UNIVERSITY OF MACAU
FACULTY OF SCIENCE AND TECHNOLOGY
DEPARTMENT of
COMPUTER AND INFORMATION SCIENCE

"Exploiting Coherence in Computer Graphics"

by

Prof. Yanci ZHANG
College of Computer Science, Sichuan University, China

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Abstract

Coherence has been widely used in computer graphics to accelerate various kinds of processing. In this talk, three ongoing research projects related to exploiting coherence will be presented.

The first application exploits local spatial coherence in screen space as well as frame-to-frame coherence to accelerate the Screen Space Ambient Occlusion (SSAO) algorithm. The core feature of SSAO is that its computation only depends on the surrounding pixels. A screen space local complexity function is designed to describe such feature. Two pixels with similar local complexity should have close AO value. Based on the above observation, the AO value of pixel p in the current frame might be directly adopted from some pixel in previous frame.

The second project employs temporal coherence to build high quality kd-tree for ray tracing. Surface Area Heuristic (SAH) might be the most popular method to construct the acceleration structure. But its assumption on the uniformly distribution of rays is not always true in practice. We propose a new heuristic called Cost Balanced Heuristic (CBH), defining a cost function for a subspace which will be used to guide the building process of kd-tree. However, the cost of subspace depends on the ray/primitive intersection tests results, which cannot be achieved before traversing the kd-tree. Temporal coherence is employed to solve the problem.

The last project attempts to improve the load balance with unpredictable tasks in the context of parallel rendering. Estimating the workload of different kinds of rendering tasks is the key to achieve the load balance. The basic idea of our approach is to use the coherence between the multiple running times of the same program to mine the knowledge of the workloads of all rendering tasks, including the unpredictable ones.

Biography

Yanci Zhang received his B.Sc. in Computer Science from Sichuan University in 1997 and Ph.D. from the Institute of Software, Chinese Academy of Sciences in 2003. After his Ph.D., he became a research assistant in Chinese University of Hong Kong in 2004. During 2005-2008, he served as a PostDoc Scholar in the Department of Informatics, University of Zuirch, Switzerland. He is currently an Associate Professor at the College of Computer Science, Sichuan University. His research interests include real-time rendering, global illumination, parallel rendering and GPU computing.

ALL ARE WELCOME!