Shape Image Retrieval in Fuzzy Clustering Paradigm

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Abstract

Shape of an object is a fundamental image feature and belongs to one of the most important image features used in Content-Based Image Retrieval (CBIR). Examples of shape-based image retrieval include but are not limited to trade mark images, logos, art, medical information systems, etc. Fuzzy k-means clustering is one of the clustering analysis techniques used in pattern/image classification methods and deals with those situations in which no information about the data groups is available and the goal is to to find an appropriate group of data. In this paper, based on Fuzzy k-means clustering and artificial neural network, we propose an efficient mechanism for indexing and shape-based retrieval of images from a given image database. In our scheme, Moment Invariants are used as feature descriptors for shape representation and image retrieval while neural network is used as an intelligent search engine. Fuzzy k-means clustering is used to provide learning samples for the neural network to facilitate back-propagation training. The moments of the object in query image are computed on-the-fly and the already established index consisting of moments of stored images is utilized to retrieve similar images. Some of the important contributions of our shape matching and retrieval approach are that it is independent from scale, translation and rotation of the shape of the query or the database images. Decision of classification of images is based on the moments using fuzzy k-means clustering and the scheme provides efficient retrieval of stored images through the use of an artificial neural network which in our scheme serves as an intelligent search engine and optimizes the search process. We have evaluated our system's performance using an image database consisting of a subset of images from the Amsterdam Library of Object Images (ALOI) using 10,000 binary images from a number of different domains. This selected image collection contains 200 different groups of images such that each group has 50 images which are identified as relevant images whereas images from different groups are considered to be all irrelevant images. We have evaluated our system performance for a number of different parameters such as learning samples, number of clusters, retrieval threshold, quality of retrieval and compared it with a similar scheme employing non-fuzzy k-means clustering technique.