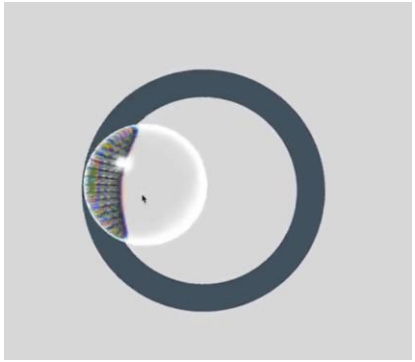
- WebXR API makes VR accessible to anyone anywhere with an internet connection through a standard Web Browser

Introduction

- In education and training, it is important to create convincing and accurate 3D visualisations, e.g. traumas, lighting, interaction effects and other processes that enhance immersiveness



https://twitter.com/kishimisu

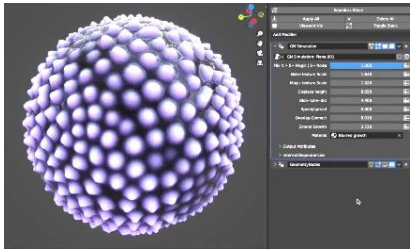


https://twitter.com/gesjaa/status/1636750016487489539

https://x.com/_martinsh/status/1492568108283928578

Introduction

- Shader programming can significantly enhance 3D visual representation of objects and processes.



https://x.com/AmrDesignz/status/1689648252520628225

https://x.com/_martinsh/status/1744328560729342164

Problem

Shader programming for web VR content is **inaccessible to artists** and enthusiasts due to its technical complexity and no clear implementation.

Solution

An intuitive shader creation and implementation workflow for creating web VR content, which is open source, has documentation and uses flow-based visual programming, with helpers and limiters, so web VR content meets the hardware requirenments for 90fps.

Tasks

1. Determine the current popular or simple and intuitive tool or framework for web VR content creation
2. Analyze the tool's or framework's custom shader implementation technical specifics
3. Find temporary solutions, by combining available solutions, that uses node-based programming.
4. Test the new workflow
5. Conclusions and future work

Integrating custom shaders to the A-Frame framework

- The A-Frame framework is a way for artists and enthusiasts to start building WebXR content.

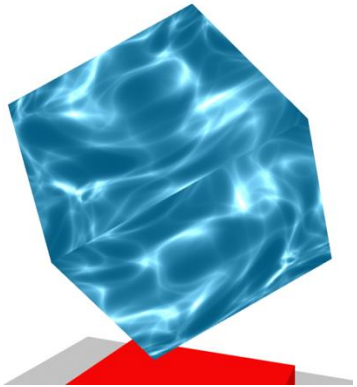
- Supports latest VR headsets
- No programming required

Temporary solutions

- Two possible temporary solutions for an easy shader integration into A-Frame are found.

1. A custom version of ChatGPT

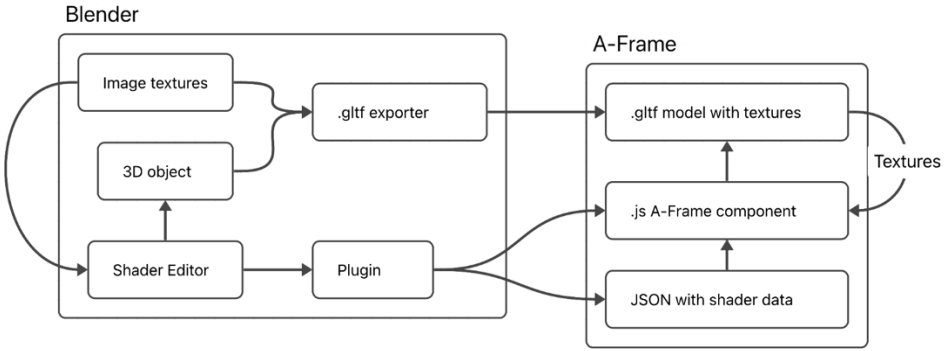
- Predefined parameters, that creates or converts existing GLSL shaders to a A-Frame shader component.
- Extensive polishing of the parameters are still required.
- Specific training data is required.
- The results are not always guaranteed as intended.



Example
Prompt: water ripples

2. Plugin for 3D editing software Blender

- Exports a .gltf file with embedded textures and a separate JSON file that contains shader data. This is a more favorable path, because the textures are embeded and used in a shader.

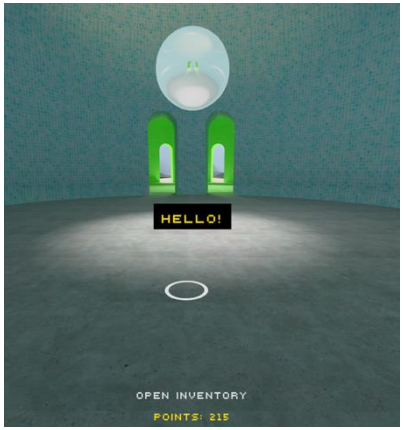


ImGame – Research results

ImGame, Creative Europe project No. 101054570

- The results of the developed shader programming workflow are presented and being used in ImGame.

- **Goal**: to encourage the community to create more complex and immersive virtual reality projects for the web.



Conclusions

- Using the custom ChatGPT saves significant time in converting and adjusting the shaders.
- There is no web VR focused shader creator tool available.

Future Work

- Continue research on node-based editors and create a prototype using AI generated node-based system focused for web VR content development.
- Expose shader uniforms for the possibility to interact with shader.