MEETING ON TOMOGRAPHY AND APPLICATIONS

MATHEMATICS DEPARTMENT, POLITECNICO DI MILANO

MARCH 21-23, 2016

Q-convexity-based shape descriptors

ABSTRACT In Discrete Tomography, several classes of binary images presenting different kind of convexity have been studied. These notions arise inherently from the pixel-based representation of the digital image, and give rise to a one-dimensional convexity (for instance, h- or v-convexity) or to a two-dimensional convexity (for instance, hv-convexity, and Q-convexity). The latter permits to generalize hv-convexity to any two or more directions, and provides similar properties to the class of convex binary images. Moreover, this kind of convexity has been mostly studied in Discrete Tomography for its good properties: the reconstruction problem for this class can be done in polynomial time and a random generation algorithm is known. In this talk, we propose to define an immediate two-dimensional convexity measure, based on the concept of Q-convexity. Convexity estimators are among the most important shape descriptors in digital image analysis. Shape feature extraction and representation plays an important role in many categories of applications like for example shape retrieval, shape recognition and classification, shape approximation and simplification, and so on. Various continuous and discrete convexity measures have been proposed which can be grouped into different categories, and among them area-based measures and boundary-based ones are frequently used. In the definition of the new Q-convexity estimator, we exploit the geometrical description of a binary image provided by the so called salient and generalized salient points, and the definition of Q-convex hull, so combining both boundary and area information. Moreover, the advantages of this approach are that normalization is straightforward, the computation of the measure can be done efficiently and the generalization to any two or more directions should be easy.
This is a joint work with Peter Balazs.

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