UNIVERSITY OF MACAU

FACULTY OF SCIENCE AND TECHNOLOGY

DEPARTMENT of COMPUTER AND INFORMATION SCIENCE

Ref: FST/SEM/0065/2011

"Parallel-Split Shadow Maps for Large-scale Virtual Environments"

by

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Date : 30/06/2010 (THURSDAY)

Time : 11:00

Venue : J311

Abstract

Shadowing effects dramatically enhance the realism of virtual environments by providing useful visual cues. Shadow mapping is efficient and general applicable for real-time applications, but suffers from the inherent aliasing errors due to the image-based nature. We present the Parallel-Split Shadow Maps (PSSMs) scheme, which splits the view frustum into different parts and then generates multiple smaller shadow maps for the split parts. A fast and robust split strategy based on the analysis of shadow map aliasing is proposed, which produces a moderate aliasing distribution over the whole depth range. By applying the geometry approximation to the split parts instead of the whole scene, the tighter bounding shapes of visible objects enhance the utilization of shadow maps. Our system utilizes hardware acceleration for the extra rendering passes when synthesizing the scene shadows.

Our approach is intuitive without using complex data structures and supports real-time performance for large-scale and dynamic virtual environments. We further work on generalized perspective reparameterization in shadow mapping to reduce perspective aliasing errors and keep the linear perspective aliasing distribution in general cases, while the light and viewing directions are not orthogonal in dynamic virtual environments.

Biography

Prof. Sun received her M.S. in electrical engineering from University of British Columbia, and Ph.D. in computer science from University of Alberta, Canada. Prof. Sun has published more than hundred technical papers refereed in VR/CG journals and international conferences, including MIT Journal of PRESENCE: Teleoperators and Virtual Environments, Computer Animation and Virtual Worlds

CAVW, Journal of Virtual Reality: Research, Development and Applications, Computers & Graphics, Computational Geometry, IEEE Transactions on Information Technology in BioMedicine, International Journal of Image & Graphics. She has served as guest editors of MIT PRESENCE and Journal of CAVW, program co-chair of ACM VRST'2002, organization co-chair of Pacific Graphics'2005, conference general chair of ACM VRCIA'2006, and numerous international program committees. Her current research interests include interactive graphics/animation, virtual & augmented reality, hypermedia, computer-assisted surgery, internet-based visualization/ navigation, tele-medicine, realistic haptics simulation.

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