Parallel IO for Simulation Based Visual Effects and Light Field Based Virtual Reality Productions

Yahya H. Mirza
CEO/CTO
Aclectic Systems Inc.
yahya@aclectic.com

Abstract

In the past, feature film productions have always motivated major jumps in technology to achieve the film maker's artistic visions. This has been the case from movies such as the original King Kong, 2001: A Space Odyssey, Star Wars, Lord of the Rings and Avatar. For the past 30 years, feature films have attempted to bring the audience into the theatres via advancements such as color, surround sound, 3D, and more recently multiple screens in a single theatre via Barco's Escape. Today there is a great excitement in increasing the immersion of virtual reality productions using real-time computer generated content, offline rendered content, captured content, and their combinations.

Volumetric light fields, and cameras which directly support them, such as the Lytro Cinema and Immerge, explicitly enable the computation of depth information, allowing one to view a scene from a variety of different viewpoints and directions. As an added benefit, depth information can be utilized in a separate compositing process to allow the proper integration of captured live action video with CG imagery. A major impediment during content creation and editing of these productions is the dramatically increased storage requirements due to storage of the light field data and the aggregate camera video streams.

Colossus™ and Enthalpy™ are visual effects tools developed by Aclectic for the visual simulation and light field rendering of smoke, fire, water, etc. These tools are being designed to leverage Aclectic's parallel IO efforts. To explore the performance of our solution, Aclectic has built a "systems-oriented" performance analysis, measurement and visualization tool we call InterScopiX™. Our motivation is to systematically explore the performance implications of the various components of our solution against an application baseline. We have been implementing our solution on an Intel cluster comprising Intel Xeon CPUs, Xeon Phi Knights Landing CPUs, 3D XPoint / 3D NAND based NVMe SSDs and an Omni-Path interconnect.

This presentation will overview our test cluster, emphasizing 3D XPoint / 3D NAND based NVMe SSDs and the Omni-Path interconnect. Next we will discuss workflows for Aclectic's use case of simulation based visual effects and light fields. A test shot made using an instrumented version of Aclectic's Colossus™ and Enthalpy™ tools will be demonstrated. Aclectic's InterScopiX™ tool will be used to illustrate our performance. Throughout this presentation, the rationale, implementation experience, and performance of our parallel IO efforts will be illustrated.

Biography

Yahya H. Mirza's original background was aeronautical engineering, specializing in hypersonic aircraft design and scramjet propulsion. Yahya was initially employed by Battelle Research Labs. His experience at NASA Ames in 1989, simulating the hypersonic aerodynamics of Waveriders on the Cray-YMP, brought him to an important realization. A clear need exists for integrated software tools that enable creative exploration, utilizing a combination of procedural techniques, physical simulation and domain specific languages. To pursue this direction, through his first start-up in 1991, Yahya initiated a cooperative research and development agreement with Wright Patterson Air Force Base. This experience was followed by nearly four years as a visiting researcher in the UIUC Smalltalk Research Group. Through his follow on start-up attempts, Yahya has worked on system software or 3D simulation / graphics based application software projects for Spatial Technologies, Microsoft, Cat Daddy Games, Source Dynamics, Pixar Animation Studios, Small Machines Inc. and Xilinx. Yahya's interest in feature film production is motivated by his life-long passion for the creative process which he pursues through his original acoustic guitar and piano compositions.