



The Computerworld Honors Program

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Final Copy of Case Study

LOCATION:
New York, NY, US

ORGANIZATION:
The Foundry Visionmongers Ltd

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ORGANIZATION URL:
<http://www.thefoundry.co.uk>

STATUS:
Laureate

PROJECT NAME:
Nuke

CATEGORY:
*Business
Responsiveness*

PROJECT OVERVIEW

Nuke is an AMPAS Sci-Tech® Technical Academy-Award winning application used to create visual effects for feature films, commercials, television, web and games. Nuke is a "compositing" application, used to combine digitised image sequences and geometric models to make stunning visual effects. These effects can range from the invisible, such as removing an airplane intruding into the background of a period drama, to the overwhelming, such as space battles with massive explosions in a science fiction epic. Nuke is today the de-facto standard application for feature-film visual effects compositing. Compositing involves taking image sequences, such as live action shots and computer generated imagery, and applying a wide variety of processing operations to make a convincing end result. Nuke does this by allowing arbitrary and complex inter-connections of a wide range of image and geometry operators. Nuke allows its images not only to have the obvious 'Red Green Blue' components, but also hundreds of additional components as users require them. These can be used to hold valuable information such as scene depth, motion estimation, or highlights on CGI objects. These extra components add hugely to the flexibility and power of Nuke, allowing it to easily accommodate complex processes, such as modifying lighting in expensively-computed CGI scenes. Nuke allows users to deeply and easily customize the application, both to fit in with their own workflow, and to allow them to rapidly add new capabilities. This radical level of openness is a major feature for an application in this domain and is vital to professional users. Nuke extends compositing into the third dimension, mixing flat images and a three-dimensional virtual objects. This workflow allows you to process images in 2D, apply them to 3D objects, render those into 2D images again, and so on - all in one application. This innovative mixed 2D/3D workflow makes some ordinarily very difficult shots much simpler. For example, in the film "The Mummy: Tomb Of The Dragon Emperor", Nuke was used this way to create an effect where the actor Jet Li spews forth mud. The creators of the film had been finding this sequence horrendously difficult before Nuke was used in this way. Nuke also has an innovative stereoscopic-3D workflow, used to assist the creation of effects in

the new generation of groundbreaking films such as "Avatar" and 'Tron: Legacy'. Compositing such material is more challenging than 2D as twice as much data needs to be handled, and any effect that is performed on one eye needs to be accurately created in the other eye, but compensated for parallax. Nuke is the only compositing tool that handles this natively. The Foundry also created Ocula - a specialist toolset for Nuke - designed to correct problems encountered in live action stereoscopic-3D film making. Ocula uses innovative algorithms from The Foundry's in-house research team to solve problems such as camera mis-alignment and colour differences between camera views. These issues bedevil modern productions and, if not addressed, undermine the quality of the viewing experience.

SOCIETAL BENEFITS

The best story tellers help us by not only entertaining us, but by showing us other ways of looking at the world and opening our minds. Nuke benefits society by allowing people who tell stories with moving images to tell more beautiful and convincing stories than they otherwise could.

PROJECT BENEFIT EXAMPLE

James Cameron's Academy Award winning motion picture, Avatar 3D, had a massive 2,500 visual effects shots. Each frame was in stereoscopic-3D, which meant shooting live action with two cameras, or creating left and right views when rendering computer generated imagery. Much of VFX work was carried out by a Weta Digital in Wellington, Industrial Light and Magic (ILM) in San Francisco and Framestore in London. They all used Nuke and Ocula to composite and correct problems with the live action stereo shoots. Appendix 1 shows a still from Avatar, with the raw live action on the right, with the result of a complex composite and correction on the left. Erik Winqvist, compositing supervisor at Weta: "The Ocula plug-ins for Nuke became an impressive and invaluable toolset for us on Avatar. I wouldn't want to dive into another stereo show without them in the arsenal." Framestore's Christian Kaestner: "Speed and flexibility in VFX post is paramount. Nuke is simply incredibly fast and interactive, even in complex composites with several hundred operations. The interactivity the artist gets from Nuke out of the box is impressive. The flexibility Nuke brings to the table might even be a more powerful key point - not only for the artist, but also for the pipeline team." ILM's VFX supervisor John Knoll on Nuke: "Nuke was an essential tool for us on Avatar. With such a challenging schedule the integrated stereo toolset and the thorough multi-processing support brought the productivity level of our compositors to new heights." Sony Pictures Imageworks (SPI) in Los Angeles did much of the visual effects on Tim Burton's Alice in Wonderland. In this re-imagining of Lewis Carroll's work, visual effects were used to create The Red Queen's over-proportioned head (Appendix 2), Alice's changing size, and the Hatter's large eyes. To do this, actors would be filmed against a green screen (Appendix 3) and later digitally manipulated by Nuke and other applications. Unusually, Nuke was used on set to preview the visual effects, so that the director could see during filming that he would later get the results he needed. Nuke's speed and flexibility was essential in allowing Carey Villegas, VFX Supervisor at SPI, to do this. According to Villegas, "I was able to do the Red Queen's head, Alice scale, and Hatter eye tests on-location where I could consult with Tim Burton and DOP, Dariusz Wolski. It was very easy with Nuke." This was done using the scriptability of Nuke, ultimately allowing the effect to be driven by a simple dial-able scale factor. According to Villegas, "I created a gizmo in Nuke to ease this process. To see a variation, we could just change the percentage in Nuke and it would automatically down-res the 4K and re-align the Red Queen's head to her scaled down body. It was a crude iteration, but it really helped. We probably tried hundreds of experiments early on before we settled on how big the head should be."



IS THIS PROJECT AN INNOVATION, BEST PRACTICE? Yes

ADDITIONAL PROJECT INFORMATION

Nuke was initially developed as an in-house proprietary tool at the post production company Digital Domain. The Foundry acquired Nuke in 2007 and has put significant resources into expanding and improving it to create a stable and commercially viable application. A few examples include things adding stereo workflow, opening it up with scripting capabilities and improving the user interface. Ocula was developed solely by the Foundry, with development beginning in 2007.