

Posudek diplomové práce

Matematicko-fyzikální fakulta Univerzity Karlovy

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Název práce Real-Time Simulation of Ocean Waves using FFT on the GPU

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Studijní program Informatika **Studijní obor** Počítačová grafika a vývoj počítačových her

Autor posudku Alexander Wilkie **Role** vedoucí

Pracoviště KSVI

Text posudku:

The student designed and implemented a system that allows visually seamless tiling of procedurally generated ocean surfaces. Spectrum-based synthesis of ocean waves has been used in graphics for more than 25 years: however, explicitly modelling large patches of open water as mesh geometry incurs both a substantial memory overhead, as well as a run time penalty. Such wave modelling techniques have seen extensive use since their introduction, but still have some residual issues if very large bodies of water are seen in a rendered scene, especially in a real time setting.

In parallel to these developments for ocean surfaces, techniques for non-repeating tiling of texture patches, like for instance Wang or corner tiles, were researched, and also have become a common feature in modern appearance modelling. However, what is still very rarely seen are real time implementations of such tiling techniques that combine high visual fidelity with interactive synthesis and rendering speeds.

What the student presents in his thesis is a system that combines interactive rendering with frequency-based ocean synthesis: with a key feature being that several comparatively small patches of ocean surface are synthesised, and blended together across the entire ocean surface in a non-repeating way that masks the inevitable repetition artefacts well.

The thesis is well structured, presents the theoretical background to the work that was undertaken, and discusses the algorithmic and mathematical approach that was selected by the student to achieve the stated goals. The visual fidelity of the obtained tiled results is analysed via frequency-based plots that attempt to visualise the resulting visual appearance on a more fundamental level than just showing difference plots between result images. While a more thorough evaluation of system performance could have been done, the discussion and analysis presented in the thesis is sufficient to ascertain the stated goals were reached. Which is why I recommend the thesis for acceptance.

Práci doporučuji k obhajobě.

Práci nenavrhuji na zvláštní ocenění.

V Praze dne 1. 6. 2025

Podpis: