ABSTRACT

The enormous growth in the internet and multimedia technology has generated a huge amount of data in the form of images, videos, and audio. This has created the demand of systems which can store and retrieve multimedia data like images in an effective and efficient manner. Content Based Image Retrieval (CBIR) is the searching, navigation and retrieval of images based on their visual content. Visual content of image include color, texture, shape and spatial location of objects depicted in the image. The low level features like color, texture and shape have limited capability for describing visual contents of an image. Therefore semantic gap is observed between visual interpretation and representation of images with low level features.

Researchers all over the world are trying to fill this semantic gap using low level features and their combinations. This thesis is a next step in this series. A number of problems in existing low level features and retrieval systems are identified and their solutions are proposed.

Generally the accuracy of a Content Based Image Retrieval system decreases as the number and variety of images increases in the database. Similar images depicting different semantic concepts may be retrieved as a result. In addition, the extraction of shape features requires accurate segmentation of images. However, segmenting image itself is an open problem; therefore extraction of shape features is not much reliable. A CBIR using multistage retrieval strategy is proposed here to deal with these problems.

Low level features of an image can be local and global. Global features are extracted using whole image and local features are extracted from a local region or part of image. Local features based CBIR systems are called Region Based Image Retrieval systems (RBIR). Accuracy of a RBIR system is higher than corresponding global CBIR in general. The traditional RBIR systems
face the problem of precise query formulation and higher response time. In addition relative locations of different objects should also be considered for increasing the retrieval accuracy. To deal with these issues a region code based retrieval scheme is proposed in this thesis.

Local Binary Pattern (LBP) based descriptors are very effective in analyzing and classifying texture of an image. The traditional LBP is sensitive to noise and have limited discrimination capability of identifying different texture structures. For improving the LBP and increasing the classification accuracy a more robust framework LBP named as Local Structure Pattern (LSP) have been proposed here.

Color and texture are most commonly used descriptors for image retrieval. In this thesis, we have proposed a Short Run Length Descriptor (SRLD) for integrating color and texture properties of image. Proposed SRLD and its histogram (SRLH) can thoroughly describe the correlation between color and texture of an image.

Finally, a region based image retrieval system using integrated color, texture and shape feature is developed. The proposed system uses region codes based technique for matching the regions. The color, texture and shape information is represented using an improved LBP based framework of Completed Local Structure Patterns (CLSP) on color and gray level images.

The proposed image descriptors and retrieval system are tested on representative image databases like Corel, Outex, Broadatz etc. The experimental results have verified that the proposed technique has better retrieval and classification performance in comparison to the existing state-of-the-art techniques.