On the Visualization of Image Databases

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Abstract

The content-based image retrieval method in image databases is to define an input image, which can contain additional information, e.g., applicable matching strategy etc. — and the output retrieved by the system is a collection of images meeting the given matching criteria (e.g., the given similarity levels). So the user defines the query image by the help of a similar-picture, sketch-based or iconic interface. The output is a set of images similar to the query image. When we give a query image q then the system extracts the feature vectors of q and matches them to the vectors of the images in the database.

There is an approach which distinguishes five spaces in image databases, namely the composition space C, the query space Q, the feature vector space F, the output space O and the display space D. In case of a general query in an image database, users formalize their query in space Q via space C to transform space F into space O. These steps are very important to get the similar images to a query image q as a result set in the image database. But it is very important to display these images, as well. This step — namely the visualization — can be considered as a transformation between O and D. In this paper I show four different models to visualize the result sets.

The four models are: the line model, the matrix model, the fish-eye model and the star model. Actually, none of them is better than the other. They are alternative solutions to visualize the images of the result sets in image databases. They are different in various parts of the visualization and the navigation. There are parts where they are great and in some other problems they are poor.

The line model is great when textual or extra information is needed to be displayed with the images, but it is not too good at the navigation, and it can display only a few images at the same time. The matrix model increases the number of the commonly displayed images, but its navigation is also weak, and cannot give good solution to display extra or textual information. At this point, we want to improve the navigation facility of the models. Therefore the fish-eye model is proposed to use. It is great in the navigation and it can indicate the clusters in space O, but it is very computational-intensive. That is the reason why I developed the star model, which has good navigation feature, it does not decrease the number of the displayed images at the same time and, mainly, it is not computational-intensive. Unfortunately, it cannot indicate the clusters in O, and cannot give a good solution to display extra information with the images (neither can the fish-eye model).