Abstract Ocean Waves

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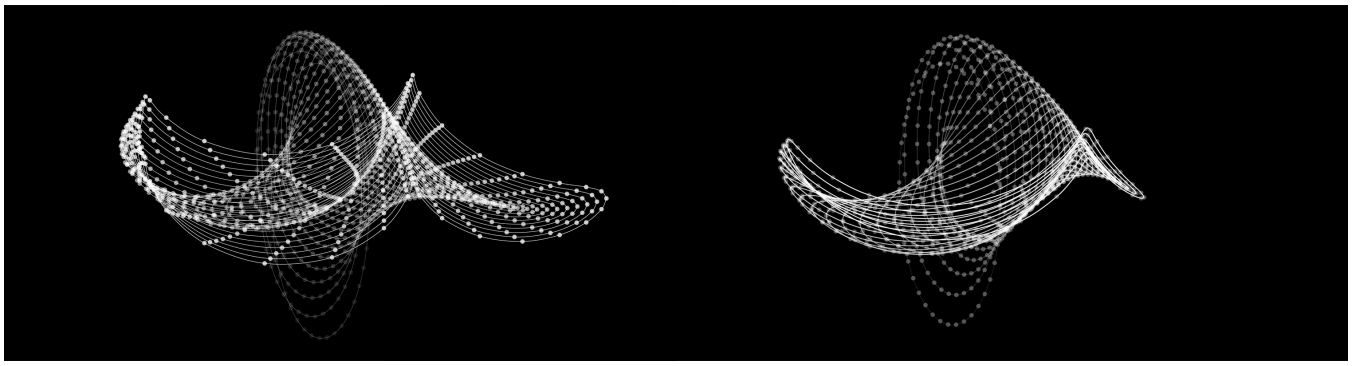

Figure 1 *Two rendered artifacts of the same family, resembling ocean waves.*

1 Introduction

Typically the models for ocean waves are computationally explored to replicate natural phenomena. Instead of aiming towards realism, this work explores aesthetic derivations of a simple state-of-the-art model for ocean waves simulation.

The Basic Model [Fournier and Reeves 1986] based on Gerstner's, is a classical physics model for realistic ocean waves in computer graphics [Tessendorf 1999]. The behavior of the model depends on a set of parameters. Establishing parameter values that are outside the typical range, and exploring unusual combinations of values for different parameters, may yield abstract and unexpected shapes that are, nevertheless, evocative of water, oceans and waves.

2 Approach

The Basic Model for ocean waves described in Fournier and Reeves [1986] is based on a trochoid – the curve generated by a point at a certain distance from the center of a circle rolling on a fixed straight line (S). Inspired by the circular nature of this model, we replaced the straight line S by an ellipse, altering the trochoid to an elliptical hypotrochoid [Lawrence 1972] (Fig. 2).

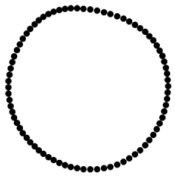

Figure 2 *Preliminary result displaying an elliptical hypotrochoid with low eccentricity.*

The parametric equations for these curves were implemented together with the wind effect on the top of the crests as in Fournier and Reeves [1986]. For each iterated point over the hypotrochoid a small circle is drawn, representing the water particles and enabling the visualization of the movement of each wave (Fig. 1).

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3 Results

By varying parameters such as wave length, phase speed, wind strength, number of waves and number of particles for each wave, several families of artifacts were produced. Each family results from the same variation rules of a set of constrained parameters, which results in aesthetically similar artifacts and produces animations of mutating shapes[4].

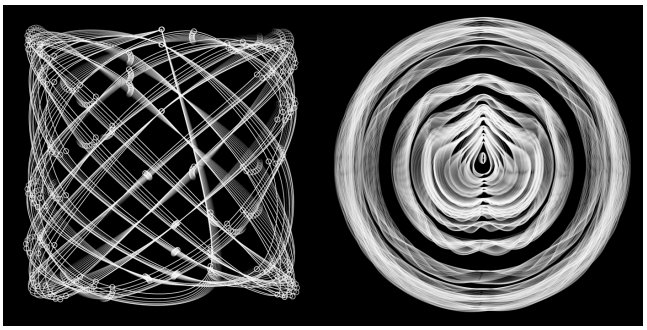

Figure 3 *Two rendered artifacts from different families.*

The emphasis of this work is on the produced shapes, therefore the use of color was discarded. However, the use of slight transparencies provides depth and elegant complexity to the artifacts, also enabling the visualization of each single wave. Although each wave is a single entity, the artifacts emerge as unified compositions of waves and a great diversity of abstract forms is possible. Movement is implicit in static and animated artifacts, conveying the fluidity and pace of ocean waves.

References

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