Case Analysis:

Compositing and Chroma Key Effects

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Abstract

The latter half of our class content in Information Technology and Creative Practice chronicles some of the most famous movies and production studios of our time, as well as the invention, application, and processes of film making through highly technical methods. Lucasfilm, Pixar, and Disney were known for inventing processes to achieve visual effects that had never been seen with such precision in films. Known broadly as "special effects," we can specify the technique of compositing as the simultaneous layering of images to create the visual illusion that all elements within the frame are in the same scene. This case study will explore the landmark achievements in film and video compositing, the process of, and a reflection on the use of this technology.

Processes

The origin of compositing images in movies can be traced back to Georges Méliès during his working years as a filmmaker in Paris, France from 1888 to 1923. Méliès was the subject of the recent movie *Hugo* (Scorcese, 2011) and his early short film *Un Homme de Tetes* (1898) is an example of the earliest film compositing technique.

Méliès used what is known as the "black background technique," where portions of an actor's body are covered in a black sack and filmed against a black background. A black obstruction such as painted cardboard covers the camera lens in a specific area so as to prevent light exposure against that area of film, and the scene is acted out. The cameraman would then rewind the film in the camera to a specific point and re-apply the cardboard obstruction to expose the previously unexposed area of film while simultaneously protecting the previous exposure. This could be repeated for every composite element desired in the scene.

In essence, part of an image is removed from the frame, combined with a replacement image by a process of layering, and finalized for the final illusion. This technique was the first step into motion picture image manipulation that would essentially keep the same principle even today**.**

A simpler process for compositing was developed during the same time period by Norman Dawn, in which an image such as a landscape or a building would be painted onto a pane of glass in front of the camera lens. This was dubbed a "glass shot." The action and artificial background could be captured in a single exposure, and costly filming locations could be substituted for more economic sets. Glass shots would also become known as "mattes," which remain a current part of the compositing process today, if only in a more advanced form.

Mattes became, and remain today, a necessity in compositing. They have taken the form of "bluescreen" or "greenscreen" and are used to impose and combine advanced images of two or more moving objects in a scene. These processes are necessary staples for almost every genre of television and film, but have paramount attention in science fiction and fantasy movies as well as practical applications such as the weather report on the news. This process is referred to as "chroma keying."

Chroma key process involves the removal of specific colors to eliminate unwanted imagery, thus the blue or green screen used as a matte behind actors or objects. Blue has been industry standard for decades, but replaced by green during the onset of digital technology since it is easier to light and not confused for sky colors by the algorithms of compositing software. The blue or green color can be removed and replaced by another image, such as a landscape, to represent a different setting or objects.

While simplification of the chroma key process via digital technology does expedite workflow and accessibility, it still cannot function without creative collaboration. Often large productions have separate departments and companies to bring together key elements of lighting, camera operation, location, talent, and post-production. Projects of very large or very small scales will require some amount of mutual understanding and planning between parties, and this is where the technology can best serve creative practices. The final product has the opportunity to shine with a professional approach to best practices, peer feedback, and positive environments.

Technologies

My research yielded two unexpected discoveries regarding technology relevant to the topic of compositing. While a process workflow can be mimicked and collaborative

relationships can be reformed outside of completed projects or movie studio systems, proprietary technology cannot.

Such was the case with Walt Disney Studios and Petro Vlahos, who was a technical innovator in the field of chroma key visuals and special effects. As an Engineering graduate from the University of California Berkeley, he was not satisfied with the current state of bluescreen productions.

Vlahos invented the "Sodium Vapor" process as an alternative. Actors would be lit normally and filmed against a white matte, while the white matte itself was lit with a sodium vapor light. Sodium vapor emits light at the specific wavelength of 589.3 nanometers. A camera was constructed that contained a prism in the lens to divert the sodium vapor light to a black and white reel of film while the rest of the visible light was captured by traditional color film. The black and white sodium vapor reel would create the matte needed in post-production compositing assembly.

The specialized camera containing a prism differentiated this process from the standard bluescreen process and yielded better results for the technology at the time. Only one camera of this type was ever made, and Disney owned it. As evidenced by *Mary Poppins* (1964) 1964 Academy Award for Best Special Effects, this gave them a competitive leverage in quality of chroma key effects in the 1960s and 70s, before Lucasfilm and other studios further developed bluescreen technology.

Lucasfilm implemented computerized controls for camera operation and film exposure during the production of *Star Wars* (1977) to aid filming objects for chroma key shots. Even then the process of replicating film and processing composites in post-production was done frame by frame. This was very arduous work. It was not until 1980 that Industrial Light and

Magic adapted the Anderson optical printer (purchased from Paramount in 1975) to quadruple the work load and use microprocessor controls to perform compositing images for *The Empire Strikes Back*. The quad optical printer was used on every ILM compositing project from then until 1993, which is a testament to the craft, sustainability, and photorealism of chroma key visuals in the analog film world.

In the digital age of video production we have left the photochemical world of film and optical printer post-productions in exchange for software. Yet, I find some perspective on what came before enlightening. It's too easy to take for granted over one hundred years of craft by opening up some matte layers in Adobe After Effects, in much the same way it is easy to overlook how Douglas Engelbart had to invent the mouse in order for After Effects to even exist.

The global impact of Adobe Systems since its inception in 1982 is the subject of another case study. I will summarize that Adobe Systems has gained enormous market share into the consumer, prosumer, and professional digital creative arts market. Between Adobe and their competitors (ex: Nuke, Autodesk, Motion) traditional analog compositing with optical printers is all but obsolete. Like any other software, Adobe strives to automate, simplify, or create a process; in the case of Adobe's digital compositing software After Effects, the process is digital video effects. As a user of After Effects, I can clearly see the relationship its user interface replicates when compared to the original processes previously discussed.

My research revealed to me that despite all of the advances in digital video compositing, and no matter how great the images produced may be, there is a stigma against its use. The preference is to use digital effects as little as possible and use practical effects instead. Perhaps this is because when a CGI image looks bad it ruins our suspension of disbelief. Perhaps an audience wants to feel like they have a measure of authenticity in visual objects, as if watching a

composite matte image of a model spaceship is better than watching a digital composite image of

a digital spaceship. Yet for all of the armchair historians who long for a golden age uncluttered

by visual effects, those are days that never were. Georges Méliès had black background

technique, and George Lucas has digital compositing, and the essence is the same: create an

illusion to suit the story.

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