

Digital Stunt Doubles: Safety Through Numbers

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Our company has been researching the creation of computer-generated actors, or Synthespians (TM) as we call them, since 1985. Diana Walczak, a partner in the company, sculpted human figures and faces that were digitized and animated for several experimental films shown at SIGGRAPH: SEXTONE FOR PRESIDENT (1988) and DON'T TOUCH ME (1989). As rendering algorithms relentlessly approach photo-realism, the ability to create life-like characters becomes a realistic and cost-effective prospect. The level of detail required to create a convincingly realistic person varies directly as a function of the distance of the person to the camera; a distant figure can be made to look realistic with a fraction of the effort required to render a convincing close-up. "Acting," in the pure sense of the word, requires the camera to be at least in the proximity of a two-shot, and the industry is on the verge of this capability, although it is extremely complex and costly to produce. An interim application of computer-generated characters lies in the representation of distant humans performing motion that is inconvenient or impossible to perform by a live stunt person. Digital Stunt Doubles have recently been used in a variety of applications to substitute for stunt people in the interest of safety, cost, or simply because the stunt would be impossible to accomplish with a live human being.

This panel session is intended to give four industry experts an opportunity to show some of the applications they have found for this technology in recent feature films, and to discuss the timetable for computer graphics as an industry to move up to the next level: from life-like digital stunt doubles to lifelike digital actors.

Frank Vitz

At Kleiser Walczak Construction Company we have been working in the area of computer generated actors for many years. We coined the term "Synthespian" to describe these synthetic actors. We have created a variety of Synthespians... some human, some exotic, some realistic, some fantastic. But it is only relatively recently that our technology has improved to the point where we can now create Synthespians at feature film resolution that are indistinguishable in certain cases from real human actors... Synthespians that can act as Digital Stunt Doubles. The movie "Judge Dredd," starring Sylvester Stallone, was one project that provided us with an opportunity to develop the realistic character animation techniques necessary for Digital Stunt Doubles. The screenplay called for a large number of digital effects shots, including realistic vehicles, explosions, weapons effects, and most exciting: an extended aerial chase sequence through the streets of a futuristic city on flying motorcycles! The Lawmaster Sequence, as it was called, would involve impossibly fast flybys, aerial maneuvers, and stunts . . . all to be seamlessly matted into model city backgrounds. This was a perfect place to use Digital Stunt Doubles. The sequence was divided into two types of shots, Live Actor and Digital Stunt Double shots. The live shots were typically those that involved closeups of the actors speaking, while the Stunt Double shots had difficult camera angles, extreme action, explosions, and so forth. We created digital stunt double versions of two actors, faithfully reproducing their facial features, body proportions, and costumes. We created CGI versions of the Lawmaster Motorcycles that matched the live stunt bikes. We choreographed the motion of the digital bikes to fit into model photography of Mega City. We animated the Stunt Doubles to move realistically on their bikes. We added a variety of additional digital effects, such as explosions, smoke, lens flares, and motion blur to make the illusion more convincing.

In this panel discussion I hope to share some of the details of what we went through during the creation of these Digital Stunt Doubles for "Judge Dredd." We learned a lot during the process, and have some new ideas as a result... ideas that are finding expression in our current

projects. The future of computer-generated actors is wide open. I am looking forward to sharing with the other panel members some speculation about where we might be headed.

Jeff Light

As film effects are driven to dizzying heights of more intense action and to create more amazing fantasy, the pressure to create convincing digital stunt doubles is increasing, and the technology to make it possible is becoming more readily available. The use of puppets, dummies, or stunt-persons as stunt doubles has been practiced since the beginning of movie making. Digital stunt doubles are simply the logical extension of this idea.

The need for digital stunt doubles is driven by a number of factors. The performance may be too dangerous or impossible for an actor. A shot that requires thousands of extras may be too expensive to shoot with modern financial constraints. Some scenes may already be composed of sufficiently complex synthetic imagery, such that it is simply *easier* to composite a digital character interacting with other elements in a scene. There are daunting obstacles to overcome in the process of creating a digital stunt double. Primarily, it should not call attention to the fact that it's an effect. The modeling, animation, and rendering must blend seamlessly with surrounding shots. Often, the switch between live action and the CG double will happen *during* the shot, when the audience is focusing their full attention on the character that is being switched! Modeling and rendering hair, skin, and cloth remain difficult obstacles to imitating the look of the original performer. Animating the subtleties of *real* human or animal motion is highly complex. Motion capture or procedural animation approaches may provide partial answers, but are not a panacea.

Since the drive to create an increasing amount of a performance with a digital character is inexorable, the implications of not simply supplanting but actually replacing actors, living or dead, raises important artistic and ethical issues, which I hope we can approach with wisdom.

Shahril Ibrahim

Digital doubles are perhaps the first use of virtual actors. They can be utilized in dangerous and risky situations, and can be used in short segments. The short amount of screen time reduces the complexity of modelling/animating and rendering of a complete human. Digital doubles also allow plasticity of the actor to achieve shots that would be otherwise impossible, for example facial and body morphs. Currently these doubles are produced by either imaging real humans and manipulating the digital information, or by painstakingly animating the humans with a combination of kinematics and dynamics. A hybrid approach is the use of motion capture to drive animated characters. It would be interesting if these animated characters could mimic their physical counterparts to achieve nuances and subtlety of motion.

As technology progresses and our understanding of human motions and behavior increases, these digital stunt doubles may move out of being just a double to being the star character. Some of this has already happened, as in the movie "Species."

Richard Chuang

In 1995, eight of the ten top box office grossing films were dominated by digital visual effects. Audiences flock to these special effects extravaganzas, and directors are increasingly willing to embrace digital techniques to enhance or replace traditional effects. One of the latest techniques to be explored in Hollywood is the use of digital stunt doubles in difficult or dangerous stunt sequences.

What is the difference between replacing a highly-paid actor with a stunt double, and having a performer's data captured digitally and used to create a digital stunt double? In both instances, production creatives are hoping to match the performance qualities of a principal actor without subjecting them to physically challenging or dangerous scenes. Digital stunt doubles provide certain advantages over human stunt doubles.

The digital stunt double can provide a greater degree of flexibility when shooting on a model or miniature set. It is time-consuming to track "witness points" for integration of live actors into model and miniature plates. A digital stunt double provides greater control over scale, motion, and lighting, and is more easily matched to the set.

Concurrently with the demand for action-heavy effects films, stunts are becoming increasingly dangerous and spectacular. Using a digital stunt double is advantageous when a particularly complex or dangerous stunt is required. Rather than placing talent in a dangerous situation, a stunt double can perform a set of movements that match the shot in a safe, controlled environment. The motion data is captured digitally and applied to a computer-generated model, which is based on the physical qualities of the principal actor. Once the raw motion is captured and applied to the model, it is refined to create a scene that would have been unsafe or impossible to shoot practically.

Digital stunt doubles offer directors greater flexibility in changing camera angles, lighting, timing, and even location without having to re-shoot the live action scene. However, a digital stunt double is only as good as the original data captured from human performance and the artistry of the CG animators who translate raw data into finished animation. In most cases, computer animation is not yet suited to creating realistic motion, complete with nuances of expression and gesture that are inherent in human performance. The amount of work it currently takes to perfect a digital character without motion capture data precludes many creative budgets. On the other hand, motion capture data is raw, and must be refined with hand-animation techniques to convey the unique qualities of an individual actor's performance. By combining motion capture data and computer animation, it is possible to get the best of both worlds: a realistic performance, plus the flexibility of being able to modify and adjust the scene in post.