



Available online at www.qu.edu.iq/journalcm

JOURNAL OF AL-QADISIYAH FOR COMPUTER SCIENCE AND MATHEMATICS

ISSN:2521-3504(online) ISSN:2074-0204(print)



A Review of Image Retrieval Based on Ontology model

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ARTICLE INFO

Article history:

Received: 01 /11/2019

Revised form: 00 /00/0000

Accepted : 30 /12/2019

Available online: 16 /02/2020

Keywords:

Ontology Model, Ontology Based Image Retrieval, Image Retrieval, Image Retrieval Based on Ontology.

ABSTRACT

Online retrieval systems for specified Information is more growth, so the need for efficient retrieval schemes become more significant area to employ user's need. Ontology based image retrieval consider more precisely method. In image retrieval system, the necessity for effective technique to achieve image matching. In this paper image retrieval techniques and methodologies are reviewed and concern with Ontology based image retrieval, like "Content based image retrieval (CBIR)" with the extracted significant features (such as: color, texture, and shape features) from the image for using in image matching. Other methodologies are "Text based image retrieval (TBIR)" and "Ontology based image retrieval".

MSC :

DOI : 10.29304/jqcm.2020.12.1.658

1. Introduction

The internet rapid development cause extremely increase to the amount of image collection presented. This growth in image sets like satellite image, medical image, and art works images leads further users from different professional domains (such as: geography, architecture, medicine, and design) to drawn in it[1]. Also, this intensely growing for image retrieval and online browsing lead for finding many images at hand on WWW. The usual retrieval technique based on keyword for multimedia documents, consider that the user searching a number of image has a strict aim in mind. While users generally don't identify their needs, or user aspects a images warehouse that less known area and have semantically complex content [2].

Image retrieval scheme offers an image groups from a collection of images existing in repository of database in which similar to user's requisites in matching estimations such as the similarity in content, edge and color [1].

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Communicated by Qusuay Hatim Egaar

Semantic machineries such as ontology produces promising methodology to image retrieval for drawing image features in low level to high level ontology perceptions. The difference between the current methods of such as image retrieval based on: (content, keyword and text) and the methods of Ontology based image retrieval that concerned with building concepts from image features (i.e.: semantic content), since this be able to aid in pleasing user requisites in better state [3].

2. Image retrieval

Image retrieval is the procedure in which related images based on user's demands retrieved and presented from the image warehouse or WWW. In general, there are two methods; (1) Text based image retrieval (TBIR), (2) Content based image retrieval (CBIR) [2].

2.1 TBIR

This method utilized for giving remarks, keywords, or descriptions to the images in the repository of database. In this process, the metadata of image employed (format, name of file, size and dimension) and the description of image contents [4].

2.2 CBIR

It is the image retrieving Operation from the huge collection of database by considering their own visual content [5]. In this method, in order to take a visual property, a distinctive feature will be used. Figure 1 illustrate features used in CBIR method. The extracted feature such as color, shape, or texture of image produced feature vector for each image [1]. The following are features used in image retrieval [4]:

- Color Features: Since the easy and rapid computation of this feature is utilized in image retrieval scheme. The color feature also considered natural feature, so it has significant role in image identical. In image retrieval technique, the features used (histogram, moments, Color space, color coherence vector, and dominant color descriptor) [4].
- Texture feature: This feature refer to visual patterns with regularity attribute and these cannot outcome from a single color or concentration. Texture is a significant property while pointed image in an image database. This Texture feature includes essential information that explain the structural organization of surfaces and their association to the enclosed environment [5].
- Shape feature: This feature of shape considered elementary features that used for describing the content of image, so its significant visual feature. A difficult task is to give depiction and description to the shape, since when a 3D object of real world will be lost one of its dimension if it is mapping in to 2D image plane. So when the shape is extracted from the image only partially denotes the estimated object [6].

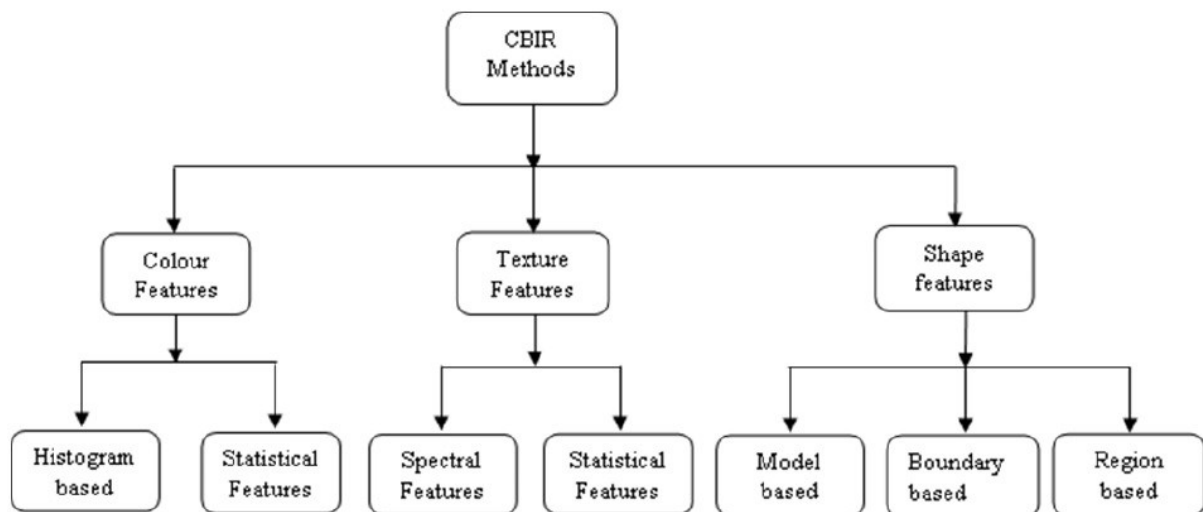


Figure 1: Some Features Used in Image Retrieval Based on Content [5]

2.3 Ontology based image retrieval

The term ontology denotes to the science of metaphysics that give nature description to associate with its relations and properties. In computer science, ontology refer to regular organization of concepts, in which the properties and relations of it can be present in ontology domain of common components that contain (axioms, rules, restrictions, function terms, relations, individuals, attributes, and classes), for providing more information concern to the concepts [3].

Ontology generally comprise of concepts with hierarchical associations, that's mean it a conceptual knowledge source. A concept is an identifier recognized by a word, phrase or label, and describes a real-world entity. Besides that the ontology may have properties that give explanation to the concepts and nonhierarchical relationships among them of ontology [7].

The ontology established on retrieving image by utilizing the representation of knowledge that fuse the mix of features of image retrieval based on text and content. To organize the information of web in structured style, the ontology used, so the contents of web will be comprehend by the computer as well as the user [2].

Ontologies represent reality, i.e. many individuals understood terms and it contain, also comprehend the entities in real representation of these terms. Ontologies consist of terms arranged together in a certain way, and terms are an important subtype of representations (an entity (for example, a term, an idea, an image, a label, a description, an essay) that refers to some other entity or entities). Artifact (human skill or product) something that is deliberately designed (or, in certain borderline cases, selected) by human beings to address a particular purpose include such things as knives, clothing [8].

Knowledge representations utilized for ontology that established retrieving image using combine of text and content features. Web information organized in structured form with a technique offered by ontology. Therefore, the contents of web can be implicit by the computer so long as the user [2].

A vocabulary of representation used in ontology. Each entity in the domain of discussion, referred by term. In another word, an association will be between an entity and its representation, which is generally a name or a symbol that can be intuitively understood by humans [9].

Ontology including a taxonomy that represent some mixing of universal classes and relations between them. In another Word, we can define taxonomy as terms (types or classes) linked by relations and all of them formed in hierarchal structure, as illustrated in figure 2[8].

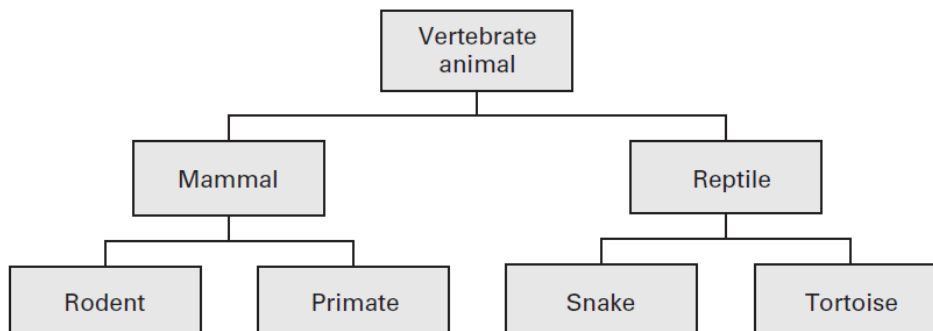


Figure 2: Fragment of a simple taxonomy of vertebrate animals

3. An existing Ontology Image Retrieval works

In Fadzli, and Setchi [10], suggest a semantic-approach to image retrieval based on text for images that manually annotated digital images using statistical methods based on Semantic DNA (SDNA) that extracted from the structured lexical ontology. There are three main techniques in this approach: (1) extraction of SDNA, (2) based on the extracted SDNA the word sense disambiguation using statistical models, (3) using SDNA a semantic similarity measures applied.

RUAN, HUANG, and HONG [11], introduce a framework to semantically retrieving image from dataset archives based on domain dependent ontology. Using unsupervised algorithm to extracting color and texture primitive features gaining homogeneous region that illustrated by concepts (high-level) and arranged by ontology based on domain specified. For associated regions and concepts (high-level) that utilized to implement querying task, the technique of interactive learning will be employed. In Addition, discuss integrating an inference engine as a reasoning mechanism over ontology. To satisfy the requirements of users, the semantic query enabled in dataset archives using mining all relationships among domain concepts and their properties.

Manzoor, and et al [12], proposed a domain specific Ontology linked to the user query system using for retrieving images. The user give the system an input like (keyword or concept) as image or text. This system based on hybrid approach and uses shape, texture and color based approaches used for purpose of classification. Using Mammal's dataset for training and tested on Mammal's domain as a test case.

Gowri, and Nagara [13] presents a system to retrieve images that semantically indexed using features (low-level) of the image plus a language of web ontology. For extracting information of image content into (MPEG7 format) automatically, the techniques of image processing used and associated to the existing domain ontologies, that way, ties the fragment between semantics (high-level) and features (low-level).

To enhance retrieving image Magesh applied a semantics framework. Two levels to consider the problem: (1) define the semantic space to create an ontology, (2) convert the NLS in to statements of SPARQL language that use its query to access the relevant images. The RDF form represent the ontologies based on knowledge and existing data standard [14].

Liu and, et al [15], introduce an ontology semantic learning model (region based) that associates categories of images with objects in "CSI" images. Each predefined semantic template (ST) corresponds to each object, which defined as the average color and texture feature of a group of sub regions. Therefore, by comparing the region features with the set of pre-defined STs, the features (low-level) of each region in a CSI image converted to an object. In [16], Sulaiman, and et al present, a multi-modality ontology semantic image framework, including four main components: (1) resource identification, (2) information extraction, (3) knowledge-based construction, and (4) retrieval mechanism. An approach, that is to say, object properties filter proposed by customizing the semantic image retrieval algorithm and the graphical user interface to facilitate the user to engage with the machine (computers) to magnify the retrieval carrying out. The experiment results showed better results in proposed approach.

4. Conclusion

Various methodologies have been used for retrieving image, more accurately technique this, which employ knowledge representation that combine content based image retrieval and text based image retrieval, mean ontology technique. Ontology denotes inevitability, that's mean any one able to appreciate the items included with it. On other side, there's an retrieving image methods based on text method and retrieving image methods based on contents, when in the last one, the content of image considered some features like texture, color and shape that extracted to achieve image matching for retrieving the image.

5. Acknowledgement

The author's thanks the "Department of Computer Science", "Collage of Science", "Mustansiriyah University", for supporting this work.

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