How Useful is Computer Graphics for Medical Diagnoses?

Gitta Domik, Stephan Arens, Ingrid Scharlau, Frederic Hilkenmeier

University of Paderborn, Germany
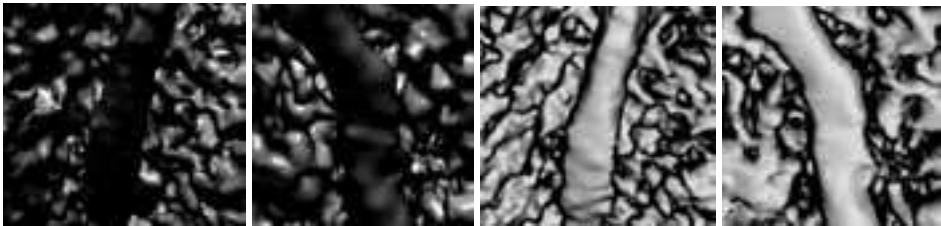domik@uni-paderborn.de

Figure 1: The left pictures form a pair of medical visualizations using the shading technique by Phong, the right pictures form a pair using a Style shading technique.

Abstract: In the Panel „From Data to Diagnosis" at SIGGRAPH 2010, panellist Cindy Grimm challenged participants and co-speakers by asking to prove the usefulness of their graphics products for medical diagnosis. She is right in her claim that usefulness of graphics algorithms for a specific diagnosis is hardly ever seriously challenged. For medical and other applications, there is a lack of evaluation of usefulness of processes and tools beyond efficiency and usability. In this paper we offer a methodical and a practical approach to evaluate „usefulness" of computer graphics for medical diagnoses. In our methodical approach we measure „effectiveness" rather than usability, and we break down complex medical tasks (in our case: the search for plaque in coronaries on the basis of volume rendered CT data) into perceptual and medical knowledge-based tasks and further derive simple visual tasks (in our case: identifying roughness, curvature, or location in an image) from the perceptual tasks. T-test analysis and ANOVA showed constant but slight improvement of one shading technique (a style based transfer function) over Phong shading in the performance of 33 participants in a controlled user study. But only one out of three visual tasks showed significant performance improvement.