VR Toolkits: Why do we keep reinventing the wheel?

Organizer/Moderator:
Daniel Acevedo-Feliz, King Abdullah University of Science and Technology

Panelists (confirmed):
- Bret Jackson, University of Minnesota
- Daniel Keefe, University of Minnesota
- Ryan Pavlik, Iowa State University
- Jurgen Schulze, University of California, San Diego
- Bill Sherman, Indiana University
- Alexis Vartanian, TechViz

Panel Description:
CalVR, MinVR, ViSTA, Virtools/3DVIA, WorldViz, VRJuggler, TechViz, FreeVR, VRG3D, MiddleVR, CaveLib, EONReality, VRUI, WorldToolKit, ... This is a short (very short and incomplete!) list of some of the toolkits and software out there that users can choose from to develop their interactive VR applications. Some are commercial, some are free, some leverage other software and they just take care of the display/interaction part, some allow full-blown control of all aspects of the graphics pipeline, some provide simple visual interfaces, some require extensive programming. How do users choose? What makes universities and commercial companies decide to start from scratch (again) and create their own toolkit? What's wrong with all of these? What's right with all of these?

In this panel we hope to bring together different perspectives from academic developers, industry developers, and users of VR toolkits, to try and understand what makes a VR tool successful and why we keep thinking that all of the developed tools out there are never quite right for our needs. A successful conclusion to this panel would be a list of features that makes a toolkit:

- **useful**, in many different fields of application,
- **effective**, by, for example, providing documentation that allows users to find and implement the best method to do a particular task,
- **efficient**, by simplifying options and complex interactions into easy to understand schemas,
- and **robust**, by, for example, supporting different OS flavors and hardware types.

Panelists' BIOS:

**Bret Jackson** is a Ph.D. candidate in the Department of Computer Science and Engineering at the University of Minnesota, where he specializes in 3D human-computer interaction and visualization. He is the primary developer of the MinVR virtual reality toolkit (http://minvr.github.io/MinVR/). In 2013 he received the University of Minnesota Doctoral Dissertation Fellowship and
intends to receive his PhD in June 2014. He received a M.S. degree in computer science in 2013, and a B.A in computer science magna cum laude from Carleton College in 2008. He is a member of the ACM and IEEE.

**Dan Keefe** is a McKnight Land-Grant Assistant Professor in the Department of Computer Science and Engineering at the University of Minnesota. His research and teaching focus is on topics in data visualization, computer graphics, and 3D human-computer interfaces, investigating questions such as: (1) How can computer graphics take advantage of the power of the human visual system to help us understand large multidimensional datasets? (2) How can new computer interfaces (e.g., virtual reality) help us work more intuitively with complex 3D problems using computers? His current projects are supported by the National Science Foundation, the National Academies Keck Futures Initiative, the University of Minnesota, and industry and include applications to virtual prototyping for medical device design, improving training for laparoscopic and robot-assisted surgery, analyzing biomechanics of the human spine, reconstructing ancient Greek sites in virtual environments, and more. In 2011 Keefe received the NSF CAREER Award. He has received best paper and best panel awards at international conferences for his research and teaching and has also published and exhibited work in top international venues for digital art. Before joining the University of Minnesota, Keefe did post-doctoral work at Brown University jointly with the departments of Computer Science and Ecology and Evolutionary Biology and with the Rhode Island School of Design. He received the Ph.D. in 2007 from Brown University’s Department of Computer Science, which nominated his work for the ACM Dissertation Prize, and the B.S. in Computer Engineering summa cum laude from Tufts University in 1999.

**Ryan A. Pavlik** is a Ph.D. candidate in Human-Computer Interaction and Computer Science at Iowa State University. He works with Dr. Judy M. Vance on natural interaction for virtual environments, focusing especially on haptic, virtual assembly, and virtual experience creation. He initiated and leads development of VR JuggLua, a software package and library integrating VR Juggler, OpenSceneGraph, and Lua to permit rapid, interactive development of virtual reality software by both trained programmers and end-user programmers on the diverse set of virtual reality systems supported by the underlying VR Juggler framework.

**Jurgen Schulze** is Assistant Research Scientist at the Qualcomm Institute and Assistant Adjunct Professor at the Department of Computer Science at UCSD, where he teaches computer graphics and 3D user interfaces. His research interests include scientific visualization in virtual environments, human-computer interaction, real-time volume rendering, and the use of mobile devices for graphics applications. He holds an M.S. degree from the University of Massachusetts and a Ph.D. from the University of Stuttgart, Germany.

**Bill Sherman** is currently a Senior Technology Advisor at Indiana University Research Technologies where his major objective is to build and utilize tools that assist in the analysis of large-scale scientific data. One of his concentrations has been on the use of immersive technology systems as instruments that serve the
analysis process. He has been working to help build a community wherein productive tools and techniques for immersive visualization can be shared. He was Chair for IEEE VR 2008 and the author of two books on VR technology: *Understanding Virtual Reality* (MK, 2003) and *Developing Virtual Reality Applications* (MK, 2009). He was a Senior Research Programmer at NCSA for fifteen years, leading their VR laboratory and teaching VR courses are UIUC. Later he was the Director of the Center for Advanced Visualization, Computation and Modeling at the Desert Research Institute in Reno (NV)

**Dr-Ing Alexis Vartanian** is currently the CTO of TechViz. He holds an engineer degree from Ecole Superieure d’Electricité (France), a MS and a PhD from Paris Sud University in Computer Architecture. During his PhD in the 90’s, he was involved in the early research to create high performance visualization systems based on commodity GPUs. In 2004, he co-founded TechViz and has since been working as CTO. TechViz is now one of the leaders of Virtual Reality software, with its solution TechViz XL that enables to use existing 3D applications in a VR system without data conversion.

**Daniel Acevedo-Feliz** is a Research Scientists in VR and Scientific Visualization at the Visualization Core Laboratory at King Abdullah University of Science and Technology, in Saudi Arabia, where he leads the Virtual Reality facilities. His focus is on the utilization of the advanced immersive applications and environments for scientific visualization problems. His interests live somewhere between VR interface design, human perception and visual design, HPC visualization methodologies, and usability studies in human-computer interaction. He has an MSc and PhD in Computer Science from Brown University and a BS in Civil Engineering from University of A Coruna, Spain.