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# Improving Level Set Method for Fast Auroral Oval Segmentation

## Abstract:

Auroral oval segmentation from ultraviolet imager images is of significance in the field of spatial physics. Compared with various existing image segmentation methods, level set is a promising auroral oval segmentation method with satisfactory precision. However, the traditional level set methods are time consuming, which is not suitable for the processing of large aurora image database. For this purpose, an improving level set method is proposed for fast auroral oval segmentation. The proposed algorithm combines four strategies to solve the four problems leading to the high-time complexity. The first two strategies, including our shape knowledge-based initial evolving curve and neighbor embedded level set formulation, can not only accelerate the segmentation process but also improve the segmentation accuracy. And then, the latter two strategies, including the universal lattice Boltzmann method and sparse field method, can further reduce the time cost with an unlimited time step and narrow band computation. Experimental results illustrate that the proposed algorithm achieves satisfactory performance for auroral oval segmentation within a very short processing time.