Update: Quality Control/Quality Assurance for the Human Reference Atlas and On-Ramping to the HuBMAP Portal Using the HRA Organ Gallery in Virtual Reality

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HuBMAP: NIH WG Meeting | Virtual | October 31, 2023

Our JumpStart Award

Name	**Professional Title**	**Role on Project**	**Institution**
Andreas Bueckle	Research Lead	JI	Indiana University
Lu Chen	PhD Student	JI	Stony Brook University
Katy Börner	Distinguished Professor	PI	Indiana University
Fusheng Wang	Associate Professor	PI	Stony Brook University

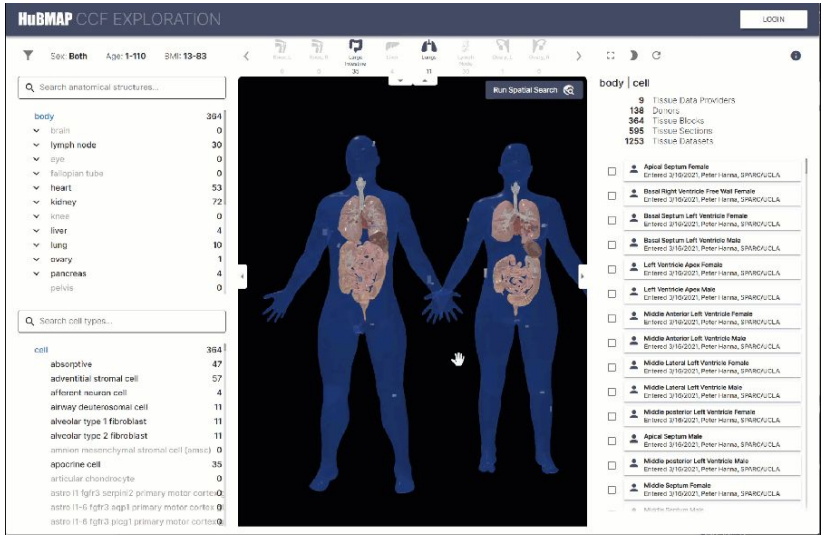
Vision…

https://medcitynews.com/2019/09/the-benefits-of-ar-in-healthcare/

Application:
The Human Reference Atlas Organ Gallery in VR

CCF Exploration User Interface (EUI)

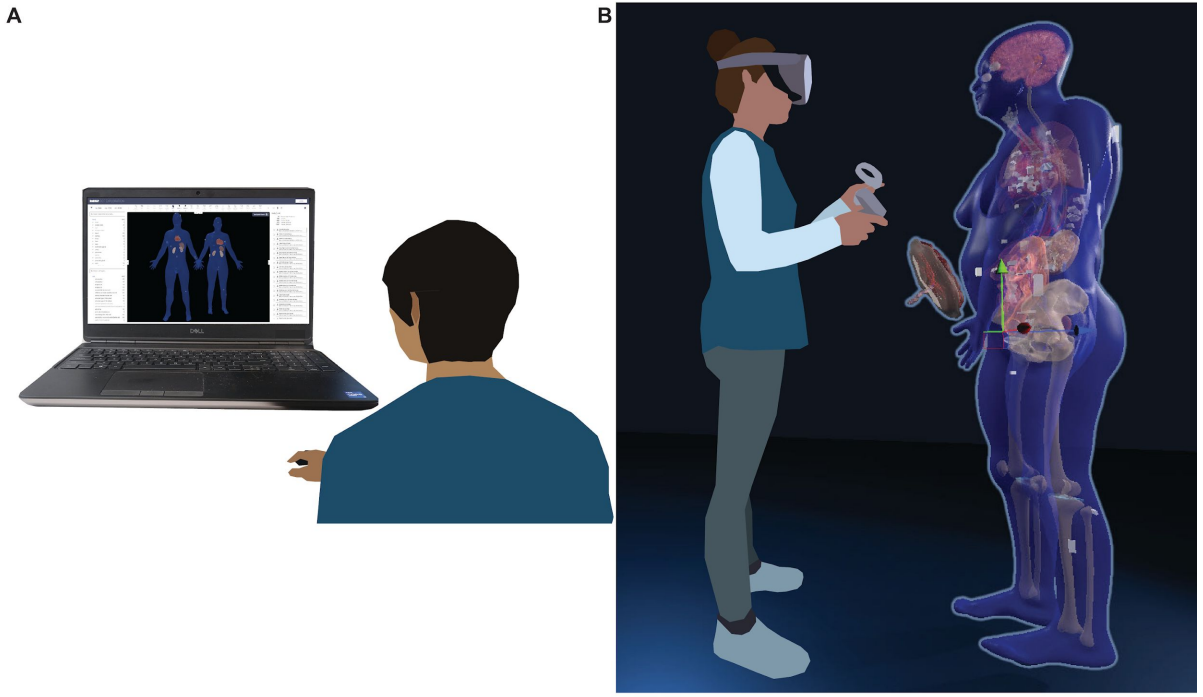
- Human Reference Atlas (HRA)
  - comprehensive, three-dimensional (3D) atlas of all the cells in the healthy human body
  - Compiled by an international team of experts who develop standard terminologies that they link to 3D reference objects, describing anatomical structures. (https://www.nature.com/articles/s41597-023-01993-8)
- The Exploration User Interface (EUI) allows exploring the Human Reference Atlas spatially and semantically



https://portal.hubmapconsortium.org/ccf-eui

What if…?

What if…?

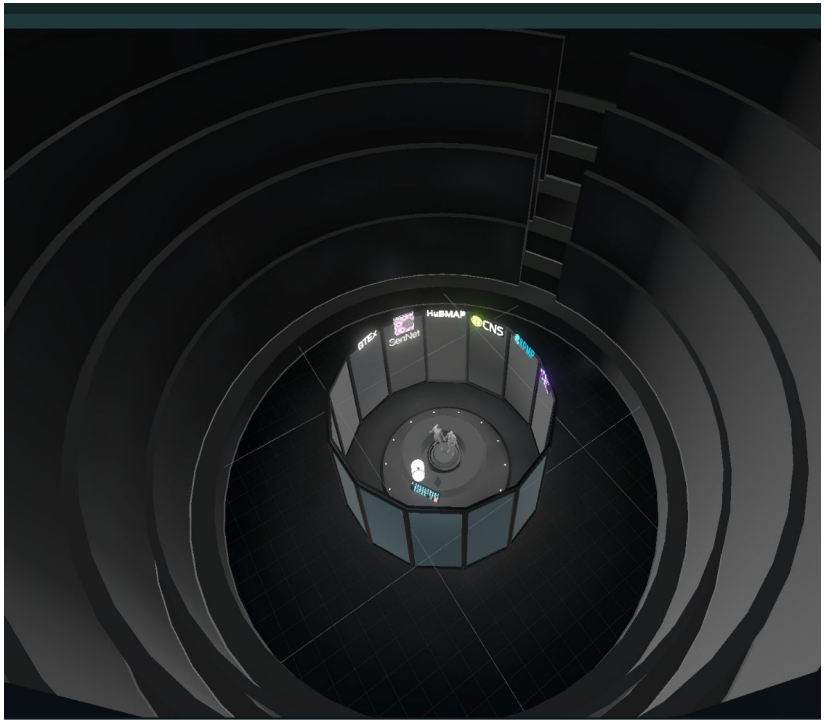


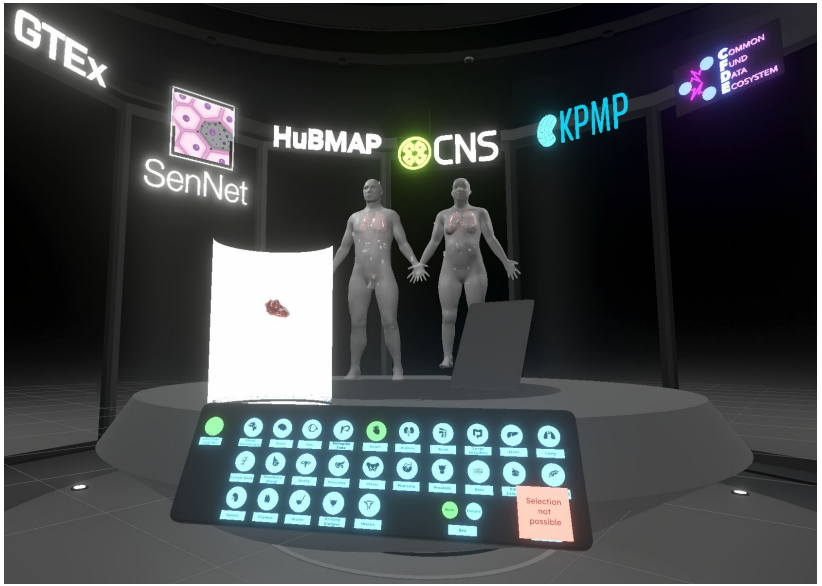
2D screen

HRA Organ Gallery (VR)

https://doi.org/10.3389/fbinf.2023.1162723

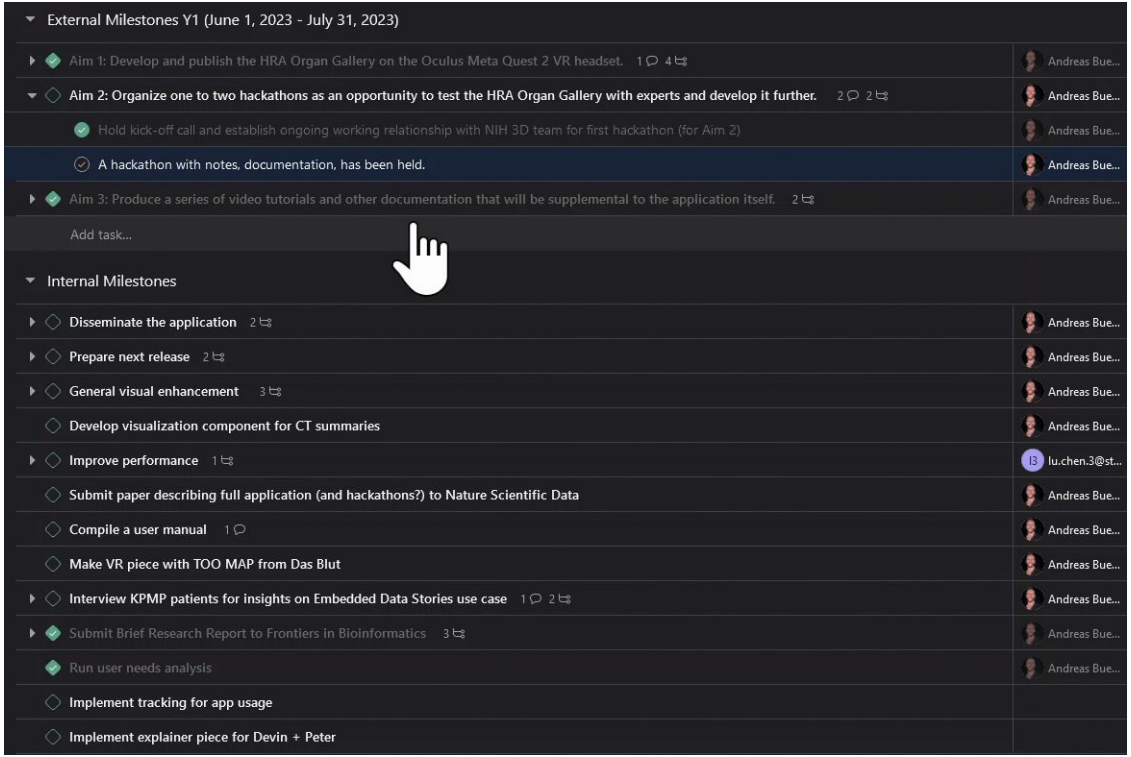
Current Status





Updates

- Hackathon held successfully!
  - Increased mean FPS from 30 -> 65 (target/max: 72)
  - Reduced #tiangles from ~4.2 mil -> ~930k
  - Improved usability of keyboard
  - Added lightbox for better screenshots
  - Notes
  - GitHub issues
- Second hackathon in SP 2024 optional



Just Completed: Hackathon with BCBB/NIAID

Workshop Organizers

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- The NIH for the HuBMAP JumpStart Award that enables us to conduct this workshop

https://cns-iu.github.io/workshops/2023-10-18-nih-3d-hackathon

DELL

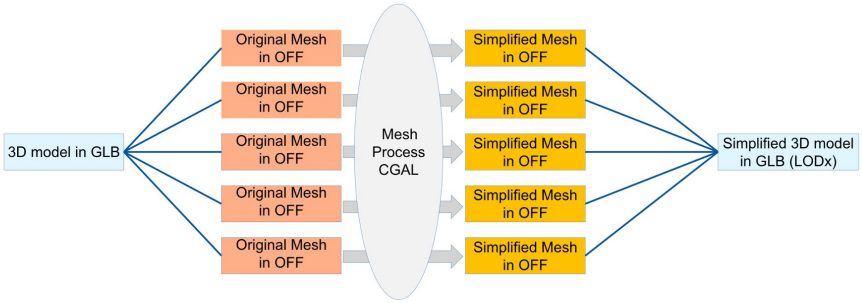
BAR 10

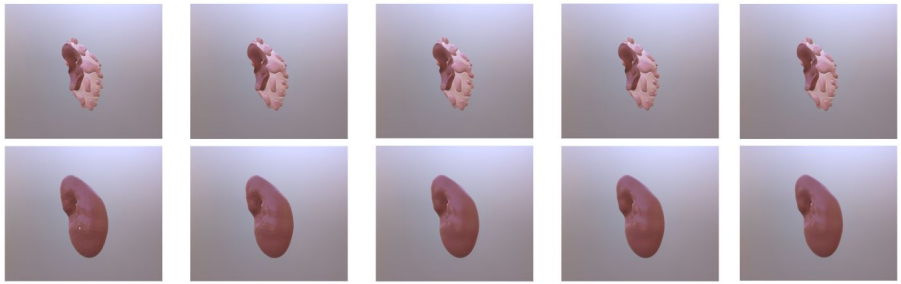
Level of Detail (LOD) Model Generation and Optimization

Reducing 3D model rendering time & increasing frame rate

Completed

- Developed a converter between different formats for 3D models
- Proposed an efficient and automatic workflow to create LOD models using CGAL (Computational Geometry Algorithms Library)
- Multi-LOD models are created and generated





GitHub: https://github.com/cns-iu/hra-multi-lod/

Future Work

- Use Blender and its Python API to generate Multi-LOD models in GLB
  - CGAL can only handle meshes with vertices, edges and faces. However, meshes always have other information, like lighting and material, which will be missing if using CGAL
- Mesh refinement for computation purpose
  - Some meshes with holes or manifold problems can be used for visualization but not computation
  - How to refine these meshes but also keep the biological correctness is important