FAKULTÄT FÜR !NFORMATIK
Faculty of Informatics

Diplomarbeitspräsentation

Visibility in a real-world cross-platform game engine

Masterstudium:
Computergraphik & Digitale Bildverarbeitung

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Scope of the work

This thesis presents optimized visibility algorithms in the context of a cross-platform rendering engine for PC, PlayStation 3, Xbox 360 and Wii. The main challenges due to varying platform properties are the following:

Unified API: Each platform has vastly different CPU and GPU specs, but a rendering engine must provide a unified API while still taking advantage of platform-specific features.

Efficient algorithms: State-of-the-art visibility algorithms must be tailored to console hardware in order to be efficient.

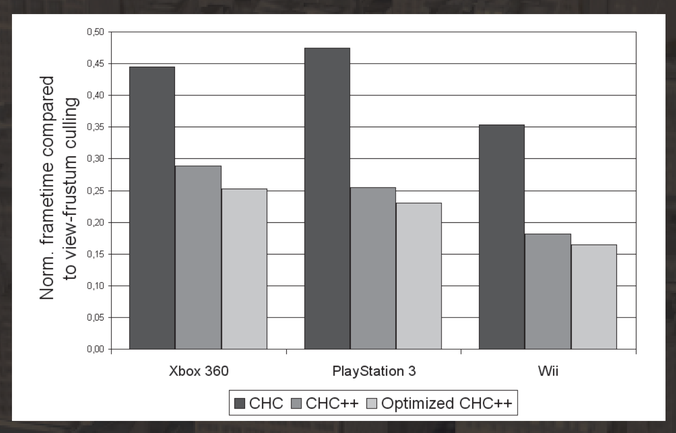
Contributions

Rendering engine: The thesis describes the design and implementation of a multi-platform rendering engine, detailing different strategies and approaches for unifying vastly different architectures into the same API.

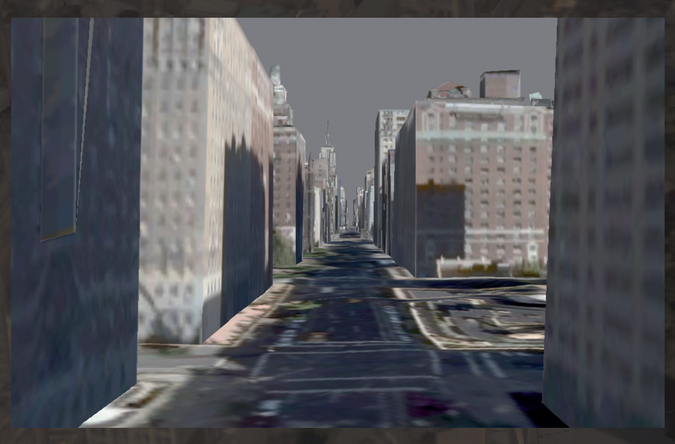
Novel occlusion query mechanism: A low-level mechanism for enabling occlusion query functionality on platforms without hardware-support was invented.

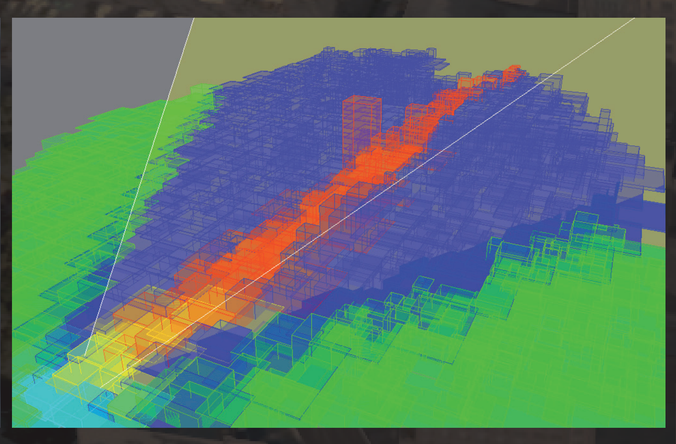
Improved algorithms: State-of-the-art algorithms were improved using new branch-free data-structures as well as platform-specific features.

Optimized CHC++ algorithm:
A tool for evaluating optimal parameters of the CHC++ algorithm was developed, resulting in a 5%-10% performance improvement over the original CHC++ algorithm.



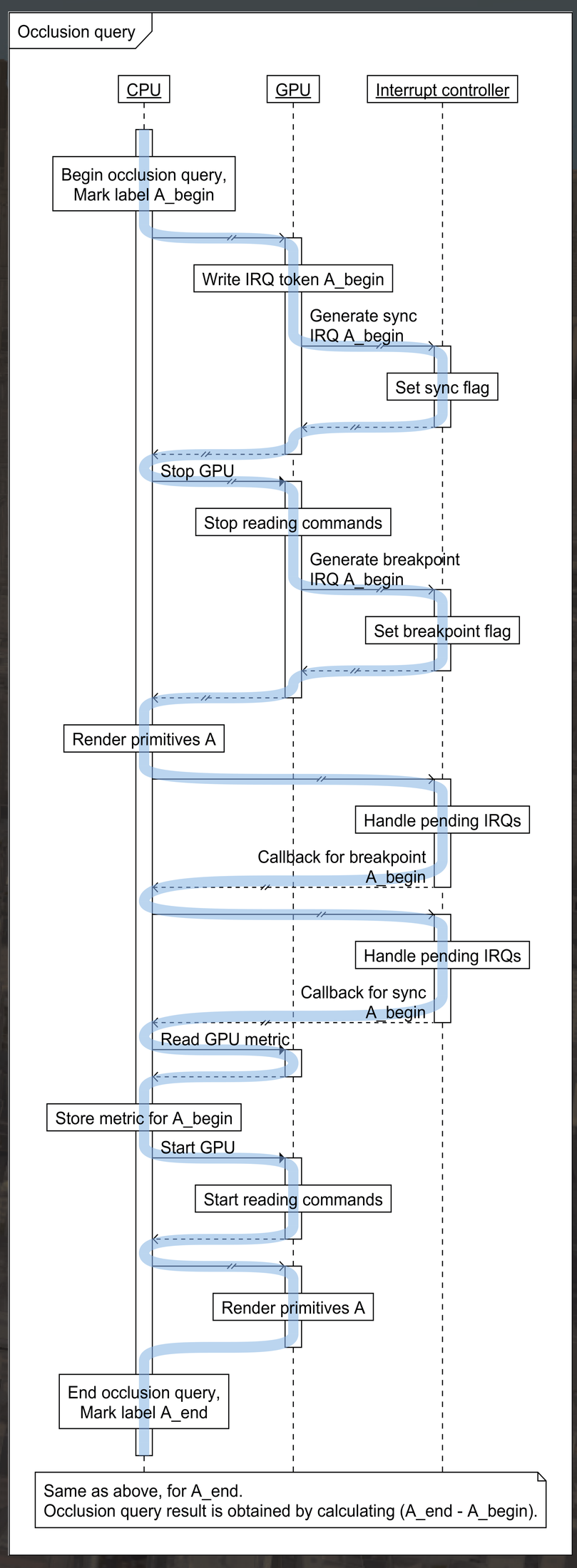
Improved visibility algorithms





Left: Camera viewpoint. **Right**: Visibility visualization. Visible objects must be rendered, while occluded objects are discarded. The used visibility algorithm is able to cull about 80% of all objects in the scene in this case.

Novel occlusion query mechanism



By inserting certain instructions into the command-buffer, the CPU and GPU can be synchronized via interrupts in a way that allows the occlusion query functionality to be implemented on platforms which do not natively support it.

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