The goal of this thesis is to examine non-photorealistic rendering (NPR) methods with respect to their application in real-time rendering and to utilize the features of modern programmable graphics processing units (GPUs) to implement several NPR techniques. To achieve maximal efficiency of the implemented rendering styles, extra care is taken to offload all geometry processing from the CPU to the GPU. Implementations of three image-space edge detectors are presented and compared. Silhouettes, border edges, creases and material boundaries can be identified by detecting discontinuities in an image with worldspace normals, in the second derivative of the depth buffer and in an image with region identifiers. Combination of the edge detectors and a stepped shader is
used to render objects in a cartoon style. A novel approach to rendering of a three-dimensional scene in mosaic style is proposed. Unlike previously presented methods, the implemented technique can render complex scenes at interactive framerates. To achieve real-time performance, a simulation of a system of infinitely stiff springs is used instead of centroidal Voronoi diagrams.