Response to reviewers

Dear Editor,

We wish to thank the reviewers for their useful comments to improve the manuscript quality. We have revised the whole manuscript according to the comments, including Figure 12, Figure 14, and so on.

Reviewer: 2

Q1: line 77-84: This method looks very similar to what OpenCv FindContours does. How is this different? It may be best to show the results of this method versus known ones (like the OpenCV method) to highlight the differences. Also, add the computation time to get each resulting image.

Reply: PSM algorithm has the some characters. Firstly,the corner detection algorithm based on sharpness is used to determine the contour corner, and the contour is segmented by the corner, which reduces the dependence of the contour segment on the starting point. Secondly, the distance ratio and arc length ratio are used to replace the distance error as the iterative stop condition, which improves the robustness of the object scale variance, such as the size, rotation, etc. Finally, both the angle and length extracted on the approximate polygon as two features describe the contour shape.

The advantages of PSM are the smaller number of the features and the higher detection rate. The number of the features for contour of the object is much smaller than that by PSM, shown in Table.1. the detection rate comparisons are shown in Fig.13 and Table.2.

Q2: line 101-109: What is j? You computed sharpness in equation 2, so what is this new formula? Do you mean that the sharpness of the contour is calculated as the maximum sharpness of the points in it?

Reply: we added the means of symbol j after Eq.(3).

We revised the symbol of the sharpness of the contour in Eq.(3).

Q3: line 112-118: Given the simplicity of the image, it's hard to imagine any contour algorithm failing in identifying the corner points. Again, can you show the differences in the same image of different algorithms versus your own?

Reply: Here, we emphasize the basic principle of PSM algorithm. PSM algorithm is compared to SM in section 2.2 and 2.3.

Q4: line 129: It is no wonder that a curved line can be approximated by a certain number of points and the mathematical equation of the approximation can be found according to the polynomial degree. The more points, the more accurate the approximation is and the more computational time is required. However, this is a known theme and for example spline approximation usually is the best choice for most problems. Why you didn't implement it? This is basic knowledge. Moreover, your method is iterative, meaning that loops are involved and the computational time increases. Please comment on this matter.

Reply: we would like to propose PSM algorithm not only to approximate the object contour, but also to approximate the contour curve with different scales, shown in Fig.7.

Q5: line 245 (figure 14): Some are not perfectly enclosed. Is this an error, could it be improved...? The bounding box is found by the HMM starting from the contour approximation, is this correct? I would add a second figure

showing the same picture analyzed by the different algorithms to provide a better visual comparison of their effectiveness to detect correct ROIs.

Reply: we recompleted the simulations of the proposed algorithm to obtain the figures, in the revised verion.

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