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Real-time visualization of ship and wavy surface motions based on GPGPU computations

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One of the key stages in ship design process is the modeling of its behavior on the wavy sea surface, carried out with the expected operational characteristics taken into account. Similar modeling process could be done within real conditions at virtual testbed, which allows to monitor the influence of external disturbances on ship's running characteristics in real time with sensors installed onboard. Visualization of the results for such modeling process allows the researcher to correctly and holistically perceive occurring events, as well as to predict and timely respond to emerging dangerous situations. If we are using GPGPU technology for computation purposes, results of modeling will be already placed in GPU memory after process completion. This fact can be regarded as an opportunity to optimize the visualization process by converting the raw simulation data into graphic objects directly on the GPU, and interaction mechanisms between OpenGL and OpenCL could be used here. In this article we demonstrate the effectiveness of this technique on the example of ship behaviour visualization on a wavy sea surface, as well as forces acting on the ship's hull.

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