Hands on high-tech moviemaking (w/ Video)

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60 hp hydraulic motion controlled winches are used to manipulate the mounted camera for capturing stunts and special effects. The winches work in unison to help "fly" objects around a defined area of space. Credit: Courtesy of Cablecam

"Lights, camera, action!" is more than the quintessential phrase that describes the moment filming begins on a movie set -- it also embodies the heart and soul of moviemaking.

The science and engineering used in moviemaking is usually behind the scenes but during this year's Academy of Motion Picture Arts and Sciences Scientific and Technical awards hosted by Marisa Tomei on Saturday, Feb 12, the 23 nominees winning 11 awards are the stars of the show.

Lights -- Bounce Light For Global Illumination

Astute observers sitting down to a marathon of the Shrek films might notice differences between the lighting of Shrek, the Ogre swamp, or even Shrek's dining room table between the first and second films.

"In the past, we would place virtual light sources all over the scene, but light would only come from the source," said Eric Tabellion, a computer scientist who is part of the Research and Development staff at PDI/Dreamworks. "In real life, light bounces off of surfaces and illuminates objects indirectly."

As a result, Tabellion and his colleague, Arnauld Lamorlette, have created a methodology to produce realistic "bounce lighting" to improve the global illumination -- techniques that light up everything in an animated scene. It has become an industry standard.

"If you tried to make an animated film without global illumination, it would look bad," said Tabellion. "Lighting has been my passion for a long time and 'Shrek 2' was the first film that we used the bounce lighting methodology in an entire film."

Camera -- Cablecam 3D

"Beauty shots" at the beginning of a movie really help set the scene. In these images, you may see, for instance, wide-sweeping views that show a pink and orange sunset behind a sandy beach or every metallic inch of a futuristic space ship. These shots are often difficult to film.

"We put cameras where you normally can't," said Nic Salomon, President of Cablecam Inc. "The Cablecam 3D allows you to get great shots where others can't get them."
The Cablecam 3D technology consists of a camera that is suspended over a set using a rope and pulley system, while customized winches allow the camera to move in three dimensions. This allows for a bird's

eye view while moving freely within the scene -- perhaps most recognizable from its use in sports telecasts -- giving an overhead view of the action.

"We do a lot of beauty shots," said Salomon. "Most notably the train scene in 'Wanted' (where the train is going over a bridge between two mountain passes and peels off the track) people ask me all the time how we filmed across the train tracks."

Action -- NAC Servo Winch System For Special Effects

Even in the movies it is tricky to move large, heavy objects, but when special effects experts can, it's a scene you'll never forget.

"When we were working on 'Spider-man 3,' John Frazier, the special effects supervisor, wanted to make a taxi cab fly," said Mark Noel, President of NAC Effects and Prop Animation. "We had created a complicated system for 'Spiderman-2' and decided to start over and make it simpler -- we added brakes, digital electronics and a Waldo innovation."

Waldo looks like a wireless marionette controller. The puppet is strung up to wires, but you are across the room making it dance. Now, instead imagine an entire taxi cab connected to two bars -- one across the two front wheels and one across the back two -- and wires strung from the bars.

"Simplicity and safety are really important because it is fairly stressful – you are flying actors 20-30 feet in the air," said Noel. "This work is really hands-on and personal, I hate when they tell me that they'll do [additional effects like] the shaking in post-production because I wanted

to do the shaking!"

Behind The Scenes -- Helping Animation & Special Effects Artists Work Efficiently

While working on an animated film, artists have to generate everything from the weather in the scene to the characters themselves. Each part is often dependent on the next and with an entire network of computers trying to generate characters and scenery as fast as possible, having step B ready before step A can be frustrating and cause delays.

"Alfred is a scriptable system for distributing computational tasks around a network of computers," said David Laur, an engineer who is now the senior software engineer for the RenderMan Group at Pixar. "It was intended to present a useful and practical interface to technical artists in the film industry, giving them control over their jobs and providing feedback about the job and system status."

The system organizes the jobs that need to be done by the computer's availability and the order of operation for jobs that are dependent on one another. Many movies, including "Finding Nemo" and "The Incredibles" were all made using this system.

"The behind-the-scenes aspects of these films are hands-on and personal," said Laur. "I am in awe and appreciate the talent and creativity of the artists and technical directors at these studios."

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