

The geodesic active contour level set image filter requires two inputs, an initial level set and a feature image. The two input images and the output image are all in 3D. The initial level set is produced by the fast marching filter. The fast marching image filter is typically used for segmentation tasks, but in this algorithm, it is just used to calculate a distance map (or level set) that represents the distance at each voxel to the seeds provided by the foreground/background segmentation. The zero-level set represents the estimated boundary between the background and foreground, and is used to initialize the contour that will be evolved in the active contour filter. The closer this estimate is to the actual object border, the better the performance of the active contour filter will be.

For the feature image, this algorithm uses an edge potential image, produced by smoothing the input, computing the magnitude of the gradient, and then using the sigmoid filter to intensify the differences between regions of low and high values in the gradient magnitude image. The values in the edge potential image should be near zero at the object boundaries. The feature image is used to control the speed at which the contour will be evolved in the active contour filter. The closer the contour is to an edge, the slower it should be evolved, stopping when it has reached an edge.