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TITLE

Production Workflow and Storage Challenges for Interactive Cinematic Virtual Reality

ABSTRACT

Today, digital post production workflows incorporating Computer Graphics (CG) effects into live action captured footage have for the most part taken a 2D perspective. Consequently, proper integration has required a complicated and laborious process involving a range of compositing techniques including: green screens, rotoscoping, masking, matting, keying, match moving / camera tracking, vignettes, etc. Furthermore, emerging 360 degree videos on YouTube and other websites have been enabled by a number of new 360 degree cameras entering the market, including the Jaunt NEO, the Nokia OZO and the 360 Designs EYE. These cameras "stitch" together the individual video streams resulting in a 3D VR panorama. A key limitation of these 360 degree cameras is the single fixed position for their 360 degree views. Practically, this means that the viewer may rotate their head, but cannot translate their position.

Alternatively, a volumetric light field and cameras which directly support them such as the Lytro Immerge, capture the incoming direction of light entering the camera in addition to the light's color and intensity. Light fields allow one to view a scene from a variety of different view points and directions. As an added benefit, computed depth information can be utilized in a separate compositing process to allow the proper integration of captured live action video with CG effects. Subsequently, live action light field footage can be used to enable a number of techniques including: interactive relighting, scene re-construction, performance capture, and multi-view output. Unfortunately, a major impediment during capture and editing of both 360 degree and light field footage is the dramatically increased storage requirements.

Aclectic is currently focused on next generation data centers with the goal of dramatically reducing the time to solution of core production technologies such as physically-based visual effects and rendering for "block-buster" films. We believe light fields and solutions utilizing light field processing will be a key enabling technology for future productions. Aclectic is developing a complete pipeline solution for these emerging 3D production experiences using a custom plug-in to Side Effects Software's Houdini visual effects system. Our Houdini plug-in drives a physically-based simulation engine (ColossusTM) and a physically-based volume rendering engine (EnthalpyTM) which run on our custom server appliance (PolymathTM). We are also building a custom viewer and an OpenVDB (a volumetric storage format from Dreamworks) implementation based on persistent memory.

This panel presentation will start by exploring the need for innovations in the post production workflow. Various approaches to live action content capture and display for emerging productions illustrating how light fields will serve as a key enabler will be discussed. Existing content creation pipelines and tools for high quality CG and physically based visual effects will also be presented with an emphasis on how we expect them to evolve to support future productions. Next we will demonstrate our current production pipeline and illustrate how we leveraged persistent memory and in particular the pmem.io libraries in our various software prototypes. We will conclude with our views on the convergence of live action, CG visual effects, computer games, and VR, outlining the implications on storage and bandwidth.

BIOGRAPHY

Yahya H. Mirza is the founder of Aclectic Systems Inc. his original background was aeronautical engineering, and he was initially employed by Battelle Research Labs. His experience at NASA Ames in 1989 simulating the hypersonic aerodynamics of Waveriders brought him to the realization that there was a need for integrated software tools that leveraged distributed supercomputing and enabled creative exploration utilizing a combination of procedural techniques, multi-physics simulation and domain specific languages. Yahya's initial exposure to VR was on a late night walk in the halls at NASA Ames in 1989, when he received a serendipitous demo of an early VR head mounted display visualizing fluid flow over an aircraft wing. Subsequently in 1995, Yahya worked on a 3D volume visualization leveraging the UIUC Virtual Reality Cave, for the Computational Electronics Group at the Beckman Institute. Through is separate start-up attempts towards realizing his vision, over the years, Yahya has bootstrapped his companies by working on system software projects for Spatial Technologies, Microsoft, CatDaddy Games, Source Dynamics, Pixar Animation Studios, Small Machines Inc. and most recently Xilinx. Yahya's interest in feature film production is motivated by his life-long passion for the creative process.