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Analogy in Image Retrieval Techniques

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Abstract - With the rapid increase in the size of the image database, it is very difficult to know what data is to be extracted, how well we can organize the data and how to retrieve the data for an application. Many researchers used different methods to explore, analyze, search and access that is been generated in different domains. Most of the time we search the data by using text based methods, but retrieving the information from image may not be relevant. We search an image by textual annotation of it. All Images are manually annotated with keywords, which depends totally on the person's perception, and then retrieved using text-based search methods. This method is both time-consuming and prone to errors. Hence, such search engines result in retrieving many non-relevant images. To overcome such drawbacks of text based image retrieval, different techniques currently being used, such as CBIR, Intelligent image retrieval etc. This paper shows the different techniques for extracting the image.

Keywords: CBIR, Text Based Search, Shape image retrieval, Color image retrieval

1. Introduction

Typically, traditional image retrieval can be divided into two categories, namely Text-Based Image Retrieval (called TBIR) and Content-Based Image Retrieval (called CBIR). For TBIR systems, the user can obtain the desired images by submitting a conceptual query terms. Through the traditional information retrieval techniques (IR), the relevant images to the query terms are retrieved. Generally, this type of image retrieval suffers from three main problems, namely subjectiveness, ambiguity and manual cost. In terms of subjectiveness, the gap between the user concepts and image annotations is not easy to narrow. In terms of ambiguity, if the query terms are out of the annotation range, it is not easy to derive the successful search results. In terms of manual cost, a successful retrieval relies heavily on a precise annotation, but a precise annotation needs high-priced manual cost especially for a large-scale image dataset.

Image retrieval is the process of searching and extracting the images from the different and complex databases. This is mostly applied in the fields of image processing, multimedia, digital libraries, remote sensing, astronomy, database applications and others related area. With the present complex scientific and non-scientific image databases, it is very difficult for any human to analyze, understand, extract and explore the knowledge. Luckily, despite how intellectually complex the task of knowledge discovery from such data may seem, it turns out that the process consists of some computational parts that may be automated and actually better executed by computers than by humans. Images are extracted from database and stores in it using feature extraction.

The process of representing raw image in a reduced form to facilitate decision making such as pattern detection, classification or recognition or transforming the input data into the set of reduced features is known as feature extraction. Features are clearly chosen to perform the desired task, which are reduced representation of the full size input. A good feature extraction is necessary to get high performance in the area of image processing or pattern recognition.

Different feature techniques are there. To compute the attributes of digital images extractions and to derive information about the image contents feature extraction is used. A feature is related not only to the characteristics or properties of an image but also to analytical response. A feature can be atomic or combination of different properties. The different feature extraction techniques are given in fig 1.

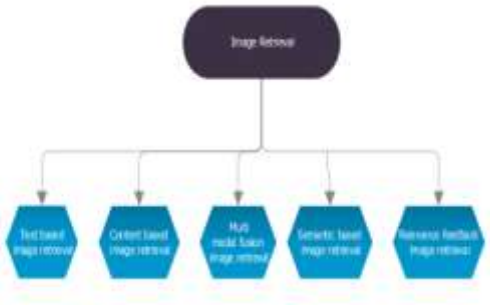

Fig 1: Different Image Retrieval Techniques

2. Types of Features

2.1 Low-level features of an image

Low level features which are extracted directly from an image without any object description. Fundamental features characterizing image content, such as color, texture, and shape that are automated extracted from images are used to determine the low features of an image.

Edge detection

Edge detection translates the image brightness into detecting sharp changes based on the assumption that the change in the brightness is strongly correlated with important events and properties. The image brightness corresponds to discontinuities in depth, surface orientation, changes in material properties and variations in scene illumination.

An edge detector applied to an image lead to set of connected curves which represent the boundaries of objects and surface marking which corresponds to the discontinuities in surface orientation. The different algorithms for computing the edges are Perwitt, Canny, and Sobel operators. These algorithms apply some conversions on the image and based on the threshold the image edges are been traced. These are mostly used for image analysis.

Corner detection

A corner can be defined as intersection of two edges, or for a point for where there is two dominant and different edge directions in a local neighborhood of the point. In general corner detection method is used to detect interest points. To do a local analysis on interest points only corners are to be detected. Blob detectors are used to refer the interest point operators but sometimes erroneously referred to as corner detectors. There exists a notion that ridge detection used to capture the presence of elongated objects. Corner detectors require large redundancies to prevent the effect of individual errors dominating the recognition task. It has the ability to detect same corner in multiple similar images in situations such as different lighting, translation, rotation, and transforms. The different corner detection techniques are Harris operator, Shiand Tomasi, Level curve curvature, Hessian feature strength measures, SUSAN, FAST

Blob detection

Blob detection was used to obtain regions of interest of an image. These regions signal the presence of objects or parts of objects in the image with application to object recognition and/or object tracking. In histogram analysis these are used for peak detection with application to segmentation. Mostly used in texture analysis, texture recognition and for appearance based object recognition. The method implemented in blob detection is, first color image is scanned, then apply morphological operations, later remove pixels smaller than threshold and then label. The different approaches for blob detection are Laplacian of Gaussian (LoG), Difference of Gaussians (DoG), and Determinant of Hessian (DoH), Maximally stable external regions, PCBR

Ridge detection

A ridge feature can be seen as a refined version of edge detection descriptor, which in addition provides an approximate symmetry axis of the candidate object. A ridge is defined as separator between regions based on intensity of image. The ridge detector involves the maximum strength measures. The functionality of ridge detection is to capture the boundary of the object by applying the smooth function of two variables in one or more ways to precise the function at least at one dimension. There are several approaches to define ridges from intensity data, which are differed by non-local and constructing ridges that propagates edge information from corresponding boundaries.

Scale-invariant feature transform

SIFT used to detect and describe the local features of an image which is mostly used in object recognition and video tracking. When images are similar corner detectors can work but when scales and rotations are used SIFT is used. SIFT features are also very resilient to the effects of "noise" in the image. The image feature generation takes an image and transforms it into a large collection of local feature vectors. Each of these feature vectors invariant to scaling, rotation, or translation of image. The SIFT algorithm described in four stages i.e., Scale-Space Extreme Detection, Key point Localization, Orientation Assignment, Key point Descriptor

Curvature

Curvature is a non linear method. The geometric concept of curvature can help to deal with some important aspects of information processing in natural and artificial vision systems. Curvatures play fundamental roles in differential geometry. The most common geometry might be the surfaces, which are two dimensional manifolds in three dimension space. Different planes intersect with the surface which forms a curve. Curves define the principle curvatures and the corresponding planes which are called as principle planes. The well-known mean curvature and Gaussian curvature are simply average and produce of

principle curvatures. A surface with zero mean curvature everywhere is called minimal surface, it has minimal area for given boundary condition. These types of surfaces are very common in our nature world On the other hand, the Gaussian curvature controls the develop ability of surfaces. A surface with zero Gaussian curvature can be mapped onto a plane without any distortion. The methods in curvatureare curvature Filter, general, simple, fast, edge direction, changingintensity, auto correlation

Image motion

Moving images attract the more attention of users for longer period of time than the still images. The approach for motion detection is motion analysis processing i.e., finding the points in the moving image. Motion analysis produces time dependent information. Some of the complex functions of motion detection are to group the same points that belong to an object, to get a particular region or point in an image, to show the direction and magnitude of moving object. Motion detection mostly depend on image sequence analysis which is used in real time applications such as spatiotemporal data, crime detection etc. There are several methods in motion detection but frequently used are differential method and background segmentation.

Area based

Area Based is a classical matching method. It performs operation by statically comparing the small window of pixels in the sensed image with windows of the same size in the reference image. Optical flow The pattern of clear motion of objects, surfaces and edges in a motion image is detected by Optical flow or optic flow between an observer and a scene. Mostly used in video compression, motion estimation. The methods for detection of optical flow are Phase correlation, Block-based methods

Differential methods, such as Lucas–Kanade method, Horn–Schunck method

Buxton–Buxton method, Black–Jepson method, General variation methods

Discrete optimization methods such as Max-flow min-cut theorem algorithms, linear programming or belief propagation methods.

Shape based:

Shape contains the most attractive visual information for human perception. Shapes possess certain features which carry sufficient information to detect an object in an image. Shape features mostly used in data compression. The different techniques used in shape based image retrieval are Thresholding technique replaces each pixel with black pixel which is less than particular threshold constant. The thresholding techniques can be applied on image are Histogram shape, Clustering, Entropy, Object Attribute, Spatial and local methods Blob extraction It is an algorithmic application of graph theory, where subsets of connected components are uniquely labeled based on a given heuristic. Connected-component labeling is not to be confused with segmentation.

Template matching: The technique of matching small part of the image with the template image is a template matching. It is used to detect quality control, navigate a mobile robot and to detect edges. The methods of template matching are Grayscale-based Matching and Edge-based Matching.

Hough transform: It is used to identify particular object from an image with any one of techniques such as voting procedure, using directional information and error compensation (smoothing). Finding of imperfect instances of objects within a certain class of shapes. Hough transform are used for analytical shapes such as lines, circles/ellipses, arbitrary shapes and for non analytical shapes which works with any parameterizable feature.

The disadvantages of Hough transforms are computationally complex for objects with many parameters. The length and the position of a line segment cannot be determined. They mostly depend on the quality of data. Hough transforms are very sensitive to noise.

Flexible methods:

Deformable, parameterized shapes

Active contours (snakes)

PHOG (Pyramid Histogram of Oriented Gradients):

PHOG is a feature extraction technique .It is a spatial shape descriptor applied to image classification .It represents the spatial distribution of edges and is formulated as a vector representation. This descriptor is mainly inspired by two sources: (1) the use of the pyramid representation, and (2) the Histogram of Orientation Gradients (HOG)

3. Context based image retrieval technique (CBIR)

The purpose of Retrieval Systems is for indexing and retrieving the relative information on the internet. The basic idea of content-based query is that when the user can provide a description of some of the prominent visual features of an image or video a mechanism is available by

which the computer can search the archive and return the images and videos that best match the description. Texture and color features are also utilized that describe the global features of images. The components of image retrieval system include a graphical user interface, a server application for receiving and processing queries, an image retrieval server, an image archive, index files that index the images in the archive by visual features. There are four important feature components for content-based image retrieval: color, texture, shape, and spatial relationship. The detailed diagram shown in fig 2.

4. Text based image retrieval (TBIR)

The main idea of text based image retrieval method is to get the result as images by posting a query or relevant word on search field .**Example- Google Search.** Image indexing and retrieval techniques which are based on textual information, such as title, keywords, captions, image descriptions, and so on. Also known as Concept-Based or Description-Based Image Retrieval**.**

5.Shape image retrieval

If a shape is used as feature, edge detection might be the first step of feature extraction. Invariance to translation, rotation, and scale is required by a good shape representation. Sustaining deformation contour matching is an important issue at the matching process**.**

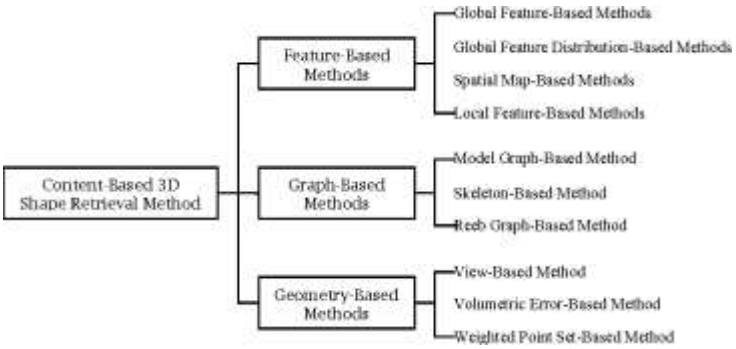

Fig 2: Detailed categorization of image retrieval

Conclusion

With the increasing demands of multimedia applications over the Internet, the importance of image retrieval has also increased. In this research study, image retrieval techniques that have used the relevance feedback schemes to improve the performance as well as accuracy of the image retrieval process are discussed. All these techniques have their own advantages as well as certain limitations. In other words, there is not a single technique that fits best in all sorts of user‟s requirements; therefore, the doors are still open to keep inventing new methodologies according to the requirements of image retrieval applications.

References

[1]Shape Distribution-Based 3 D Shape Retrieval Methods : Review and Evaluation.

[2] Retrieving 3D shapes based on their appearance

[3] Lin Chen, Dong Xu, Ivor W. Tsang, and JieboLuo, "Tag-Based Image Retrieval Improved by Augmented Features and Group-Based Refinement", IEEE Trans. Multimedia, vol. 14, no. 4, Aug 2012.

[4] Linying Jiang, JiefuRen and Dancheng Li, "Content Based Image Retrieval algorithm oriented by Users Experience", 7th International Conference on Computer Science & Education (ICCSE 2012), July 14-17, 2012. Melbourne, Australia

[5] W. M. Smeulders, M. Worring, S. Santini, A. Gupta, and R. Jain, "Contentbased image retrieval at the end of the early years," IEEE Trans. PAMI, vol. 22, no. 12, pp. 1349–1380, 2000.