Hľadanie ideálnej cesty pre kameru virtuálnej kolonoskopie

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This work deals with finding a path inside objects in 3D image data and is performed in cooperation with the company TatraMed Bratislava. The goal is to develop a suitable mathematical model and computer program for finding an ideal path in human colon represented by a visual information given by 3D computer tomography. This path will determine a trajectory of camera in virtual colonoscopy, medical technology dealing with colon diagnoses by computer. Physicians use this technology for searching polyps and tumours in colon. The first step in our approach is segmentation of the colon in medical data using a region-growing algorithm. Then we use a mathematical model for computing distance function inside the segmented volume. First we compute this function as the shortest distance to a userś selected starting point. This function is used to create an initial guess for the curve, which will represent the searched path. In the next step we calculate distance function to the boundary of segmented volume. The gradient of this function determines the velocity vector field in which we insert the initial curve. Using projection of the vector field to the plane normal to evolving curve, a regularization of the motion by curvature and suitable tangential velocity, we end up with the smooth, asymptotically uniformly discretized curve representing optimal trajectory for the camera in virtual colonoscopy. The overall strategy for finding the optimal trajectory inside 3D objects presented in this work is original. The asymptotically uniform tangential redistribution introduced in this work for 3D evolving curves represents new approach for solving 3D curve evolution in stable and smooth way.