Teeth and Gums modeling using medial representations

Oral healthcare is an active area of research in several fields such as orthodontic teeth alignment to novel applications for teeth cleaning. Philips is active in development of new consumer devices allowing users to improve and maintain their oral health.

Assignment: We aim to develop new methods and algorithms to segment 3D high-resolution surface models of teeth and gums into the individual teeth and the gum area. The resulting algorithms should be able to

- Robustly detect the fine-scale, often blurred, separation lines between individual teeth and teeth and gums

- Produce a segmentation where each tooth is correctly localized (no over- or under-segmentation)

- Process large mesh models (hundreds of thousands of polygons) in seconds or less on a modern PC platform

Research: To achieve the above, we will investigate a novel approach to segmentation: 3D medial surfaces, or skeletons. One goal of the project is to research the potential of skeletal surface descriptors to serve as robust tools for surface segmentation.

Skills: The candidate for this assignment should be proficient with C and C++ programming, and software development under Linux. Prior knowledge in GPU programming (CUDA) and geometric algorithms (e.g. mesh analysis and generation and computational geometry is an additional advantage.

Background information:

Background information on 3D skeletonization techniques and algorithms relevant to this project is available online at:

http://www.cs.rug.nl/svcg/Shapes/Skel3DPoly