Chapter X

Algorithm for the Retrieval of Image with Emergence Index in Multimedia

Sagarmay Deb, University of Southern Queensland, Australia
Yanchun Zhang, Victoria University of Technology, Australia

ABSTRACT
We discuss here emergence phenomenon where we study the hidden meanings of an image. We present this concept in image database access and retrieval of images using this as an index for retrieval. This would give an entirely different search outcome than an ordinary search where emergence is not considered, as consideration of hidden meanings could change the index of a search. We talk about emergence, emergence index and accessing multimedia databases using emergence index to locate geographic areas in this paper along with the algorithm.

INTRODUCTION
Content-based image retrieval (CBIR) is a bottleneck of multimedia database access. Although plenty of research has been dedicated to this area during the last decade, it has yet to attain maturity. Original text-based approaches in image retrieval were time consuming and expensive as they involved manual processing of image data
which could sometimes be very voluminous. Attempts have been made to combine text-based and content-based retrieval (Gudivada & Raghavan, 1995) and quite a few models like QBIC, Virage, Excalibur, Attrasoft, Pichunter, VisualSEEK, Chabot, and Photobook have been developed. Fully automated CBIR has been developed very recently using low-level features like color, texture, shape and spatial locations. A few models are now commercially available like QBIC, Virage, Excalibur, Attrasoft and others. Also, non-commercial models developed by universities and research institutions are available. But they do an approximate match between input and objects of image databases. Thorough image segmentation, which is vital to accurate retrieval, is not yet achieved.

CBIR has been defined in three levels. Level 1 talks about finding symmetry between input image and images of databases. To some extent, success has been achieved in this level. Level 2 is about finding semantic meanings out of the image like ‘Find a double-decker bus in an image.’ Only very limited success has been achieved in this field. One of the best known works in this field is of Forsyth and others (Forsyth et al., 1996) by successfully identifying the picture of a human being within an image and this technique has been applied to other objects. Level 3 is about finding inner meanings of an image like ‘Find pain in an image.’ This requires very sophisticated and complex logic and segmentation. Very little has been achieved so far in this level with state-of-the-art technology (Eakins & Graham, 1999).

Although quite a few commercial and non-commercial models are developed, none of them attempted to study the implicit meanings of the images. We achieve more accurate and different search outcomes when implicit meanings are also considered. For example, we can consider a square with one diagonal. This is the explicit meaning of the image. But when we consider implicit meanings, we end up getting two triangles in it. This is what we mean by emergence.

We will use content-based image retrieval where we would define our index, based on contents of the image, studying also the emergence phenomenon in the process for a more accurate search.

The chapter provides the definition and application of emergence index using pictures and the application of emergence index in image query processing. The section “Emergence Index” gives the definition and the section “Calculation of Emergence Index Using a Geographic Location” gives the calculation of emergence index and of establishing symmetry for a geographic location. “Algorithm for Accessing Databases with Emergence Index” presents the algorithm for accessing multimedia databases with emergence index. We make our conclusion at the end.

**MAIN THRUST OF THE CHAPTER**

**Emergence Index**

Features of an image, which are implicit or hidden, are emergent features if these can be made explicit.

**Examples of Emergence**

Shape emergence is associated with emergence of individual or multiple shapes. Figure 1 contains examples of shape emergence.
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