SPECIAL VISUAL EFFECTS

THE HOBBIT
AN UNEXPECTED JOURNEY

48 FRAMES PER SECOND STEREO – Creating special visual effects for a film at 48fps in stereo meant not just doubling the amount of data, it meant re-learning some of the core techniques of visual effects. For instance, animators had the luxury of more frames but had to learn how to use them to convey the movement smoothly over twice the number of frames and account for the change in motion blur. Also, the visual fidelity of everything had to be that much sharper.



SLAVE MOTION CONTROL CAMERA – Forced perspective was not a viable option in stereo, particularly at 48fps. In order to account for the scale difference we needed to create between the actors, we developed a new camera technique called Slave Mocon.

Two stages were set up adjacent to each other on a sound stage with a master camera driving a slave camera to get identical movements but at two-thirds the scale. These two camera takes were then composited together to allow for intricate interactions between characters of different scales and a more elegant solution to keep the framing tight and final composition tight.



PERFORMANCE CAPTURE ANIMATION – Evolution in motion capture technology enabled Andy Serkis to be captured onset acting in the take with Martin Freeman in their pivotal two-character drama at the center of the film. The incredible live performance given by Andy was then translated by animators and delivered with more nuance and detail than ever before. Advancements to the muscle system, shaders and technology used for the eyes provided the detail and believability in Gollum that matched the power of Andy's performance.



CREATURES GREAT AND SMALL – The Hobbit is populated by the fantastic array of digital creatures that help bring Tolkien's stories to life. The hideous Goblin King and the fearsome pale orc Azog are the central villains of the film. Both are entirely digital and were executed using a combination of motion capture and key-frame animation.



The majestic beauty of the giant Eagles, imposing scale of the Stone Giants and the surprising humor of the Trolls provide high–impact supporting roles in the film.

Thousands of digital goblins, a dozen giant bunnies, a melodramatic hedgehog, spiders, mice and dog-like wargs are woven throughout Bilbo's journey along with glimpses of the fearsome dragon Smaug.



EXPANSIVE ENVIRONMENTS – The Middle-earth of The Hobbit is one of epic beauty and terrible darkness. Many of the film's breathtaking environments were entirely CG or elaborate set extensions. The massive expanse of the goblin caverns, Rivendell and Erebor are all extensively modeled and invested with incredible detail. The unique geometric opulence of Erebor is contrasted with the fetid worn rock tunnels and rotted planks of the goblin caverns. Majestic Rivendell includes dozens of full simulation waterfalls interacting naturally with the 3D terrain and highlighted in many stages of day and night.



PHYSICALLY-BASED EFFECTS – New simulation tools were developed to handle the fire in The Hobbit including the napalm-like dragon fire in the prologue, the torches in the goblin cavern and the fire that frames the climactic forest showdown at the end of the film.



We used our in-house simulation framework, Synapse, to combine multiple simulations to direct the intensity and directionality of the flames as well as add realistic smoke and combine them in a single simulation solve. The destruction of Dale and the epic thunder battle between the crumbling Stone Giants required extensive destruction simulation.



The Stone Giants had at least five different simulations going at all times to account for the cracking, crumbling, dust and debris required for their every movement. Adding volumetric clouds, CG rain and simulated lighting strikes, the Stone Giants sequence alone required extensive use of rigid body and fluid dynamics.

DIGI-DOUBLES – In many cases the hero characters were tightly intermixed with CG characters as they were in the Goblin Caverns or performing actions that were not safe for the actors. In these instances we were able to transition to a digital version of our heroes, The Hobbit makes use of an unprecedented number of digi-doubles. We have advanced the quality of our digital doubles to the point where they can hold up to close scrutiny even while passing right in front of camera in a close-up.



LUMBERJACK – Many of the environments required CG forests that could be built quickly into a scene but be flexible enough to be altered easily by the artist. New tree growth software called Lumberjack was created to accomplish this task. Lumberjack allows the artists to specify a tree type and simulate its growth based on controlling its available natural resources (such as sunlight, water and oxygen).



The artists can grow the tree by adjusting the tree's timeline and even prune limbs to force the tree to compensate its growth naturally. This means the tree grows in a realistic manner for the environment and has the combination symmetry and randomness you see in nature. All Lumberjack trees are pre-rigged for wind-based movement and other dynamic effects.

CROWDS AND EXTRAS - In some of the large scenes we used a combination of Massive for intelligent procedural crowds and a new piece of software called Facemixer. As an example, Facemixer allowed us to create 13 hero goblins and identify 32 different feature variants that we could mix and combine based on anatomical matching. We created hundreds of unique goblins, all with their own look and characteristics.

