TR469474

Virtual Design Reviews in VRED Using Ray Tracing and Remote Collaboration

Hardie Tankersley
Silverdraft

Learning Objectives

- Learn how to implement collaborative design reviews in VRED using built-in tools and best practices to improve creative process.
- Learn how to activate GPU and CPU ray tracing functions in VRED and use compute cluster resources to deliver best quality and performance.
- Learn how to design workflows for virtual design reviews between design, engineering, and business management.
- Learn how to create new design process to improve quality and reduce cost.

Description

Design review sessions are an essential part of product development for everything from automotive to architecture to manufacturing. It is essential to bring together stakeholders and experts from all disciplines—including design, engineering, and manufacturing—early in the design process. Visualizing prototype designs in VRED software in real time has been invaluable in discovering potential issues and delivering better products on a faster cycle. We have developed a set of design review tools implemented in Python inside of VRED to enable work sessions to be more effective and create a documentation trail for concrete decision making without resorting to as much physical prototype construction. Using ray tracing, VRED can enable reliable review of design details, especially glass, mirrors, and metals. Real-time remote collaboration enables participation from far-flung departments around the world without requiring travel. This session will explore case studies and demonstrate these capabilities.

Speaker

Hardie Tankersley
VP Visualization Solutions – Silverdraft
Hardie is a veteran builder of products at the intersection of entertainment and technology. Hardie has held previous roles as the Senior Vice President of Innovation at Fox and delivered new products around streaming and connectivity. He is currently on the forefront of developing high-quality commercial-grade immersive visualization applications for design, marketing, and storytelling.

Silverdraft

We are Silverdraft. We produce visualization tools and systems to drive high-resolution photorealistic experiences. One of our major markets is automotive design. We have worked with design teams around the world on ways to integrate photorealistic visualization into the design process. Today we want to walk you all through some of what we have learned and how we can both streamline the process for efficiency and speed as well as improve the creative output.

Automotive Design Immersive Workflow

- How the design moves from abstract shapes to production
- Most designs start with abstract shapes and rough sketches. Then we move to modeling and defining geometry with Alias. We experiment with many different ideas at different scales, sometimes producing small scale models and prototypes with clay or 3D printing.
- VRED enables design to collaborate with engineering and production in detail. Faster and more efficient.
- The design process is a multi-disciplinary collaborative process that requires input from many different teams and roles: design, modeling, color, R&D, engineering, manufacturing. Real time visualization enables much better communication between different roles since each team member can look at a complete model at the same time with real-world context. And realtime interactivity allows them to play around with the model, open and close doors, turn lights on and off, and change other variables to see how different aspects of the design influence and interact with each other.
- Design can experience the model at full 1:1 scale in real world environments
- By rendering a 3D model interactively and in real time each team member can experience the vehicle naturally as a customer would. And in VR they can move naturally around the scene. They can easily view different variants such as trim packages or colors or environments. Designers can feel the presence of a design at full scale in 3D, walking around, opening doors, sitting in seats. They can play with light, color, and materials to experiment with different effects and see the results in realistic environments just as if it were a completed prototype vehicle.
- Design team can intuitively collaborate and create process loops between modelers, designers, and design director
- Engineering can examine details of components and start to figure out assembly
- Visual inspection and testing of how components interact
- Full customer experience – walk around and kick the tires, open the doors
- This allows a more streamlined development process that can move faster, iterate more, and particularly catch issues and quality problems earlier in the process which saves tremendous cost and effort vs fixing things later down the line.

Remote collaboration in VR

The real power is in redefining and streamlining the workflow. VRED enables design to collaborate with engineering and production in detail. Faster and more efficient.

The design process is a multi-disciplinary collaborative process that requires input from many different teams and roles: design, modeling, color, R&D, engineering, manufacturing. Real time visualization enables much better communication between different roles since each team member can look at a complete model at the same time with real-world context. And realtime interactivity allows them to play around with the model, open and close doors, turn lights on and off, and change other variables to see how different aspects of the design influence and interact with each other.

Since most of us are now in a world where travel is difficult we have to replace the face-to-face meeting. But mailing documents around is slow and low-bandwidth communication. There nothing like getting designers and engineers (and even business managers) to interact in real time. We can't quite make eye contact yet. But we can talk and point and walk around together. Instead of flying everyone (and the expensive full-scale prototype vehicles) to a central location for a few days to point at a model we can now do it any time. Some design teams are now doing multi-disciplinary team reviews like this on a weekly basis instead of quarterly.

- Conduct remote design reviews between design, HQ, engineering, production
- Everyone can see the same model and see and hear each particpant in real time
- VRED provides a powerful customization environment that allows us to create our own functions within the application via Python APIs. Silverdraft has worked to build specialized tools for VR design reviews such as notes, 3D model markup, variant switching, precise sectioning, image capture, and so on.
- Easy for managers to track and annotate notes from the session
    - Silverdraft collaboration tools can enable everyone to come out of a review session with useful and actionable notes including pictures attached to part specifications and measurements. We typically see design leaders in HMD leading the review but a larger number of other staff including project managers attending via PC screen.

Ray tracing

- Amplifies efficiency and effectiveness of reviews
- Enables more complex and detailed reviews
- Accurate reflections and transparencies in mirrors, metal, and glass
- Color and subsurface scattering in materials in context
- Now with VRED 2021 and NVIDIA RTX and Silverdraft scalable computing we can activate ray tracing in the scene to not only enhance the visual quality and impact and realism, but to enable even more detailed review functions. With ray tracing active you can see exactly how light plays off of surfaces, reflects off of different materials, and interacts with glass, mirrors, and metal. And because it is real time you can make changes, move things around, tweak materials and lights

and really see the impact of design decisions in a way that couldn't be done before.
- With true physical modeling you can now be sure that when you make a design decision you are seeing the true accurate and final impact on the product.

The output of a meeting has to be decisions. It's nice to be able to interact with the team. But usually someone is assigned as the issue tracker. This person doesn't have to be in a headset. They can participate just sitting at a PC screen, but with full viewing and participation. Here the superpowers really come into play. With superpowers you can capture an image with a virtual camera, like a screenshot, and then have it saved to file and incorporated into a process workflow. It can be imported into a Shotgun project where actions can be assigned and it becomes a part of the workgroup record, available to the whole team.

Silverdraft Solutions

Silverdraft contributes to the process by providng layers of value both underneath and on top of VRED. Underneath we apply our specialized knowledge and experience with high-performance computing to drive the VRED scenes to render in real time with no frame drops or glitches. And above VRED we develop software to customize the experience for your team's workflow. We integrate the complete system into a solution that brings all the power of VRED in an easy, fast, and cost-effective way. Our experts work with your team to identify the best process for your particular issues. Then we design a system and a workflow so that your team can do their best work.

- Multi-GPU render clusters
- High-performance desktops and new laptop
- Best support for high-resolution experiences with Varjo
- Extensions to VRED tools for reviews and collaboration

Silverdraft works closely with the Autodesk VRED team to always make sure that we are working with our customers to get the most power from the available solutions.

Videos & Links:

Remote Collaboration in VRED
https://youtu.be/h5pdr9BAJfE

Varjo XR-1 - Design review demo
https://vimeo.com/401350958

Varjo Mixed Reality
https://varjo.com/blog/blend-real-and-virtual-seamlessly-with-new-xr-1-features/

Ray Tracing in VRED
https://youtu.be/G-6X_jkphmI