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Automatic optic disk boundary extraction by the use of curvelet transform and deformable variational level set model.

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Summary: Efficient optic disk (OD) localization and segmentation are important tasks in automated retinal screening. In this paper, we take digital curvelet transform (DCUT) of the enhanced retinal image and modify its coefficients based on the sparsity of curvelet coefficients to get probable location of OD. If there are not yellowish objects in retinal images or their size are negligible, we can then directly detect OD location by performing Canny edge detector to reconstructed image with modified coefficients. Otherwise, if the size of these objects is eminent, we can see circular regions in edge map as candidate regions for OD. In this case, we use some morphological operations to fill these circular regions and erode them to get final locations for candidate regions and remove undesired pixels in edge map. Since usually OD is surrounded by vessels, we choose the candidate region that has maximum summation of pixels in strongest edge map, which obtained by performing an appropriate threshold on the curvelet-based enhanced image, as final location of OD. Finally, the boundary of the OD is extracted by using level set deformable model. This method has been tested on different retinal image datasets and quantitative results are presented.

Keywords: retinal image; digital curvelet transform (DCUT); optic disk (OD)
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