Centro di Eccellenza per
l'Ingegneria dell'Informazione,
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Modern VR Content Handling

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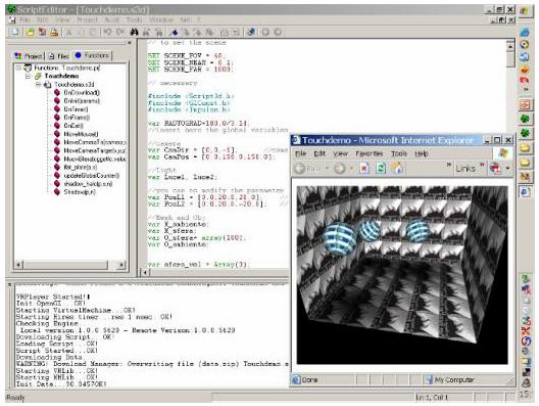
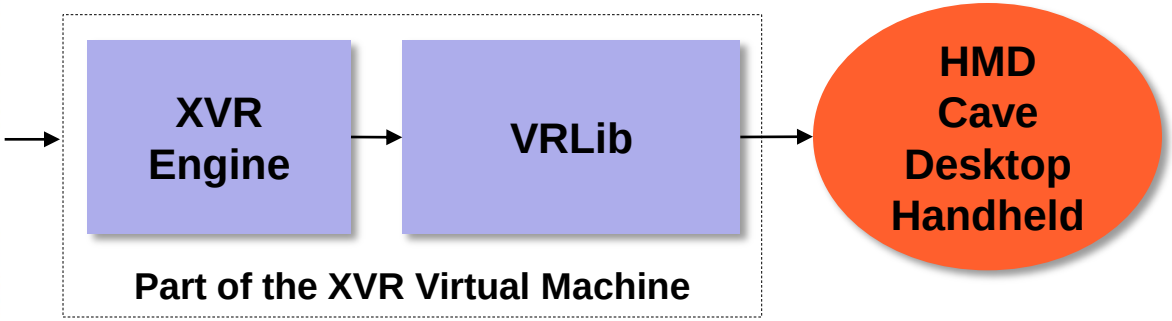
InReTe

A Rendering Engine Dedicated to VR

VRLib is our real-time rendering library, used to build interactive virtual reality applications using the OpenGL graphics system.

It is the library used by the XVR virtual reality applications development environment to visualize 3D scenes.



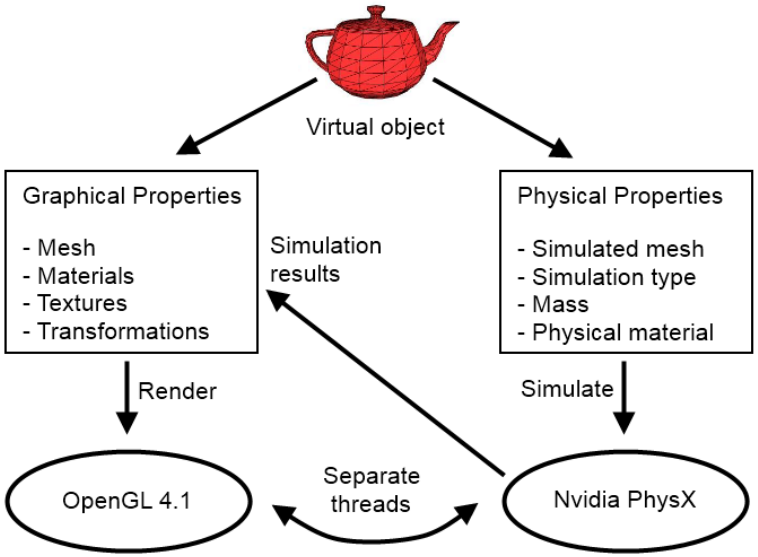


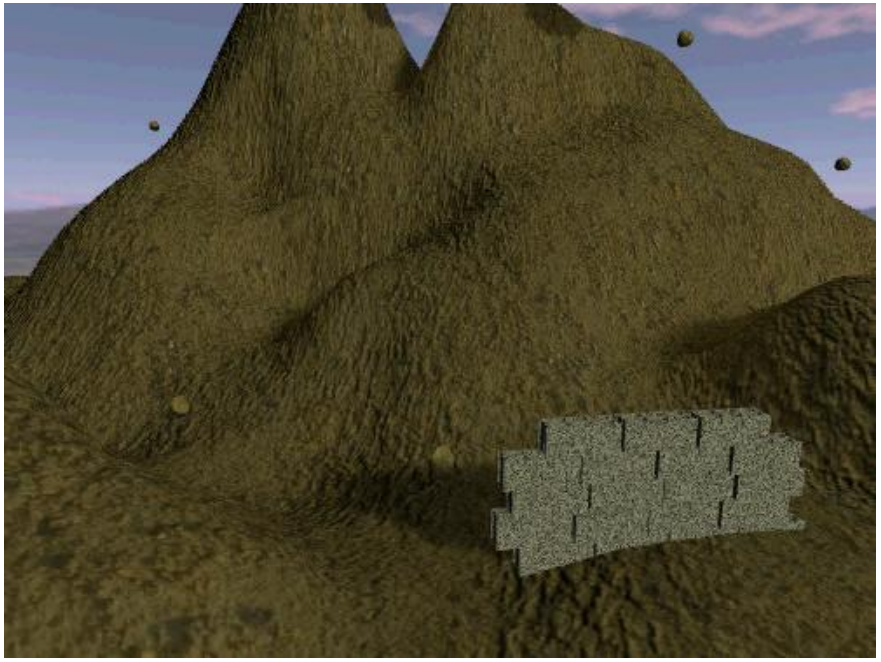
VRLib supports typical VR needs: stereo rendering, HMDs support, CAVEs through cluster rendering.

VR3Lib is the latest generation of the VRLib family, with built-in support for:

- physical simulation of virtual objects (rigid)
- many shader-based modern rendering techniques

Joining Graphics and Physics



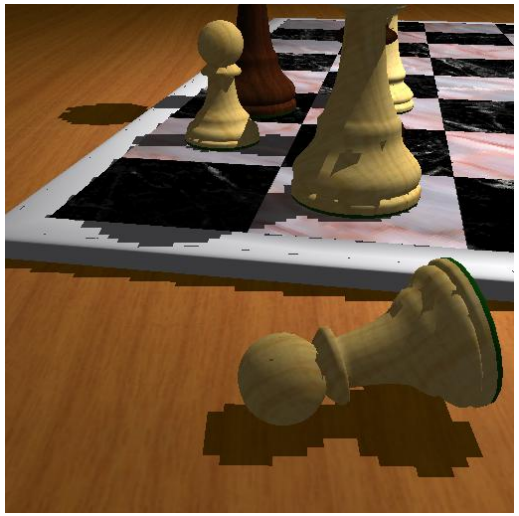


- Physical properties and simulation natively handled by the VR3Lib.
- Single file format (AAM), multiple object descriptions:
  - Graphical description (used for rendering)
  - Physical description (used for rigid body simulation)
- Graphics and physics tightly coupled together.

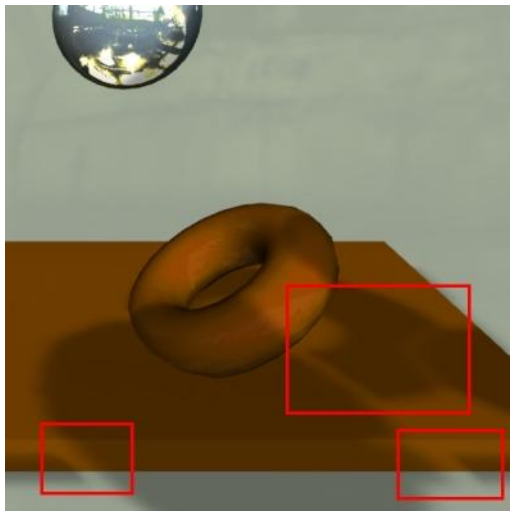
Beyond Phong Shading

- Image-based lighting (IBL) via cube environment mapping.
- Real world HDR pictures used for lighting.
- Technique inspired by:
  - P. Debevec, “Image-Based Lighting”, 2002.
  - F. Houlmann and S. Metz, “High Dynamic Range Rendering in OpenGL”, 2006.

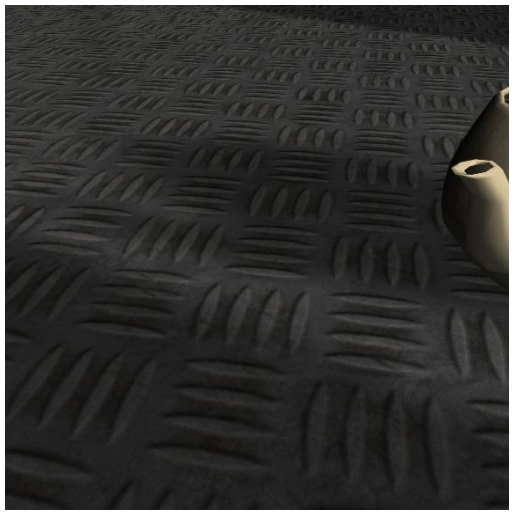
Real-Time Soft Shadow Mapping



Basic SM



VSM



EVSM (our method)

- Soft shadows using Exponential Variance Shadow Mapping (EVSM).
- Improves upon VSM e ESM by reducing light bleeding and artifacts for non-planar receivers.
- Technique inspired by:
  - A. Lauritzen et al, “Layered Variance Shadow Maps”, 2008.
  - M. Salvi, “Rendering Filtered Shadows with Exponential Shadow Maps”, 2008.

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Conclusion and Future Work

- Effective Virtual Environments authoring is key to successful scientific research in the field.
- With the VR3lib we are exploring automatic handling of realistic VEs.
- The framework maintains the API of our successful 2nd generation VRLib (used by several VR research labs across EU), introducing simulation of complex physical and lighting phenomena.
- It presents many more built-in advanced rendering capabilities we have not presented here.
- Constantly evolving to integrate new capabilities. Working on GPU tessellation stages at present.
- Reference goal is and will be ease of use.

thank you!

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