

The Present and Future of Real-Time Graphics in Film

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ABSTRACT

The movie frames we see when watching films today are typically generated using an offline renderer, which could take multiple hours per frame to produce. This time-consuming process makes previewing content difficult, so creators have worked around this issue by utilizing real-time graphics to iterate their content more efficiently. While real-time graphics could be used for previewing, the level of quality had not yet reached the standards needed for a final movie frame. However, over the years, the previews generated by real-time graphics have gotten more refined and have even enabled pre-visualizations using virtual reality. This provides even more context to creative minds. In addition to the ever growing use of real-time graphics, the quality of technology has improved, potentially allowing for the generation of final frames, that can start to look like a movie.

This panel will bring together engineers, artists and executives representing various areas of expertise to provide information about how real-time graphics are being used in multiple studios today. They will also describe some of their challenges and how they foresee the future of real-time graphics in film.

CCS CONCEPTS

• **Computing methodologies** → **Rendering**;

KEYWORDS

rendering, renderers, real-time, software, open source, graphics

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1 PARTICIPANTS

Kim Libreri is the Chief Technology Officer of Epic Games, he is responsible for continuing Epic's tradition of fusing state-of-the-art technology with the pinnacle of visual artistry, and for defining Epic's Unreal Engine as the platform of choice for games, movies,

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television, visualization, virtual reality and augmented reality. Previously, Kim led Lucasfilm's Star Wars technology strategy and innovations in interactive storytelling as Chief Strategy Officer. Kim has credits on more than 25 films including "Super 8", "Speed Racer", "Poseidon" and "The Matrix Trilogy," for which he helped develop Bullet Time technology.

Guido Quaroni joined Pixar in 1997. He held different roles in production as a Technical Director on Toy Story 2, Sequence Supervisor on Monsters, Inc. and as Supervising Technical Director on Toy Story 3 and Monsters University. In 2011 Guido was promoted V.P. of Software R&D, leading the team responsible for Pixar's in house CG software including the Academy Award Winning Presto Animation System.

Natalya Tatarchuk (@mirror2mask) is a graphics engineer and a rendering enthusiast. As the Director of Global Graphics at Unity Technologies, she is focusing on driving the state-of-the-art rendering technology and graphics performance for the Unity engine. Previously she was the Graphics Lead and an Engineering Architect at Bungie, working on innovative cross-platform rendering engine and game graphics for Bungie's Destiny franchise. Before moving into game development full-time, Natalya was a graphics software architect and a lead in the Game Computing Application Group at AMD Graphics Products Group (Office of the CTO) where she pushed parallel computing boundaries investigating advanced real-time graphics techniques. Natalya has been encouraging sharing in the games graphics community for several decades, largely by organizing a popular series of courses such as Advances in Real-time Rendering and the Open Problems in Real-Time Rendering at SIGGRAPH. She has also published papers and articles at various computer graphics conferences and technical book series, and has presented her work at graphics and game developer conferences worldwide. Natalya holds an M.S. in Computer Science from Harvard University with a focus in Computer Graphics and B.A. degrees in Mathematics and Computer Science from Boston University.

Damien Fagnou has been part of the VFX industry for almost 20 years, he spent a large portion of his professional career with MPC where he worked in various area, including Software, Stereo, VFX Operations and most recently was their Chief Technology Officer. In his current role at Technicolor Production Services as Senior Vice President for Technology and Infrastructure he oversees Technology for the PS Technicolor Brand like MPC Film, The Mill, Mr.X and Mikros Images and more.

Pol Jeremias-Vila (@poljeremias) is a Lead Graphics Engineer at Pixar Animation Studios where he develops Hydra, Pixar's real-time renderer. He is credited in multiple movies including Coco

and Finding Dory, and he has worked in rendering technology for multiple games including Star Wars 1313. Pol is also the co-founder of Shadertoy.com, a website that enables graphics enthusiasts to create and share rendering knowledge. Since 2012, he's been actively involved with SIGGRAPH, directing the Computer Animation Festival, Real-Time Live!, and more recently the Virtual, Augmented and Mixed Reality program. He holds a Master's degree in Computer Science from the University of Southern California.

2 SAMPLE QUESTIONS

- What are the challenges of real-time graphics? How do they differ from off-line graphics?
- What aspects of your pipeline use real-time graphics?
- What advantages or disadvantages do you experience when using real-time solutions for final frame?
- What are the challenges of creating content for real-time playback?
- Do audiences have a desire to see real-time playback?
- How far can we push rasterization for film frame? And, how far can we push path tracing to be more interactive?
- How can hybrid (rasterization/path tracing) pipelines help movie making?
- Do you see foresee any breakthroughs in technology that will drastically improve rasterization or path-tracing in the upcoming years?
- In what areas of filmmaking do you see real-time graphics being used in the next 5 years?