

Tangled

Choreographing Destruction: Art Directing a Dam Break

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1 Introduction

Much like the character animation in *Tangled*, the goal of the dam break sequence was to bring classic Disney 2D sensibilities to CG effects. Hand-drawn effects animation in films such as *Pinochio* and *Fantasia* served as inspiration. The water shapes drawn in these films were very stylized yet conveyed recognizable forms of nature (see e.g. figure 2). The concept was to emulate these shapes and then enhance them with the modern benefits of CG rendering such as ray traced reflections and ambient occlusion. We developed processes that allowed the combination of physical simulations, articulate sculpting of form and specific manipulation of timing.

2 Fast Exploration

The design process for this sequence began with a close collaboration with the layout team. An effects animator was tasked with providing animatics containing rough fluid simulations to establish timing and scale. Fast turnarounds of a few days per pass gave the directors the ability to play with the sequence freely. Early visualization of potential problems, creative opportunities, and even additional shots were born out of this collaboration. One such example is the “ride film” style shot that gives the audience the feeling of plunging down the flooded cavern.

3 Simulation and Sculpting

A particle level set liquid simulator created initial shapes and particle passes. Using the animatic as a base, high resolution simulations were run that matched the established timing (see figure 1). Remapping the timing of the simulation gave the artist complete control over anticipation, energy, and scale. In some instances, several simulations were run separately and merged together before building the outer surface of the water so that very specific beats could be hit on exact frames. Shapes were then refined using Houdini’s procedural deformation tools to enhance the form. This allowed the team to further art direct the simulation by sculpting the fluid into the desired shapes. Additional foam and spray particle elements were layered to add realism and stylization.

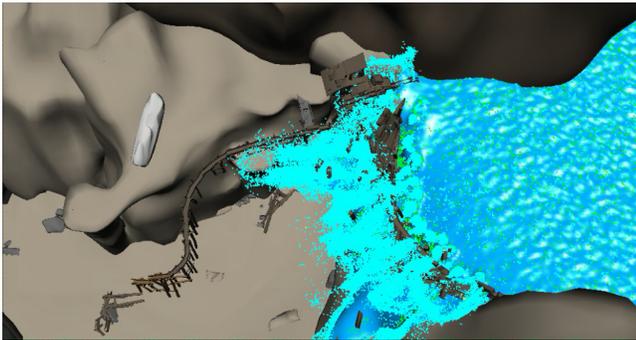


Figure 1: Higher resolution primary fluid simulation matched to lower resolution layout simulations (not shown). ©Disney.

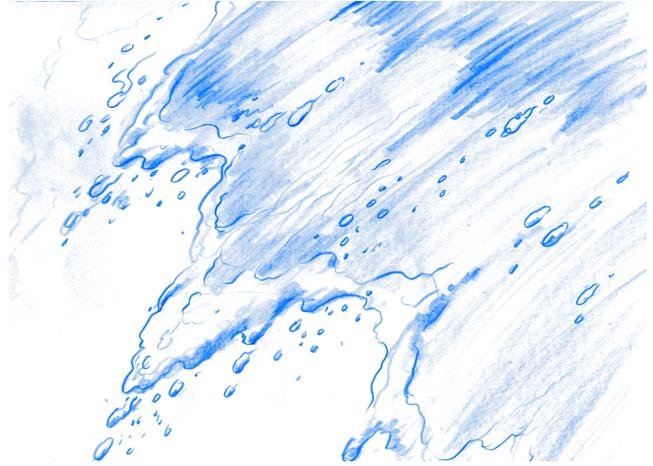


Figure 2: An concept sketch of the director’s desired water style (by Ted Kierscey). ©Disney.

4 Integration

A major challenge was maintaining a sense of large scale while still stylizing the look. This required keeping the water flow speed slow enough to feel large. On the rendering side, we found minimizing and localizing mirror reflectivity was also necessary. Several layers of procedural spray and mist tied the base fluid shapes with the environment. We used exaggerated contrast shading on the foam levels to further create a classic look.

5 Conclusion

Natural elements such as water in an animated feature benefit greatly from applying the same twelve principles of animation that are consistently followed for character animation. As an animation studio, exaggeration and stylization of effects and environments are thus very important. This is especially difficult to accomplish while using physically based techniques such as fluid simulations. We believe we have taken steps toward better stylization in CGI on *Tangled*, but plan to go further in the future.



Figure 3: Final rendered shot from film exhibited the primary water surface, spray foam, and fractured geometry. ©Disney.