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A Fuzzy Rule based Compact Composite Descriptor Appropriate for Hand Drawn Color Sketches Retrieval

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Abstract: In this paper, a new low level feature suitable for Hand Drawn Color Sketches retrieval is presented. The proposed feature structure combines color and spatial color distribution information. The combination of these two features in one vector classifies the proposed descriptor to the family of Composite Descriptors. In order to extract the color information, a fuzzy system is being used, which is mapping the number of colors that are included in the image into a custom palette of 8 colors. The way by which the vector of the proposed descriptor is being formed, describes the color spatial information contained in images. To be applicable in the design of large image databases, the proposed descriptor is compact, requiring only 48 bytes per image. Experiments demonstrate the effectiveness of the proposed technique.

1 INTRODUCTION

As content based image retrieval (CBIR) is defined any technology, that in principle helps to organize digital image archives by their visual content. By this definition, anything ranging from an image similarity function to a robust image annotation engine falls under the purview of CBIR (Datta et al., 2008).

In CBIR systems, the visual content of the images is mapped into a new space named the feature space. The features that are chosen have to be discriminative and sufficient for the description of the objects. The key to attaining a successful retrieval system is to choose the right features that represent the images as "strong" as possible (Chatzichristofis and Boutalis, 2007). A feature is a set of characteristics of the image, such as color, texture, and shape. In addition, a feature can be enriched with information about the spatial distribution of the characteristic, that it describes.

Regarding CBIR schemes which rely on single features like color and/or color spatial information several schemes have been proposed. The algorithm proposed in (Jacobs et al., 1995) makes use of multiresolution wavelet decompositions of the images. In (Pass et al., 1997), each pixel as coherent or noncoherent based on whether the pixel and its neighbors have similar color. In (Rao et al., 1999)(Cinque et al., 2001)(Lim and Lu, 2003) are presented the Spatial Color Histograms in which, in addition to the statistics in the dimensions of a color space, the distribution state of each single color in the spatial dimension is also taken into account. In (Sun et al., 2006) a color distribution entropy (CDE) method is proposed, which takes account of the correlation of the color spatial distribution in an image. In (Huang, 1997) a color correlograms method is proposed, which collects statistics of the co-occurrence of two colors. A simplification of this feature is the autocorrelogram, which only captures the spatial correlation between identical colors. The MPEG-7 standard (Manjunath et al., 2001) includes the Color Layout Descriptor (Kasutani and Yamada, 2001), which represents the spatial distribution of color of visual signals in a very compact form.

The schemes which include more than one features in a compact vector can be regarded that they belong to the family of Compact Composite Descriptors (CCD). In (Chatzichristofis and Boutalis, 2008a) and (Chatzichristofis and Boutalis, 2008b) 2 descriptors are presented, that contain color and texture information at the same time in a very compact representation.