Anisotropic mesh adaptation applied to image segmentation

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ABSTRACT

In this presentation we focus on the possible benefits led by a smart combination of consolidated techniques for image segmentation with anisotropic mesh adaptation procedures.

Several approaches are available in the literature to achieve a quick and sharp edge detection in image segmentation [1]. In this presentation, we focus on the methods based on the minimization of an energy functional. The reference model is the Mumford-Shah functional which, however, turns out to be very challenging with a view to an efficient discretization. Alternative approaches employ different functionals, such as the Ambrosio-Tortorelli approximation, the Chan and Vese model or the Region Scalable Fitting Energy.

Concerning anisotropic mesh adaptation, the benefits due to the employment of a computational mesh customized to the problem at hand are already well-established in several engineering and applicative fields, whereas they deserve to be more deeply investigated in image processing. The anisotropic setting we refer to is the one used, for instance, in [2], where elements are sized, rotated and shaped according to the metric predicted by an a posteriori error analysis.

We verified that the selection of a smart computational mesh ensures a considerable reduction of the computational effort demanded to reach a certain accuracy during the object detection phase [3].

The topic is undoubtedly of great interest due to the many applications where the identification of an object (or of a portion) in a digital image is relevant, such as in medical imaging, object detection, people/object recognition. Current challenges include, among the others, the segmentation of 3D images as well as of moving objects.

REFERENCES

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