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Entertainment Engineering

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In This Issue: Entertainment Engineering TV

Discovery Channel Uses Fluid FX for *Deadliest Catch* Series

Mathematically defined directable wave forms create 3D CG ocean



Joining forces in the highly competitive world of CG visual effects is the “wave” of the future. Visual FX studios Engine Room in Hollywood and Fusion CI Studios in Santa Monica pooled talents recently to create ground-breaking CG ocean fx for the season launch of Discovery Channel’s Emmy nominated series, *Deadliest Catch*.

The network promo included 3D CG shots of photo-real stormy ocean surfaces interacting with Discovery Channel’s floating logo as it’s pounded by ocean waves. Using proprietary methodologies and fluid dynamic algorithms, Fusion Studios created the ocean surface simulations and Engine Room handled the rest, from animation to compositing, including an underwater shot. By combining their unique talents, Engine Room & Fusion created highly advanced ocean fx, not yet seen outside feature film.

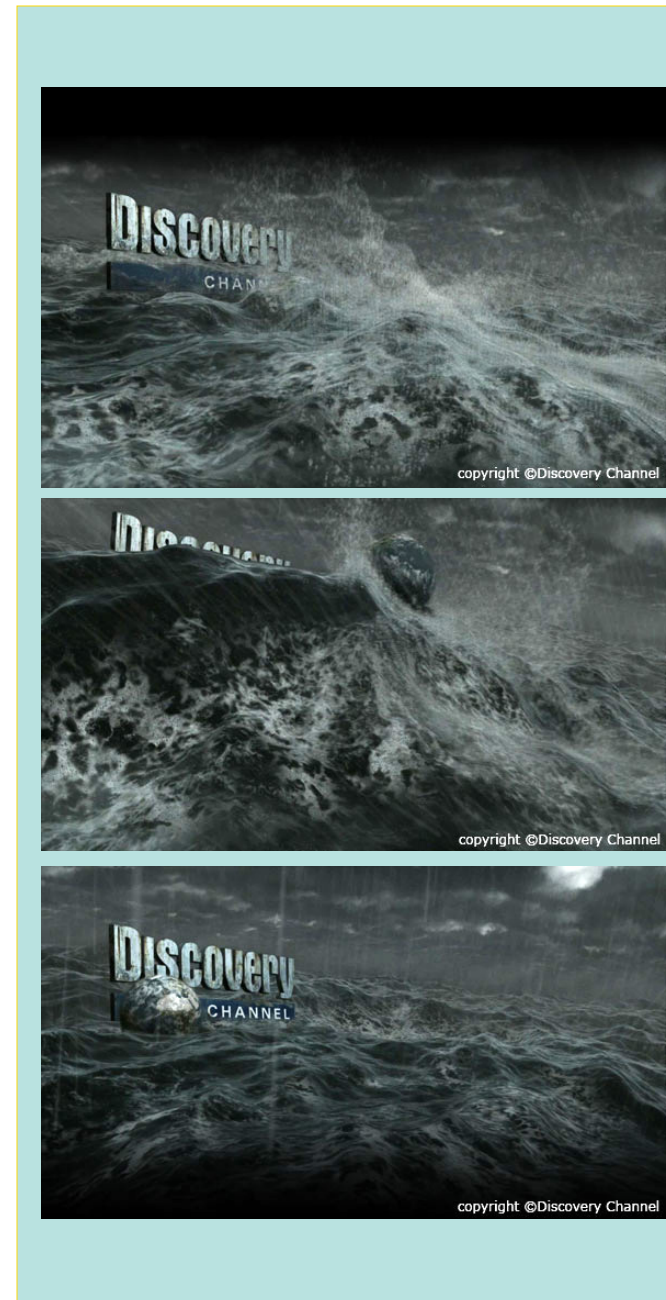
“It was a perfect working model for us,” says executive producer Lauren Millar from Fusion CI Studios. “We specialize in fluid & particle fx exclusively and therefore don’t compete with other vfx studios; rather, we combine our expertise to create technologically advanced fx that neither studio would accomplish alone within certain timeframes and budgets. And it was a great experience working with Engine Room, we knew there would be absolutely no compromise in quality.”

“Without time for an R&D period, we had to develop

aspects of our ocean surface technology during a tight production timeline,” says Mark Stasiuk co-founder of Fusion CIS. “It was a great technological challenge, but we’ve devised a few tricks that allowed us to pull it off. We’ve developed proprietary methods to quickly tune-up results to hit a look, responding to the creative needs or technical limitations that our partner studios run into. For this project, each stage of the simulations took only a few hours per iteration.”

Realistic looking stormy ocean effects continue to be immensely challenging, usually requiring lengthy R&D and massive rendering capabilities because they’re huge-scale and dynamically complex with multiple fx happening simultaneously – a moving ocean surface, cresting waves, spray and mist, surface foam, and interactions with geometry. And on top of all that, for this project the director needed to choreograph nature, creating wave swells and crests in specific places – a major challenge for physical simulation software. So Fusion combined a physically simulated stormy ocean surface with mathematically defined directable wave forms, creating a phenomenal ocean surface that was both oceanographically accurate and completely controllable -- a major achievement.

“We knew going into this project that the technical challenges would be immense” says Engine Room founder Dan Schmit. “Especially for a television promo, this level of 3D is quite unheard of. Being a



collaborative company, Engine Room knew that the only way to pull it off would be by assembling the right team. “Mark and Lauren were our first and right choice to provide our inhouse artists with the high level ocean simulations that were necessary, they worked with us very closely all the way through the rendering and compositing process to insure that the look was being realized correctly.”

Although the two companies have never worked together before they found the experience to be extremely rewarding. “Mark’s high level technical background proved to be the magic bullet needed to get this project done while in the process delivering a feature quality we needed”, adds Schmit. “Engine Room’s business model is all about assembling the right team and more often than not this is achieved by

Mathematically defined directable wave forms

Basically the ocean surface’s deformations are the result of adding two layers. One layer is the oceanographically accurate deformations for everything from chop up to small swells. This part is not directable in detail, but since it’s the smaller features it doesn’t matter that much. The second layer are sets of large swells that are defined by an adaptation of a truncated Fourier transform sequence with power function and other features, like wave speed, derived from oceanographic observations and theory. However, we build in factors that act as controls on direction of propagation, and magnifiers on dominant height, wavelength, etc. These are then filtered with a broad wave form to generate a particular wave-set, and finally we add together a few of these to make up the sets of large swells. The controls built into the waveforms allow Fusion CI Studios to push the behavior away from physically accurate toward the needs of the director. With the controls they created, they were able to place large swells where they were wanted, with single-frame accuracy, to perform roles in the piece like hiding the globe or revealing the Discovery logo, exactly when wanted. This meant the animators could hand Fusion CI object animation, for which they would design ocean movement to nearly match, and then the animators would fine-tune object motions if needed to account for the finer scale ocean features. These kinds of ocean tools are needed not just for these kinds of pieces, but also for generating water motions to meet up with match-moved objects in practical shoots, for example where one would have a boat mounted on hydraulics.

bringing specialized 3D artists in-house. This however would never fly with the Discovery project because of the tight deadline and bringing in Fusion CI was the only way we could have ever made it work. The final spot is the proof.

This project was quite a technological accomplishment -- we dramatically improved the quality of the ocean surface and wave crest sims over what we’ve previously done for feature film,” says Stasiuk. “And it was a fantastic experience working with the guys at Engine Room, they do great work”

For More Information:
Fusion CI: <http://fusioncis.com/>