VR Eye Tracking & Foveated Rendering with VRS

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VIVE Pro Eye Tracking

Agenda

• Eye Tracking & SRanipal SDK
• Nvidia Variable Rate Shading (VRS)
• Foveated Rendering
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Requirements

• HMD
  - VIVE Pro Eye

• PC
  - Windows 10 (64-bit)

• Software
  - Unity 5.5.3 or Later
  - SteamVR (October 14 release or later)

• Graphics card
  - NVIDIA (Turing required for VRS & Foveated Rendering)
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SRanipal Demo
What is SRanipal

• Super reality animation pal

• A software framework able to read a user’s face, including
  - Eye movement
  - Facial expression
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Supported Hardware

- Eye tracking - VIVE Pro Eye
- Lip tracking - VIVE Lip accessory which attaches to VIVE Pro and VIVE Pro Eye
SRanipal Function

- **Input:**
  - Eye image
  - Lower facial image
- **Facial coverage** - Eyes, Jaw, Mouth, Cheeks
- **Output:**
  - Gaze vector, pupil size, eye openness
  - 26 blend-shape weights for lower facial portion
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Software Architecture

SR-Runtime

1. Eye expression
2. Lip expression
3. SW auto update

Support Eye-tracking Plugin

SR-Runtime and SRanipal client communicate via IPC

SRanipal Unity Plugin

SRanipal Unreal Plugin

Applications

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Eye Tracking Uses

- Expressive Avatars
- UI Controls (Selection and Scrolling)
- Analytics
- Object Selection (Focus)
- Aim Assist & Hand Eye Coordination
- Gaze Aware NPCs
- Realistic Depth of Field
- Foveated Rendering with VRS
Nvidia Variable Rate Shading (VRS)

- **Variable Rate Shading:**
  - Allows fine control of shading rate for each 16x16 pixel region
  - Coarse Shading: 1×1, 1×2, 2×1, 2×2, 2×4, 4×2, 4×4
  - Supersampling: 2x, 4x, 8x

- **Algorithms:**
  - Content Adaptive Shading
  - Motion Adaptive Shading
  - Foveated Rendering
Nvidia Variable Rate Shading (VRS)

- VRS reduces excessive pixel shading load
- VRS allows customizing shading rates within the frame
- VRS selectively improves visual quality with supersampling
- VRS preserves edges and visibility of the objects
- VRS works at screen space and is simple to integrate

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Foveated Rendering

- Render lower resolution in peripheral vision
- Fovea: middle of retina, FOV 5°, half of optic nerves
- Fixed Foveated vs. Dynamic Foveated
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Eye Tracking

Foveated Rendering

- Graphics card driver handle foveated rendering
Avatars

- We provide 4 avatar samples in SDK
Eye Tracking Tips

• The pupil diameter data is provided for the left and the right eye individually (mm)
• Adding gaze aware to small objects, increase collider size to prevent flickering
• Use a mesh collider for complex shapes that may be near or block other colliders
• First person is better than 3rd person for eye tracking uses (objects larger)
• Place focus point in center of UI buttons, don't use strong outlines (distracting users/draw eyes away)
• UI elements with labels should be grouped and act together (i.e. if reading label)
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Contact

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SDK

Video

https://developer.vive.com/resources/

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