1 Introduction

This sketch will give insight into the methods Scanline used for creating the liquid battlefield scenes of Zach Snyder’s 300. From massive parallel network simulation to rendering, we’ll explore the innovative techniques that made it possible to bring these scenes to life with a relatively small team and a short production schedule.

2 Artwork Matching Ocean Simulations

Each shot had a very specific production design to artistically recreate the original page of Frank Miller’s Graphic Novel. It was extremely important to the director and creative team that the scenes stayed true to the concept paintings. As a result we needed to match a very specific, and somewhat exaggerated ocean look as well as developing a realistic feel to the motion of the waves. To achieve this we developed a technique for Flowline that allowed us to first recreate the very specific look needed as well as offering a variety of different motions and speeds that all led to the same wave constellation of the artwork. Finally, Visual Effect Supervisor Chris Watts just had to pick the wave motion he liked the best.

3 Splinter Simulations

The ships in the ocean-battle sequence needed to crash into each other, against rocks and had to interact with the water. Therefore a new Splinter Simulation technique was implemented into Flowline. Each Persian ship had been modeled log by log with more than 6000 single pieces resulting in a main skeleton, a supporting structure and the hull. Flowline’s Splinter Simulation engine then automatically “nailed” the pieces together according to various realistic wood parameters. In comparison to classic Hard Surface Rigid-Body simulations, this lead to flexible bending wooden structures that were only breaking when certain tensions in the wood were reached. All wooden pieces in the Splinter Simulation could also react to and affect the waves motion as well as generating splashes and spray.

4 High resolution Parallel Network Simulation

One of the biggest challenges on this show was the immense scale of the scenery. We had to cover at least an area of 300x200 meters with a very detailed Fluid simulation for Waveinteraction with ships, sails, rocks, people and props. To achieve this Flowline was extended to simulate the whole area of the ocean in parallel on the network. 80 generic machines were calculating an overall simulation resolution of 8k. For the artists, work flow was more or less the same like kicking of a sequence rendering on the render farm. With this new method, simulation times were crunched down to a fraction and the artists had fast feedback cycles for their simulations. It also enabled us to turn around more versions for the client quickly so that we could really get the look they were after.

5 Rendering of Large Datasets

Finally the massive amount of simulation data had to be ray traced into a final image. Since everything had been simulated on dozens of network machines, the simulation data summed up to multiple gigabytes per frame which no single machine could handle completely in RAM. To resolve this, Flowline was extended with a dynamic rendering acceleration structure which allowed it to only load the data that it is needed for the currently rendered ray. To enable the use of self shadowing, Flowline’s shadow structures had been extended with a similar dynamic system to allow shadows from areas far away of the currently rendered ray to correctly darken the spray.