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Active contours define the desired curve or surface as minimizing a relevant energy functional. Minimal geodesics allow to find global minimum of active contour energy using Fast Marching to solve Eikonal equation. Minimal paths and front propagation have been used for a variety of applications like segmentation in 2D and 3D images, edge completion, finding centerline trajectory for virtual endoscopy, segmenting a surface as a set of 3D minimal paths. This talk will focus on various surface segmentation methods in this framework.

We extended the minimal path between 2 points in order to find in a 3D image the boundary surface of an object knowing two curves on this object. The surface is defined implicitly in order to contain a set of minimal paths that link the two curves together.

More recently we developed a new approach of segmentation in 2D and 3D images through a set of minimal paths by adding automatically and iteratively keypoints that distribute uniformly on the boundary we wish to find. This set of keypoints then defines a geodesic mesh on the surface. We then use a transopirt equation in order to fill in the holes and get a complete surface that contains the geodesic mesh. (Received February 05, 2008)