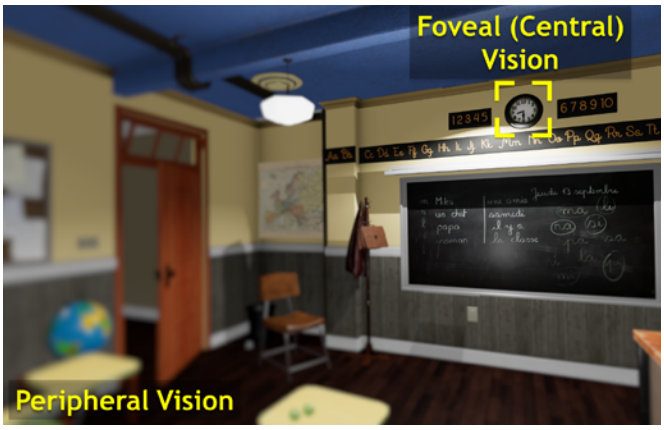
SIGGRAPH 2016 EMERGING TECHNOLOGIES
PERCEPTUALLY BASED FOVEATED VIRTUAL REALITY

No Foveation



Temporally Stable Foveation

Contrast-Preserving Foveation

Immersive virtual reality (VR) requires rendering high-quality images at very high resolutions and framerates. Foveated rendering enables these experiences on today's hardware by exploiting the reduced visual activity in our peripheral vision. The *fovea*, or the central part of the retina, is rich in photoreceptors, which makes the region highly sensitive to details. But it fills only a small portion of the visual field. As we go farther from the fovea, the sensitivity to details decreases significantly. Foveated rendering creates images that match this reduction in detail, dramatically reducing rendering costs.

We have used a series of perceptual experiments to explore improvements in the quality of foveated rendering. We show the advantages of temporally stable and contrast-preserving foveated rendering in virtual reality, and demonstrate a real-time foveated rendering algorithm based on the findings from our perceptual experiments. The proposed algorithm significantly reduces rendering costs without a noticeable loss in visual quality.

We demonstrate our foveated rendering algorithms on a prototype eye-tracking VR display provided by SensoMotoric Instruments (SMI) capable of accurate and low-latency eye tracing at 250 Hz.

NVIDIA CONTRIBUTORS

Anjul Patney
Joohwan Kim
Marco Salvi
Anton Kaplanyan
Chris Wyman
Nir Benty
Aaron Lefohn
David Luebke

SMI SensoMotoric Instruments

NVIDIA