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A Query by Example Approach for Retrieving 3D Images Based on Their Visual Similarity

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Abstract: With the amount of superhighways, a vast amount of data is currently available on the internet. The advances in the methods for processing and coding images, video and audio have led to a wide spectrum of non-traditional forms of data being available across the network. Text, images video and audio data, all perhaps stored in multiple heterogeneous formats, form the core of what is known today as multimedia data. 3D objects are an important multimedia data type with many application possibilities. 3D models can represent complex information, and the problem of content-based searching in large 3D object repositories arises in a number of practical fields. The large amounts of 3 D objects as multimedia data that are being collected in multimedia archives have originated the need for means to search the archives. It is recognized that, unlike text, for which effective content-based retrieval ways are presently used, it is challenging to automatically indexed or search 3D image supported their content. For this, it is necessary to make use of any available description associated with the objects, concerning either the content itself or the context of the objects' production and use. Metadata is getting a fair share of attention in current research on solutions to the querying of multimedia objects. But retrieval of multimedia information on the basis of only keyword or metadata will not solve the problem, in the present manuscript we have proposed a web based multimedia information storage and retrieval model is proposed for the integration of metadata and content. This model is tested on the implementation of a prototype of multimedia information storage and retrieval system based on a relational database. Statistical functions are used on medical images to calculate similarity for storage and retrieval.

Keywords: 3D images, Multimedia, Visual Similarity, Storage and Retrieval.

I. INTRODUCTION

A multimedia database deals with the storage, manipulation and retrieval of all types of digitally presentable info objects such as text, still images, video and sound. Providing mechanisms that allow the user to retrieve desired multimedia system info is associate degree vital issue in multimedia system info. The purpose of this manuscript is to present the actual knowledge management (storage, indexing and retrieval) requirements for totally different forms of media knowledge so present the methods, methods and techniques obtainable in relational info management systems. The objective is two-fold: first, to gain an understanding for the present progressive within the management of multimedia system knowledge and second, to identify areas requiring more analysis efforts.[1][2] A multimedia info system that may store and retrieve attributes text, and colour pictures, digitized voice or music, videos. Metadata is knowledge that describes alternative knowledge.

Meta is a prefix that in most information technology usages suggests that "an underlying definition or description." Metadata summarizes basic info concerning knowledge, which will build finding and dealing with specific instances of knowledge easier. For example, author, date created and date modified and file size square measure examples of terribly basic document data. Having the ability to filter through that metadata makes it abundant easier for somebody to find a selected document. A multimedia data retrieval system differs from an ancient retrieval system in 2 main aspects:-

• The structure of multimedia objects is additional advanced than the structure of typical matter knowledge, handled by ancient data retrieval system.
• It is difficult to outline similarities, since spatial and temporal aspects have to be taken in account.[2][3]

Both aspects create it tough to formulate associate degree acceptable question and to search pictures or images. One of the key problems to be solved is the development of metadata, that is, the generation, structuring, representation, management and proper utilisation of data or information about data. For example the multimedia achieves like various Protein databases provides the retrieval of similar structure proteins only through keywords. Content based or structural similarity retrieval is still a goal to be achieved. Multimedia information system concern with the basic concepts and techniques in retrieving information. It is indexing and similarity based retrieval of multimedia data. The purpose of an automatic retrieval strategy is to retrieve all the relevant documents whilst at the same time retrieving as few of the non-relevance ones at the possible. Metadata describes other data. It provides information concerning a sure item's content. For example, an image might embody information that describes however giant the image is, the colour depth, the image resolution, when the image was created, and other knowledge.[4][11] A text document's metadata might contain data concerning however long the document is, who the author is, when the document was written, and a short summary of the document. Metadata can be created

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manually, or by automated knowledge method. Manual creation tends to be more correct, allowing the user to input any knowledge they feel is relevant or needed to help describe the file. Automated data creation can be far more elementary, usually entirely displaying knowledge such as file size, file extension, when the file was created. The main purpose of metadata is to facilitate within the discovery of relevant info, more typically classified as resource discovery. Metadata what's more composes electronic assets, give computerized ID, and backings documenting and protection of the asset. Metadata helps with asset disclosure by "permitting assets to be found by important criteria, recognizing assets, bringing comparative assets on, recognizing disparate assets, and giving area data".

For example, a digital image may embody data that describe however giant the image is, the colour depth, the image resolution, when the image was created, and other knowledge [5][6][7]. A text document's metadata might contain info concerning however long the document is, who the author is, when the document was written, and a short summary of the document. Metadata among net pages may contain descriptions of page content, as well as key words linked to the content. These links are typically known as "Meta tags", which were used as the primary key about determinant order for an internet search till the late Nineties. The reliance of Meta tags in web searches was faded in the late Nineties attributable to what are often shows as "keyword stuffing". Meta tags were being largely victimized to trick search engines into thinking some websites had additional connection in the search than they very did. Metadata is knowledge. As such, metadata will be hold on and managed during a information, often known as a data written account or data repository. However, without context and a purpose of reference, it might be not possible to spot data simply by observing them.

II. STATE OF ART OF MULTIMEDIA INFORMATION RETRIEVAL

Multimedia Information Retrieval (MMIR or MIR) is a research discipline of computer science that aims at extracting semantic information from multimedia data sources. Data sources include directly perceivable media such as audio, image and video, indirectly perceivable sources such as text, bio-signals as well as not perceivable sources such as bio-information, stock prices, etc. Multimedia data Retrieval has become one of the foremost active sub-fields of multimedia system analysis. While progress has been vital in analysis, however, there has been little progress in the development of applications for widespread use. The purpose of this panel is to induce an outline of the most research problems, research and market directions for multimedia system data Retrieval. Image classification, query matching, image standards, attribute classification, and evaluation are the major issues[8]. Image classification is concerned with assigning some higher-level semantic meaning to the amalgamation of pixels that make up an image document[5][6].

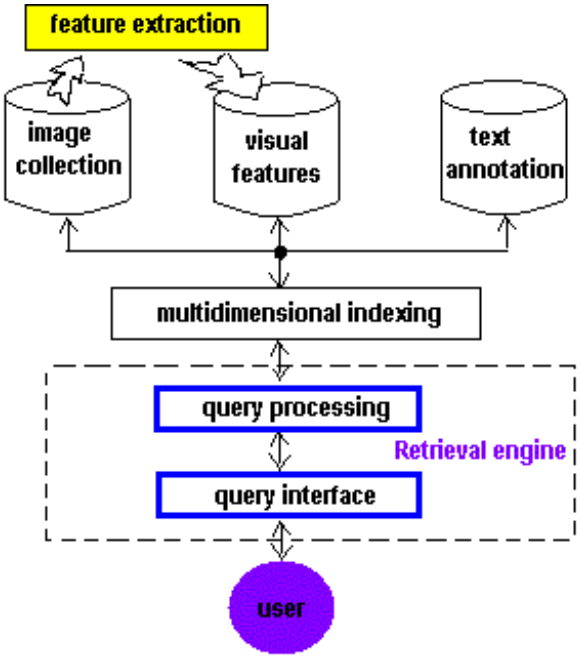

Fig. 1. Conventional approach for Image Retrieval

Usually the primary motivation behind such classification is to enable query matching, but classification is a complex issue, mainly the context is through pattern recognition. Image classification is primarily a pattern recognition problem. For a human being, pattern recognition is innate and often subconscious; optical illusions, for example, play on this fact by generally tantalizing the eye to visualize patterns that unit of measurement inaccurate or incorrect[9]. Even babies learn at a terribly early age to spot a parent's face. For an automatic image method system, however, pattern recognition is a surprisingly difficult draw back. The same level of detail that permits computers to perform large numerical computations with inerrant accuracy works against computers creating an effort to acknowledge patterns in footage. Since two pictures of the same object may be slightly totally different, such as different angles of read, different lighting, different coloring, etc., a computer's precision will not simply "ignore" such variations. Humans, of course, with their (relatively) larger lack of precision, can easily see past minor variations and classify similar objects correctly[8][9]. To facilitate computers with these precision the MMIR systems depends heavily on the quality of the training data. Discriminative descriptions can be extracted from media sources in numerous forms. Machine learning provides categorization methods for all varieties of knowledge. However, the classifier can solely be as sensible because the given coaching knowledge. On the other hand, it requires respectable effort to give category labels for giant databases. The future success of MMIR will depend upon the supply of such knowledge. Problems associated with text-oriented approach, is that although the methodology is simple, it's insufficient since it is manual and time overwhelming and additionally the following indexes unit extraordinarily subjective and tied to a restricted vocabulary.

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III. TYPES OF IMAGE SIMILARITY

The concept of image similarity has to be printed taking into account the kind of images most likely the appliance. Two kind of similarity may be distinguished.

- SEMANTIC SIMILARITY: - Semantic Similarity relates to computing the similarity between ideas that ar not essentially lexically similar. Semantic similarity aims at providing sturdy tools for standardizing the content and delivery of info across act info sources. This has long been recognized as a central problem in linguistics internet wherever connected sources would like to be coupled and communicate info to every alternative. Semantic internet can conjointly modify users to retrieve info in an exceedingly additional natural and intuitive method (as in an exceedingly "query-answering" interaction).
- SYNTACTIC SIMILARITY: - It is supported the essential perception of raw physical characteristics (visual or syntactic features).
- Since it is difficult to spot the set of options that ar most applicable in any given reasonably pictures (medical, satellite, aerial, natural scenes etc.), several analysis teams focus on specific kinds of pictures.

IV. CONTENT BASED 3D IMAGE RETRIEVAL

Content based Image retrieval deals with identifying and extracting features related to image contents. Various methodologies like QBE, Color based similarity, Shape based similarity are in practice for retrieving content based image retrieval. In **Query-by-example (QBE)**[4][6] method user supplies an image and the system finds other images that are similar to it, this method ignores semantic information associated with images. Best ranking functions based on image properties that are not affected by variables like pose, camera focal length and focus, lighting, camera viewpoint, and motion.

In **Color-Based Retrieval** method feature summaries across entire image average color are treated as a global feature, it does not depend on image resolution even though; location of colors is very relevant. Color histograms of different pictures are compared. Colors are quantized into one of N bins; numbers of pixels in each bin are compared. 3D objects are an important multimedia data type with many applications in domains such as Computer Aided Design, Simulation, Visualization, and Entertainment. Protein databases store details of protein structure with a unique ID i.e. PDBID[11]. Similar proteins are mainly searched by either entering PDBID at NCBI search system. All the similar protein's PDBID will be displayed and then user can view them individually. So basically the structure of protein is being compared on the basis of their content. Since proteins are 3D object, they can be retrieved using 3D image processing technique. In this paper we propose a 3 D image retrieval system with high performance and high accuracy using statistical techniques.

V. PROPOSED FRAME WORK

We propose a three layered web model for fast and effective retrieval of 3D images

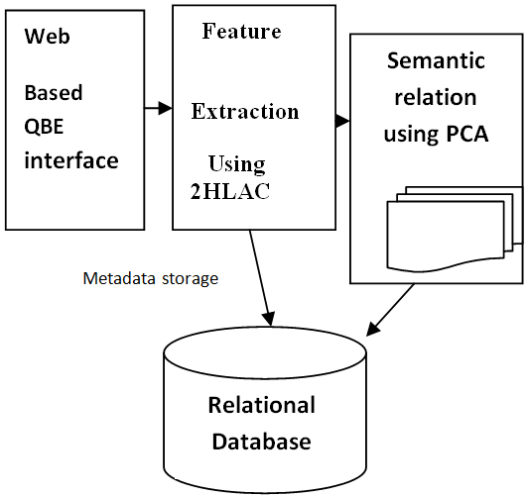

Fig. 2 Frame Work for Retrieval of 3 D Images

1. Web Interface :
Web Interface/ query Interface is implemented as Query by example interface. User will paste/ upload the images whose similar images he/ she is interested in finding. To find the matching 3D objects the image will be rotated and images on different angles will be passed to the feature extraction layer.

2. Feature Extraction Layer:
Feature Extraction Layer's job is to extract the feature, 2D HLAC features are used to extract the features. HLAC features are the most suitable for visionary based image retrieval.

3. Semantic Layer:
At Semantic Layer we have done Principal Component Analysis. Principal Component finds linear combinations that maximize variance subject to being uncorrelated with those already selected There are few such linear combinations-- known as principal components. The idea is to find a k-dimensional projection where $0 < k < d-1$.

4. Database Layer:
At database layer we have used relational database Oracle 2008, for storing the features and link of images.

VI. CONCLUSION

Content based retrieval of multimedia objects, can be done using text oriented approaches. But for retrieving the object on basis of their visual similarity use of statistical analysis is required on extracted features. For achieving semantic similarity the metadata approach is required. In present manuscript an algorithm is proposed which is combining the visual similarity and semantic. Using the proposed approach the specific domain such as medical image retrieval can be done easily.

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