Abstract Title: Nonlinear virtual colon unfolding

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Purpose: The majority of virtual endoscopy techniques tries to simulate a real endoscopy. A real endoscopy does not always give the optimal information. Polyps are located at the surface of the colon. An endoscopic view visualizes a small percentage of the surface. We deal with the unfolding of the colon surface as a possible visualization technique for diagnosis and polyp detection.

Materials and Methods: A new two-step technique is presented which deals with the problems of double appearance of polyps and nonuniform sampling that other colon unfolding techniques suffer from. In the first step, a distance map from a central path induces nonlinear rays for unambiguous parameterization of the surface. The second step compensates for locally varying distortions of the unfolded surface.

Results: The technique generates a single view of a complete, virtually dissected colon. Between others, we applied this technique to a CT volume data of an extracted colon with a resolution of 381x120x632. The colon is 50 cm long and contains 13 polyps. The 13 polyps where localized in the unfolded colon view. The extracted colon was physically dissected and several pictures of the dissected colon were also taken. These pictures enable a qualitative comparison between the real data and the results of the presented algorithm.

Conclusions: The nonlinear virtual colon unfolding is a promising technique for the detection of polyps. Once detected the physician can go back to their location in the original volume data in order to inspect them more accurately.