

Surveying VR Data Visualization Software for Research

Notes

Tuesday, January 31st, 2023

- Presentation and Interview with Kenny Gruchalla:
 - Visual data in graphs provide a more intuitive understanding of data
 - Much of our neurons in our brain are used for visual detection, so seeing plotted data can help us identify correlations much better than coordinates, averages, standard deviation, and other statistical data.
 - 3D immersive interaction spaces like the cave provide a more embodied environment
 - "huh, that's weird" - we understand our world by moving through it
 - Applications of VR technology in helping with National Renewable Energy Laboratory:
 - Energy Efficiency:
 - Vehicle Technologies, Building Technologies, Industrial Technologies
 - Renewable Energy:
 - Wind, Solar, Bio-fuels, Geothermal, Energy Storage
 - Energy Analysis:
 - Technology Systems Analysis, Market and Policy Analysis, Sustainability Analysis, Resiliency Analysis
 - What were some challenges you faced while becoming an expert in using VR assisted research software?
 - Double sided sword:
 - Initially, convincing people that immersive visualization had value and getting funding for projects was difficult.
 - Once we got funding and as soon as everyone got excited about it, we had to pull back the reins a bit.
 - We have to really think about the data before we develop the immersive visualization to see if it is really worthwhile.
 - Application of immersive visualization with domain scientists using Pymol, a molecular dynamics tool.
 - All three groups came out with a new discovery after walking through the cave.
 - Are we activating some part of our brain that we haven't activated or are new discoveries a result of seeing data from a different angle?

Read Article:

- K. Gruchalla & N. Brunhart-Lupo The Utility of Virtual Reality for Science and Engineering In W.R. Sherman (Ed.), VR Developer Gems, 2019

Project Ideas

■ Project 1: Virtual Brown Campus Tour using Unreal Engine

- Design detailed 3D models of museum exhibits and college campuses like Brown, allowing users to explore them using VR controllers.
- Can tour buildings and locations on campus, interacting with tour guide bots

■ Project 2: Virtual Nature Trail using Unreal Engine

- Create a virtual reality experience that allows users to explore a nature trail and learn about the plants and animals that live there.
- Using Unity or Unreal Engine, build 3D models of the environment and use VR controllers to interact with the flora and fauna.

■ Project 3: Virtual Virtual Reality Museum

Create a virtual reality museum-like experience that explains interactively some of the technology, data, and concerns of VR:

- **Interactive Introduction:** A brief introduction to VR, its history and current applications.
- **VR Demonstration:** A virtual environment where users can experience VR first hand by exploring different VR applications, such as gaming, education, medical, and entertainment.
- **VR Technology Overview:** A detailed explanation of the components of VR technology such as head-mounted displays, controllers, and tracking systems.
- **VR Development Tools:** A interactive display of the different VR development tools, such as Unity and Unreal Engine, and how they are used to create VR experiences.
- **VR Design and Interaction:** An exhibit on VR design principles, interaction design and user experience considerations.
- **VR Ethics and Privacy:** An exploration of ethical and privacy issues related to VR and how they can be addressed.
- **VR Future:** A discussion with a bot on the future of VR, including potential applications and the impact it will have on society.

■ Setbacks:

Project Evaluation

- Project 1: Virtual Museum/Brown Campus Tour using Unreal Engine
 - The proposed project clearly identifies deliverable additions to our VR Software Wiki
 - The proposed project involves collaboration in VR
 - The proposed project involves large scientific data visualization along the lines of the "Scientific Data" wiki page and identifies the specific data type and software that it will use
 - The proposed project has a realistic schedule with explicit and measurable milestones at least each week and mostly every class
 - The proposed project explicitly evaluates VR software, preferably in comparison to related software
 - The proposed project includes an in-class activity, which can be formative (early in the project) or evaluative (later in the project)
 - The proposed project has resources available with sufficient documentation
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