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### Walt Disney Animation Studios

Since it was founded in the early 1920s, Walt Disney Animation Studios has brought magic into families' lives. Through their continuous improvements and creation of software systems, Disney has been able to create magical stories and change the way animation is viewed. Because of their numerous projects, cast members create new software and production technology which make their lives easier, and their movies more magical.

The software created by development teams focus on making certain aspects of animation more efficient. Each team is composed of different departments, usually the product development and character or lighting technical directors, which allows the software development to move quicker as engineers are constantly in contact with the character directors and artists to see what they need most out of the program. For example, the software "Tonic" was created by a group of software engineers to make hair animation more realistic and less time consuming. It was created for the movie *Moana*, where the title character's long, curly hair is down for a majority of the film, interacting with ocean breezes while sailing. Styling hair strands individually is impractical for every character in a movie. "Tonic" allows the developers to use "hierarchical volumes" to style a character's hairstyle, and then "populates those volumes with individual hair strands". The base of the hairstyle is created, allowing animators to use that time to make incremental edits to add detail and increase the speed of production.

Walt Disney Animation focuses on landscaping too. Once again, cast members had to create a new software for *Moana*. The movie presented multiple challenges due to the film's

environment. The majority of the film is set on the ocean, as Moana sails across the ocean to deliver the heart of Tahiti back to its home. The ocean is not an easy thing to recreate visually. It's unpredictable, violent, continuously changing color and varies depending on the lighting. To accurately capture the beauty and complexity of the ocean, "Water Caustics" was created by the production development and lightning teams at the studios. The software uses photon mapping to simulate light rays reflecting across the surface of water. The technique gives the ocean a natural look, but still allows the artists to keep control over the actual image. In the end, the final product is something the artist has control over, not just the result of photon mapping.

Walt Disney Animation's newest project focuses on holograms. The program was developed for their upcoming movie, *Wreck-it-Ralph 2: Ralph Breaks the Internet*, which will use holograms to show various elements of the internet, such as different websites, signs and characters. Some holograms can be seen in the trailer for the movie, which opens this November. Holograms, as a concept, are associated with science-fiction, like Star Wars or Star Trek. The holograms there seem out of place, slightly unsophisticated, but Disney's new hologram software has the ability to create the holograms to fit with the creative style of animation used in *Wreck-it-Ralph*. The holographic software allows the animators to create holographic objects, but without the "internal structure" of the hologram to be seen. This process was complete through the use of a new shader in the graphics system, that manipulates the light projected at the vertices. The new shader has the ability to create a glow around the edges of the objects, through manipulation of path-tracing frameworks, to create a hologram which isn't completely transparent. These holograms will hopefully be in constant interaction with Ralph and Vanellope in the movie. It will be interesting to see how the holograms will change when non-holographic characters touch them and how the holograms will interact with the surrounding environment, especially if the

buildings are not holographic, or just partially so. At risk of over advertising *Wreck-it-Ralph 2*, seeing the final rendition of the holographic software will truly be like seeing a work of technological art and innovation.

Walt Disney Animation Studios continuous to advance animation through their constant innovations. When the cast members see a problem during the creation of new films, they develop new systems to make their jobs easier. Their constant innovation and sharing of technology helps advance the world of all animated movies. Walt Disney Animation Studios share articles they've written about their personal advancements in graphics rendering and software engineering, allowing all animators to learn from them, and improve the industry as a whole. The studio's openness to improve is what makes their movies some of the most successful animated movies in the world, and one of the most consistently successful companies since their creation. Everyone has seen at least one Disney animated movie. Everyone can find something they like in a Disney movie: the characters, the storyline, the art style, or even their development style. No matter what draws a person to Disney, it is easy to admit there's magic in the company.

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