Enhance medical software applications with immersive virtual reality experience

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Virtual Reality – Key Features

- **Immersive display**: large field of view, stereoscopic visualization
- **Natural 3D interaction**: position-tracked headset and handheld controllers, with buttons, touchpad, joystick, etc.
Virtual Reality – Now Accessible

• “VR-ready” computers (with discrete graphics card) from $1000 +
  – HTC Vive $650
  – Oculus Rift $550
  – Windows MR $400

• Standalone VR systems
  – Oculus Quest $550

https://www.bestbuy.ca
https://www.displaydaily.com/article/display-daily/what-you-call-vr-i-call-a-cave
How to develop VR software?

Use a game engine?

- Fully immersive standalone applications, mobile devices
- Real-time photorealistic rendering, physics engine
- Huge community, lots of resources

“made by game developers, for game developers”

How to integrate it into existing workflow and software?

How to upload patient-specific data?

Should we redevelop common medical imaging software features?

How to get support?

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Use medical application platform

- Hybrid desktop/immersive workflows, hospital information system integration
- Medical image processing, analysis, and visualization tools
- Community focused on medical applications
Open-source software platform for medical image visualization, analysis, treatment planning, and real-time guidance. Completely free, no restrictions (BSD-type license).
3D Slicer – Existing Tools

- Core features: multi-modality 2D/3D/4D visualization, DICOM, segmentation, registration, etc.
- Extensible using Python scripting, Jupyter notebooks, any Python packages (tensorflow, opencv, ...)
- 150+ extensions available in the app store: radiation therapy, deep learning, radiomics, medical training, image guided surgery...
3D Slicer - Statistics

- $50+ million of funding, 5 generations since 1997
- 570k+ downloads to date, 25-30% growth per year
- 248 contributors to core + many more to extensions
Goals of SlicerVR

1. Quick prototyping of medical VR applications for research and product development
2. Use existing software modules
3. Simultaneous desktop + virtual reality experience
4. Open, customizable, extensible
SlicerVR - Features

• Support all OpenVR compatible systems (HTC Vive, Oculus Rift, Windows MR headsets)
• Dynamic rendering quality: maximum quality without motion sickness
• Controller interactions
  – Fly
  – World manipulation: “pinch 3D” to pan, rotate, zoom
  – Object manipulation: grab and position objects, lock or link transforms
Method 1 of 3: Volume rendering + dynamic slice view
SlicerVR – Collaborative VR
How to try

Hardware requirements:
   VR-ready PC + OpenVR-compatible headset

Setup:
   1. Install 3D Slicer from www.slicer.org
   2. Install SlicerVirtualReality extension from built-in app store (Extension Manager)

Usage:
   1. Load any data (import DICOM, STL files, ...)
   2. Press the Start VR button
Thank You!

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3D Slicer:  http://www.slicer.org
SlicerVR:  http://www.slicervr.org
Perk Lab:  http://perk.cs.queensu.ca