Chapter IV

Quadtree-Based Image Representation and Retrieval

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Abstract

This chapter is a survey of quadtree uses in the image domain, from image representation to image storage and content-based retrieval. A quadtree is a spatial data structure built by a recursive decomposition of space into quadrants. Applied to images, it allows representing image content, compacting or compressing image information, and querying images. For 13 years, numerous image-based approaches have used this structure. In this chapter, the authors underline the contribution of quadtree in image applications.
Introduction


This chapter surveys the different applications of quadtree in the image domain. In the first part, the principles of quadtree representation are recalled. The second part presents several approaches minimizing the memory space used by encoding image quadtrees in a linear form or by compressing images using quadtrees. The third part gives an overview of the different approaches proposed for the storage and manipulation of clusters of images. Finally, the last part deals with the Content-Based Image Retrieval approaches using quadtrees.

Quadtree-Based Image Representation

Different types of data, like curves, surfaces or volumes, can be represented by quadtrees. A survey of the different quadtree types is presented by Samet (1984, 1990) and online demos are proposed by Brabec and Samet (2003). The most widely known quadtree, called region quadtree, allows cutting an image in regions or quadrants according to a given split criterion (for example, color homogeneity). As explained by Shusterman and Feder (1994), a quadtree allows representing images at different levels of resolution. This section recalls the general principles of quadtree and presents approaches using it to store image feature vectors.