Web Content-Based Image Retrieval System Based on 4-D Structural Features

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Abstract – **An approach to search images from a databases by structural features got from the three stages clustering algorithm is considered. Software packages architecture for visual pattern processing is presented.**

Keywords – **clustering, content-based image retrieval, structural properties, visual pattern.**

I. INTRODUCTION

The existent universal content-based image retrieval (CBIR) systems attribute to one of three categories depending on approach of extracting features: a histogram, coloured location, and region-based. Extracted features are stored in a visual feature database. In the searching phase, when a user makes a query, a feature vector for the query is compared to the vectors in the feature database. The images most similar to the query are returned to the user. A successful image categorization will greatly enhance the CBIR systems performance by filtering out images from irrelevant classes during matching.

Most of the image search systems haracterized by low accuracy and search efficiency, and the main drawback of all the practical implementations is the replacement of the entire database search sorted descending images similarity with an image-query, and as a consequence, poor performance and inability to answer a query in real-time.

II. CBIR PROBLEM

In general, the content-based image retrieval problem is to create a image set that are relevant to the user's image-request, arranged in decreasing relevance order, and to choose the optimum between the time minimization and images relevance maximization.

To solve this problem we solved the following subtasks:

1. *Image decomposition*. For the images decomposition used three-stage clustering hierarchical agglomerative algorithm [1].

2. *Optimization algorithms to reduce their complexity*. An approach to reduce the multistage decomposition algorithmic complexity and decompose key sets and their clusters at certain rolling-up tree levels is developed [2].

3. *4-D structural feature extracting*. A method for obtaining the transformation and blur degree coefficients, integrated and distributed images structural properties based on their three-stages clustering algorithm is developed [3].

4. *Image classification*. Proposed and studied three methods of automated images classification [1, 3].

5. *Image key forming*. These structural properties suggested to use as an image key.

6. *Indexing images*. Each image from a graphic database is associated with a file index, which is stored in the light of the image class in the appropriate directory in the XML file.

7. *Search images by keys*. Based on the established mathematical software information software package with user interface is developed.

III. PROGRAM PACKAGE ARCHITECTURE

A program package "Clustering" with an user interface is developed. Package controls all work phases: the image specifying, setting the control parameters, a algorithms progress reports, numerical parameters results etc. The package includes the following subsystems and components that interact with each other:

− *Core* (class library) contains the classes implemented algorithms, functions and procedures for the image decomposition, keys extracting and forming, image indexing, searching and processing.

− *Pattern Clustering* and *Pattern Keys Clustering subsystems* (windows design) are developed for interactivity with the user input and baseline data verification, specifying the required parameters.

− *AForge.NET* and *ZedGraph components* (class libraries) are an open source projects written in C#.

IV. CONCLUSION

An approach to solving content-based image retrieval problem using 4-D structural features obtained as a clustering result, allowing comparison with other approaches to improve the search images quality is developed.

Information, software based on established mathematical support for hierarchical decomposition, image classification, indexing, analysis and searching are developed.

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