

## **Abstract**

Modeling natural phenomena is one of the most challenging tasks in computer graphic. The ocean wave simulation is included in this challenge. With the GPU graphical processing, it is possible to use advanced rendering techniques with great realism in real-time applications. This work initiates the research field in modeling and rendering of natural phenomena at Computing Institute of UFF in the area of Visual Computation and Interface. This dissertation simulates the ocean wave behavior processing all geometric computation and rendering in GPU. The shape is defined by Gerstner's equation where the water particles movement is simulated. It is possible to consider the representation as in deep water as in shallow water. The method also simulates the breaking waves near the shore and the topology deep sea influence in it called wave refraction, changing its geometric properties adequately. The rendering implemented in this work uses combinations of advanced real-time rendering techniques from tangent-space reflective bump mapping and environment mapping to Fresnel reflection and HDR. As illustrated by examples of results, this technique creates a very realistic waves animation and adjusted scenario.

## **Keywords**

GPU, real-time rendering, ocean waves, water, breaking waves, natural phenomena, vertex and fragment programming, shader