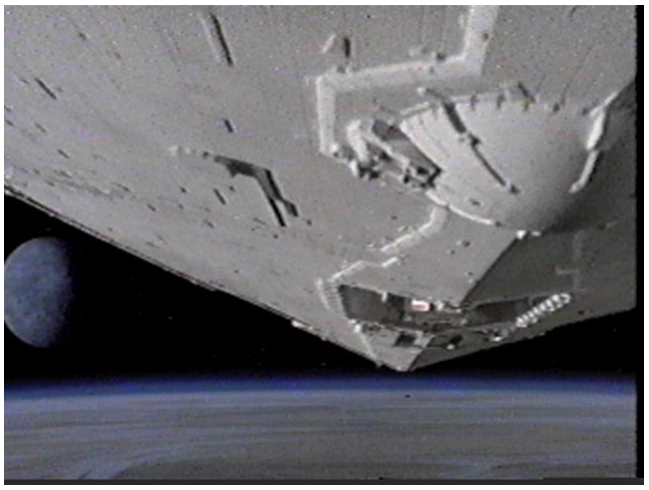
Sean Hilty
EECS 487
12-4-2006

Industrial Light & Magic:
Pioneering Computer Generated Visual Effects

Industrial Light & Magic (ILM) was founded in 1975 by George Lucas in order to generate the unprecedented special effects he envisioned for his move *Star Wars*. ILM pioneered computer generated visual effects and has become one of the top visual effects studios in the world. Through 2005, it has received 14 visual effects Oscars and 22 technical Oscars.

ILM began as a small group of college students, artists, and engineers brought together by John Dykstra, who had previously been an assistant on the special effects team for *2001: A Space Odyssey*.



Some of the initial work done by ILM on *Star Wars* did not use computers for image generation, but to create an effect called “motion control photography” where small cameras

moved along predefined paths around a large model. The ship shown in the image above was animated using this method. The motion control photography method required considerable programming on early computers in order to move the camera precisely. Today, the procedurally generated motion of a camera location and camera direction vector in three dimensions around computer generated models is used in almost all CG animation.

Industrial Light & Magic created the first completely computer-generated sequence called the "Genesis sequence" for the film *Star Trek II*, the first completely computer-generated character, the "stained glass man" in *Young Sherlock Holmes*, and the first completely computer generated 3D character, the pseudopod in *The Abyss*. A screenshot of the pseudopod is shown below.

With the ability to computer generate entire 3D characters, film has become a medium that can stretch the imagination by bringing all kinds of creatures to life. In

1993, ILM unveiled incredible digital dinosaur models for Steven Spielberg's *Jurassic Park*. ILM animators observed animals at zoos to create lifelike motions for the dinosaurs that followed their physiology and anatomy. Another breakthrough that allowed the realistic motions of the dinosaurs was a new technology termed "Dinosaur Input Devices," which were physical models which fed information into computers to allow computer models to be animated in the traditional style. The film's conclusion presented an amazing, fully digital fight between raptors and a tyrannosaurus rex created by ILM, shown below.

When George Lucas decided to revisit his *Star Wars* saga and create episodes I, II, and III, he turned to ILM for computer generated characters and character animation. One example of this is the CG character Yoda. In *Episode II*, Maya and SOFTIMAGE

software were used for much of the modeling and animation of Yoda. ILM developed proprietary facial animation software to streamline the animation of facial features. Animators could then adjust the position of facial features according to 11 key muscles, and the movement of hair on the model by moving control hairs that effect the hairs around them. A screenshot of Yoda's face in the animation software is shown on the next page.

Star Wars Episode III: Revenge of the Sith set the world record for the most visual effects used in a single film with 2,151 shots. Many of the environments and

backgrounds were computer generated, so the film was able to be shot entirely on sound stages at Fox Studios Australia.

ILM has contributed cutting edge computer generated visual effects to recent movies such as *Pirates of the Caribbean*, *The Chronicles of Narnia*, and has been working on the upcoming film, *The Transformers*. As Industrial Light & Magic develops new tools and as computational power continues to increase, ILM will certainly keep on pushing the boundaries of the capabilities computer generated animation and imagery.

Sources

http://www.ilm.com/inside_timeline.html

http://en.wikipedia.org/wiki/Industrial_Light_%26_Magic

http://en.wikipedia.org/wiki/Motion_control_photography

http://www.linuxjournal.com/node/6011/print