Mapping applications on mobile devices are becoming increasingly popular and storing map data in a vector format offers much more possibilities than using pre-rendered map images. OpenGL ES 2.0 is an API to provide hardware accelerated 3D Graphics on mobile devices such as smart phones or tablets. This thesis was created in cooperation with Ulmon GmbH to replace their current CPU-based map renderer. The main task of the presented work was to create a prototype of a hardware accelerated rendering library, offering vector map rendering with OpenGL ES 2.0. Outside of the scope of this work, the prototype will be tuned and extended and eventually released as the primary map renderer of the travel apps of Ulmon GmbH.

A new feature of the proposed implementation is the 3D mode where text and icons stay upright, as can be seen in this rendering of Melk Abbey, Lower Austria.

Contributions

- A Hybrid Rendering Architecture, combining the speed of a tile-based renderer with the feature richness of a realtime renderer by rendering certain features in a post-processing step over the base map.
- Multi-Tiles, a concept to minimize load latency
- Line Tessellation and Rendering with support for lines of arbitrary width, line dashing with a user-defined pattern and three different line cap styles.
- A Tile Selection Algorithm using a polygon rasterization technique to determine the visible tiles.
- A 2D Packing Algorithm to pack many small icons of similar size into a texture atlas.

Problem Statement

Mapping applications on mobile devices are becoming increasingly popular and storing map data in a vector format offers much more possibilities than using pre-rendered map images. OpenGL ES 2.0 is an API to provide hardware accelerated 3D Graphics on mobile devices such as smart phones or tablets. This thesis was created in cooperation with Ulmon GmbH to replace their current CPU-based map renderer. The main task of the presented work was to create a prototype of a hardware accelerated rendering library, offering vector map rendering with OpenGL ES 2.0. Outside of the scope of this work, the prototype will be tuned and extended and eventually released as the primary map renderer of the travel apps of Ulmon GmbH.

Results

In this figure, it can be seen that the proposed implementation generates 256 tile images on average 2.42 times faster than the previous implementation.