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Optimized Image Retrieval System in Oracle DBMS

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ABSTRACT

In this work, the authors are moving towards the creation of an effective image retrieval system in Oracle DBMS. Several DBMSs have been extensively used to manage the textual information stored with images and CBIR tasks usually rely on specific applications. The separation between the DBMSs and CBIR prevents the optimization of integrated search process based on the connection between the textual and visual content description of image. Moreover, the relevance of image retrieval depends directly on the choice of similarity criteria (color, texture, shape) that can give inaccurate results in case of non-trivial selection of these parameters. The purpose of the authors' approach is to build a CBIR system using advanced and integrated retrieval techniques defined in Oracle DBMS. This approach provides an assistance tool that can guide the user to the appropriate choice of search criteria. The authors present an experimental part that measures the performance of their system, which can help the user to correctly model his query by giving the appropriate retrieval criteria for a database with 800 images.

KEYWORDS

CBIR, Image Metadata, Images Database, Integrated Search, Optimized Query, Oracle Multimedia, Similarity Criteria, Visual Content

1. INTRODUCTION

The continued improvement in the quantity of multimedia data, especially images, led to a large mass of image databases which results two major challenges: storage and image processing.

Since 1990, scientific research focused on the development of a new way to retrieve images which can be automatic and effective (Singhai, 2010) (Walter, 2006). Among these systems we can quote: QBIC (Query By Image Content) (Pecenovic, 1998) of IBM, BlobWorld system (Pecenovic, 1998) of California University, the website img(Anaktisi) (Zagoris, 2009), MedFMI-SiR system (Daniel, 2011) and the ImageFinder (Payel, 2011).

The major problem related to the development of content based image retrieval system consists of the establishment of technical which can describe the visual content of image and take in consideration the needs of users and their different points of view regarding image interpretation (Park, 2002). Thus, the choice of search criteria shall be achieved based on all relevant information available on all the image data, so the contribution of the less significant features will be neglected.

Despite their usefulness and popularity, the systems we have mentioned have certain limitations, such as imprecise results, low interactivity, lack of semantic in query processing and functionalities to effectively model the query by selecting the appropriate search criteria.

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In CBIR system, it is important to take account the semantic description of the image based on the metadata and the textual description stored with each image. The semantic description is the complementary part of the image visual content (Ahmad, 2015) which leads to an integrated retrieval engine that can execute optimized query by combining textual and content based image retrieval. Moreover, the choice of similarity criteria is empirical, and it is necessary to try to correctly model and control these parameters. If they are set improperly, the results of search will be irrelevant and unsatisfactory to the user needs. The selection of the appropriate criteria and the choice of their accurate weight depend of the type of image database, and the user need. Actually, in CBIR systems, the user randomly selects the search criteria which can produce a loss of precision in the result and force the user to repeat the selection of new coefficient with different weight several times so that it can find relevant search results.

This work is part of image retrieval (by content, by index, by key word, etc.). The aim of this paper is to enable the user to navigate in the image database and perform the search by content based on an appropriate selection of search criteria and a combination with the semantic description of image metadata using Oracle DBMS. To achieve this, we divided the work into two main parts. The first part concerns the extraction and identification of features model (Scholkope, 1995) (Kovesi, 1996) composed of relevant attributes and the modeling of different types of search queries by performing an integrated search that combines textual and content based retrieval. To achieve this goal, we used Oracle DBMS that would lead to: an advanced modeling of image type using a signature that describes the visual content of image and the modeling of an integrated and quick search based on text and content indexation (Veltkamp, 2002). Afterwards, the choice of the appropriate query will be determined by a selection of a combination of search criteria that gives the most elevated accuracy in retrieval results. The selection of Oracle DBMS is justified by the advanced modeling of image using Oracle Multimedia feature that represents an extension part to retrieve multimedia data by content. This extension enables Oracle Database to store, retrieve, and manage images using text, content-based description and index to make query faster (Larry, 2007).

In this paper, we present a CBIR system that allows the visual navigation in database (Idrissi, 2008), the integrated search and the choice of the best similarity criteria for our image database to lead to the closest results of image query. This work represents an optimization of our image retrieval system (Kaouther, 2015) that was implemented under the Oracle DBMS.

Besides this introduction, our paper includes the following sections. Section 2 gives an example of existing CBIR systems. Section 3 represents a summary of Oracle image retrieval system. Section 4, represents the principle of similarity criteria choice. Section 5 represents our new approach. Section 6 represents the validation of our approach. Finally, we conclude by evaluating this work and proposing some future perspectives.

2. CBIR SYSTEM

2.1. Classical Architecture of a CBIR System

In content based image retrieval approach, the descriptive model associated with image in database is represented as a feature vector (signature). This vector contains a reduced description of the visual content stored in the image. After that, a comparison will be made between a query image and images database for the classification step using a distance measured between feature vector of the query image and the images vectors stored in database. The architecture of this system is divided into two main parts:

- The offline phase: in this phase the attributes are automatically extracted from images of database and stored in vectors. Then, these vectors are stored in a database of descriptors.
- The online phase: aims to extract the features of a query image given by the user then compare it with descriptors stored in database to select similar images to the query.

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