Abstract:
Perception based rendering becomes a hot research topic recently in Computer Graphics. It not only can promote the understanding of an image by attracting the attention of the specified user to his focusing area, but also has the potential to reduce the rendering computation. In this talk, we present three research works on how to benefit the perception of an image based on the characteristics of HVS. Firstly, we introduce a novel foveation filtering to simulate the gaze effect of the human eye on a 2D image by using the Mipmap pyramid to replace traditional Gaussian filtering. By using nonlinear Mipmap interpolation under the Bilateral Filtering scheme, we are able to achieve more accurate and effective foveation viewing results. Furthermore, a detail enhancement method based on the Cornsweet Illusion is incorporated into our framework. Compared with previous work, our approach can generate the same quality results with higher performance.

Secondly, we present a novel foveation rendering algorithm based on distributed ray tracing to simulate the gaze contingent vision of a 3D scene. An image-space adaptive sampling mask is designed adhering to the Contrast Sensitivity Function (CSF) of the HVS. Then, an irregular layered representation for the 3D scene is constructed by depth peeling technique. Based on this novel data structure, we propose an efficient Depth Interval Refinement (DIR) technique to reduce quickly the Potential Intersection Object Set, and accelerate the ray tracing process dramatically.

Finally, we apply the perception characteristic of the HVS to detail enhancement of 3D models. Based on a series of experiments, a novel adaptive exaggeration function is developed which is capable of modulating the extent of detail enhancement to obtain satisfactory shape exaggeration result. Meanwhile, a local refinement algorithm is also conducted to allow users to freely enhance any detail at their desire.

About the Speaker:
Prof. Qunsheng Peng is currently a professor in State Key Lab of CAD&CG, Zhejiang University and serves as the vice chairman of the Lab Academic Committee. He graduated from Beijing Mechanical College in 1970 and received a Ph.D from the Department of Computing Studies, University of East Anglia, UK in 1983. His research interests include realistic image synthesis, virtual reality, bio-molecule graphics and scientific visualization. In these fields, he has authored and coauthored more than two hundred journal and conference papers, including ACM SIGGRAPH, ACM VRST, ICCV, Eurographics, Pacific Graphics, etc. He received Computer Graphics Achievements Award of China at Chinagraph 2000. He is a member of the editorial board of The Visual Computer, Journal of Computer Science and Technology and several Chinese journals.