



Tutorial: Mobile 3D Graphics

Date: Monday, April 14th

Time: 09:00 – 12:30 & 14:00 - 17:30 (Full-day Tutorial)

Presenters:

Kari Pulli
Research Fellow
kari.pulli@nokia.com
<http://people.csail.mit.edu/kapu/>
Nokia Research Center

Jani Vaarala
Graphics Architect
jani.vaarala@nokia.com
Nokia

Ville Miettinen
wili@rawjay.com
Independent

Robert J. Simpson
Graphics Architect
robert.simpson@amd.com
AMD Finland

Tomi Aarnio
Senior Research Engineer
tomi.aarnio@nokia.com
Nokia Research Center

Mark Callow
Chief Architect
callow_mark@hicorp.co.jp
HI Corporation

Abstract: Mobile phone handsets are fast becoming personal computing platforms and offer exciting new opportunities for graphics applications. They present the largest ever market opportunity for the graphics industry. Handset shipments are an order of magnitude larger than PC shipments. Not surprisingly they come with significant limitations compared to traditional desktop environments. This course presents two 3D graphics APIs that address the special needs and constraints of mobile platforms and have become dominant in that space: OpenGL ES and M3G. OpenGL ES 1.1 is a lightweight version of the well-known workstation standard, offering a subset of OpenGL 1.5 capability plus support for fixed point arithmetic. OpenGL ES 2.0 brings programmable shaders into mobile devices. M3G, Mobile 3D Graphics API for Java Micro Edition augments the low-level rendering capabilities of OpenGL ES with scene graph, animation, and file format support to facilitate content production with popular tools such as Max or Maya. The second generation M3G 2.0 (still being standardized) introduces shaders to mobile Java. These APIs provide powerful graphics capabilities in a form that fits well on today's devices, both with and without a hardware floating point unit and a graphics hardware accelerator. We begin the course with a discussion of the target environments and their limitations, and general techniques for coping with these (such as fixed-point arithmetic). We continue with detailed descriptions of the functionality of OpenGL ES 1.1, 2.0, and M3G 1.1, comparing to related desktop standards as necessary and explaining what was left out and why. We will show how to use the APIs in practical examples and will provide advice on how to extract the best performance from each API and how to deal with the challenges inherent in deploying applications in the mobile space. We conclude with a description of the forthcoming M3G 2.0 standard.



Tutorial: Mobile 3D Graphics

Kari Pulli has been an active contributor in both OpenGL ES and M3G standardization groups. Kari is a Research Fellow at Nokia Research Center Palo Alto. Before joining Nokia in 1999, Kari worked on graphics at Microsoft, SGI, and Alias|Wavefront, obtained a PhD at University of Washington in graphics in 1997, and was the technical head of the Digital Michelangelo project at Stanford Graphics Lab in 1998-99. 2000-04 Kari taught Computer Graphics at University of Oulu. During 2004-06 Kari was a Visiting Scientist at MIT CSAIL Computer Graphics Group. Kari is a member of the Eurographics Executive Committee.

Jani Vaarala is a Graphics Architect at Nokia. He has been actively involved with OpenGL ES standardization, and headed a project that developed a SW OpenGL ES engine and adapted EGL for Symbian OS. Jani started on 3D graphics in early 90's on an Amiga, on which he developed several award-winning graphics demos. Jani is a member of ACM Siggraph, Eurographics, and the Khronos Group.

Ville Miettinen was until recently the CTO and co-founder of Hybrid Graphics, Ltd, which was merged into NVidia, now Ville works on his own projects. During the last decade he has been involved in the design and implementation of numerous software products in the games and 3D graphics industries. His research interests include dynamic code generation and software rasterizers, and he has authored conference and journal papers on graphics hardware and visibility optimization. He is a member of ACM SIGGRAPH, the Khronos Group and the JSR-184 expert group.

Robert Simpson has worked in the graphics industry for 11 years and is currently a Graphics Architect at AMD. His principle areas of interest are instruction set architectures, compilers and graphics algorithms. He represents AMD in the Khronos standardization group and is the specification editor for GLSL.ES. Prior to that he worked at Inmos and STMicroelectronics in the UK where he was a lead designer in the development of parallel processor architectures, data communications and graphics hardware. He holds over 10 patents in cpu design, communication protocols, VLSI design and graphics. He gained an MA in Physics from Oxford University.

Tomi Aarnio is the specification lead and editor of the M3G standard (JSR-184, 297). As a Senior Research Engineer at Nokia, he has been involved in designing and implementing several mobile graphics engines, most recently heading the implementation of M3G. His research interests include real time rendering, data compression, and hardware abstraction. He is a member of ACM SIGGRAPH, Eurographics, and the Khronos Group.

Mark Callow is Chief Architect at HI Corporation. He led the international team who created HI's M3G and OpenGL®ES implementations and continues to be involved in the design and development of embedded 3D graphics engines Mark has been an active contributor to both OpenGL ES & M3G standardization groups since their inception Prior to HI, Mark was with Silicon Graphics for 11 years where he developed many innovative graphics and digital media related products. He previously taught several well-received Siggraph courses and is a member of ACM, ACM Siggraph and the IET.