

ABSTRACT

To create and store images in digital formats with the availability of easy and inexpensive methods, the process of preserving and sharing visual information has grown dramatically. The ability to make its content easily available to its users is the main central aspect of digital libraries, and therefore for image-related search tasks they provide adequate retrieval mechanisms. As personal digital libraries as well as automatically acquired image collections, traditional text and metadata-based approaches are not sufficient, commonly lack detailed descriptions that could be used for searching the required image. In digital libraries also methods from content-based image retrieval (CBIR) are needed, to better support image search: by using the image content itself, CBIR provides mechanisms to search for images and compares the images with visual input that the user provides and ranking the results based on similarity.

To alleviate the vacuum between the low-level image features and high-level semantic concepts is the main problem of CBIR system. A highly robust and efficient shape descriptor based CBIR model has been proposed in the present research work. Canny edge algorithm is employed by the proposed scheme to identify strong key points on the edges, whereas for key point set formation the generalized distance transform scheme has been used. On the other hand, shape feature and combination of shape and Histogram of Oriented Gradients (HOG) are used by proposed approach, to make proposed CBIR system more robust. Unlike conventional approaches, here a robust deformation cost deploy shape descriptor has been suggested that efficiently eliminates the irregular set of key points and therefore safeguard optimal shape description along with the histogram of gradients (HOG) descriptor is incorporated with shape feature. The present research work illustrates two cases for content-based image retrieval system. They are: (a) image retrieval using shape feature and (b) image retrieval using combined shape and HOG feature. For performance evaluation, extracted features are fed to classifier like Support Vector Machine (SVM) and K-Nearest Neighbor (K-NN). According to Wang and Corel-5K Image Dataset the experiments have been carried out on two different benchmark dataset. Classifiers are used for better classification for various classes present in the dataset and then for retrieval we used similarity matching using Manhattan distance metric.

The performance of the proposed CBIR using shape descriptor model is simulated on the Wang image dataset which illustrates 97.11% precision and 97% recall using SVM classifier. The sensitivity and specificity obtained are 96.9% and 99.7% respectively. Similarly, using shape based feature extraction like 92.64%, 93.93% and 91.67% using SVM classifier for Corel-5K dataset classification accuracy, precision and recall results are achieved. Using HOG based feature extraction in combination with shape descriptor are 94.25%, 95.09% and 93.42% using SVM classifier for Corel-5K dataset classification accuracy, precision and recall results are achieved. The proposed shape descriptor in combination with the HOG descriptor gives better result than the independent shape descriptor.

The efficiency of the proposed shape descriptor is 97.93% precision and 97.40% recall, the simulation results obtained with Wang image datasets has been attested using K-NN classifier. The sensitivity and specificity is 97.4% and 99.711% respectively. Similarly, using shape based feature extraction with K-NN as classifier for Corel-5K dataset results in 93.40%, 96.42% and 93.16% classification accuracy, precision and recall results are achieved. Using HOG based feature extraction in combination with shape descriptor are 96.55%, 97.57% and 96.53% using K-NN classifier for Corel-5K dataset classification accuracy, precision and recall results are achieved.

A comparative study of the results depict that K-NN classifier perform better than the SVM classifier. When the independent shape descriptor and the existing object segmentation by J.J Chen et al. [25] is evaluated against the proposed HOG descriptor in combination with shape descriptor, the latter gives more desirable result. The proposed model can be used in diverse realistic environmental conditions like illumination, cluttered background and various viewpoints.