

Description of the Problem

Initially, our group were given a short and vague description of the problem we need to solve. Our first task as a group was to interpret the description we were given, and refine it to make it more specific. This would then form our formal specification to work to. The original description we were given is as follows:

The rapid expansions of the Internet and fast advance in digital imaging technology have enabled the wide spread use of image libraries and databases. One of the challenges in managing large image databases is the indexing of images. There are generally two approaches to indexing textual-based and content-based approaches. In textual based approach, an image is annotated with a set of keywords that appropriately describe the visual content of the image. Database access/image retrieval in this approach is based on keyword (text) search/matching. In contrast, content-based approach uses advanced image processing/computer vision techniques to extract a set of visual features (such as colour distributions, texture characteristics, objects shapes etc) from the image as its annotation. In this second approach, database access/image retrieval is based on "query by example" whereby the user presents the system with an example (image) and retrieves from the database those images that are similar (to the example).

Last year, a group of student has successfully developed an image indexing and retrieval system based on text. Your task is to extend the system to enable image indexing and retrieval based on visual contents.

Specification

After carefully analysing the description of the task that had been set to us, we set about refining it to produce our own interpretation of what we have to do. The result of this became our specification:

Specification

The group is to design and implement a program that allows an image provided by the user or supplied in a database, to be queried against an existing database of images. The program is to be created in Java. It shall return a list of thumbnails, as defined by the results of the query, containing images that are most similar to the queried image in terms of colour and colour distribution. Any one of these thumbnails can be selected as the subject for a further query. Comparison of the images will be achieved through the use of content descriptors based on colour histograms of the image. Other comparison methods may also be implemented, time permitting. The program will initially support images of the popular types .JPEG, .GIF and Windows Bitmaps (.BMP) and possibly others (such as .PNG and .TIFF) if time permits. Once a query has been performed, the query will display the results and possibly use the data for future queries.

The GUI shall consist of one window where all other operations are run from, and this window will have links and menus to guide the user. From this graphical interface the user will be able to perform the queries, and manage the image database adding and removing picture files from it. The database files will be stored as plain text and there will not be a limit on the size of the database or any databases added to the program as long as there is storage space to accommodate them. It will also allow new databases to be created by the user, with any images provided by the user to be added into it. The database file itself will contain information about an image including its location, and possibly other image information such as the histogram data.

The finished program will be a standalone application with all sub-routines and sub-programs being executed within the main program. Documentation for the program shall be provided in the form of a manual as well as help files that can be initiated from within the application via submenus in the GUI. The program will be flexible to support computers of varying processing power, and when displaying and processing images the user can restrict the number of images used.

Reports shall be produced by the group as a whole and by individuals for the following deadlines:

- 6th December 2001 (Interim)
- 7th May 2002 (Final)