

because of their better correlation with human perception. Histogramming is the most commonly used scheme to capture the color composition of an image. For 24-bit images, the number of bins in the color histogram is 2^{24} . Since such a high resolution is not needed for image similarity retrieval, it is common to quantize the color space by either reducing the color resolution or color depth¹⁰. Global color histogram, whether quantized or not, suffers from one drawback; it is not able to capture the spatial component of the color composition of an image. Consequently, images retrieved using global histogram similarity are frequently found unacceptable. This has led to many variations of histogramming. For example, a local histogramming approach is suggested in² where an image is divided into 9 equal partitions and each partition has its own local color histogram. In⁵, a multi-level histogramming approach based on quad-tree structure is used to incorporate spatial component of the color composition of an image. Although these variations of color histogramming are able to capture the spatial distribution of color information, they do not provide an efficient representation scheme. The color information of each image is represented in a very high-dimensional space because of many local histograms. This leads to high storage demands and inefficient searches during similarity retrieval.

In this paper, we present a novel representation scheme for encoding the color composition information of images that captures the spatial distribution of color information in images and at the same time is relatively compact with respect to existing methods. Our representation scheme is based on the HSI color space, which is closely related to Munsell color system. The suggested scheme uses dominant hue and saturation values, which are determined for different parts of an image through a process of block-based histogram building and peak detection. The proposed color composition representation scheme is called Color-WISE as it is part of the Wayne Image SEeker (WISE) being developed in the Vision and Neural Networks Laboratory at Wayne State University. WISE consists of several independent modules that can be combined to search for images using any combination of color, shape, and texture features. The search scheme used by Color-WISE at present is based on the search engine of the Microsoft Access database; however, a neural network-based search method is currently under implementation.

The organization of the remainder of the paper is as follows. Section 2 describes the details of the Color-WISE system. Section 3 provides details of a performance evaluation study comparing the performance of the proposed representation scheme with respect to global and local histogramming schemes. Finally, a summary of the work and future directions are given in Section 4.

2. AN OVERVIEW OF COLOR-WISE

Color-WISE is an image similarity retrieval system which allows users to search for stored images through three kinds of visual queries. The first kind of query, called *full-image query*, consists of a user asking the system to show stored images that are similar to the query image in terms of color composition. This is the most frequently used mode of querying. The second kind of query allowed in Color-WISE is *query by painting*. In this mode, a user can paint an image to show to the system the desired color composition. The third kind of query permitted in Color-WISE is called *partial-image query*. In this mode, a user can ask the system to show stored images that exhibit the desired color composition at certain image locations, for examples images with blue color in the center. The user queries the system through an interface as shown in Figure 1. The system has a number of parameters that are set to default values; however, a user can change some of these parameters.

Since an image similarity retrieval system is characterized by three major components consisting of the image content representation scheme, the similarity metric, and the search organization, we provide below a description of Color-WISE in terms of these components.

2.1 Image Content Representation in Color-WISE

The image content representation scheme in Color-WISE is guided primarily by three major factors. First, the representation must be closely related to human visual perception since a user determines whether a retrieval operation in response to an example query image is successful or not. Second, the representation