Evaluation of resources on object-relational database management systems for image similarity queries.

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Abstract

The purpose of this research was survey the resources on object-relational database management systems, following the SQL/MM standard for analyze the efficiency and effectiveness on image similarity queries.

Key words: image similarity query, complex data type, object-relational database management systems.

Introduction

Multimedia data (image, video, audio or text) can be processed as complex data types for an object-relational database management system (DBMS) using standardized resources by SQL:1999 and specifically by SQL/MM (MELTON; EISENBERG, 2001).

Based on these standards, we made an analysis of the resources of the main DBMSs in the market (MySQL, PostgreSQL, Oracle, DB2 and SQL Server) for similarity queries in image data type (Still Image). Among DBMSs evaluated, the Oracle was the only one that has full standard resources of the SQL/MM.

Considering the images sets geometric, monochrome and facials, we did tests using these images in Oracle 12c® for evaluate effectiveness and efficiency on image similarity queries.

Results and Discussion

The results of the tests showed that Oracle 12c® is more effective in similarity queries with sets of images that preserve features of color, shape and texture. Thus, the best cases were the set of geometric images (Figure 1 – Geometric) and the set of monochrome images (Figure 1 – Monochrome), while the worst was the facial images (Figure 1 – Facial). Besides, we made tests with a set of mixed images, which had a large number of false-positives (Figure 1 – Mixed).

Figure 1. Effectiveness of image similarity queries on Oracle 12c®, considering sets of geometric, monochrome, facial and mixed images.

As for efficiency, it is important to consider that comparison by similarity is not performed directly on the images, but on their features (shape, color and texture). Thus, initially we made the image features extraction at the query execution time. In this case, we had a gain of time to insert the image in the database and a loss of time in query execution (Table 1 - No strategy). However, considering that query is the operation more costly for a DBMS (CASANOVA; MOURA, 1999), can be used the strategy to extract the image features at the insert time and save them in database, enabling for use them directly in queries. This increases the efficiency of queries around 50% (Table 1 - With strategy).

Table 1. Efficiency of image similarity queries on Oracle 12c®, considering insert and query times.

	Insert time	Query time	Total
With Strategy	44,12s	42,70s	86,83s
Without Strategy	3,97s	85,26s	89,23s

Conclusions

The implementation of image similarity queries in object-relational DBMSs is relatively easy when the DBMS has resources in agreement with Still Image data type, provided by SQL/MM. However, the effectiveness is limited to basic features of color, shape and texture. About the efficiency, we concluded that the extraction of image features takes time and it is better accomplish this process before execution of queries.

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