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HIDDEN INDEXING BASED ON SYNTACTICAL APPROACH FOR DIRECT ACCESS METHOD

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ABSTRACT

In this paper hidden indexing techniques that can be used in a face recognition system have been developed. This technique is based on the syntactic approach uses the development of octal chain code. As an initial step, a variety of multi-dimensional image is extracted to produce the desired binary value. Then syntactic approach is used to determine the patterns produced by the binary value. Binary pattern formed is set in such a way to generate a database index to form a sequential index that can facilitate direct access method. The proposed method is expected to reduce the time of data search process. Future work, better extraction methods will be tested in this study for 3D model.

Keywords: database, indexing, face, syntactic, octal chain code.

INTRODUCTION

Conventional problems of image indexing have led to the improvement of interest in developing techniques of indexing methods. In the conventional image indexing, the records are always in an alphanumeric based on additional information (tagging) given to the image. Accuracy and response time depend on completeness attribute given.

The hybrid database access is based on the visual attributes which based on the visual description of the image. Response time depends on the complexity of the visualization attributes described. And the accuracy depends on the ability to describe visually attribute clearly. The access to hybrid database access classified into three levels described bellows. (Kumar, 2011)

Level 1: comprises retrieval by low level features such as texture, shape and color or the Region of Interest (ROI) of image elements. This level of retrieval uses the objective that directly derivable from the images, without the need to refer to any external knowledge base or tagging.

Level 2: comprises retrieval by derived features, using some degree of logical inference about the unique of the objects depicted in the image. It can be divided into:

a) retrieval of objects of a given form
b) retrieval of persons

To solve queries at this level, reference to some outside store of information is normally required.

Level 3: comprises retrieval by non alphanumeric attributes, using a unique amount of high level pattern about the meaning and purpose of the objects. This level of retrieval can usefully be divided into:

a) retrieval of pictures with emotional expression
b) retrieval of biometrics image (Jain, 1999)

Tree levels of retrieval method described above can be useful in illustrating the strengths and limitations of different image retrieval techniques. The significant unique at present lies between levels 1 and 2. Many papers describe to levels 2 and 3 together as semantic image retrieval, and as a consequence, for this reason the gap between levels 1 and 2 as the semantic gap. (Wang, 2002). Direct access method based one original content that is unique and complete with non alphanumeric form. In this type, has high accuracy access data because of all information from original form utilized. In this method response time depends on the complexity of the objects being compared (trade off). Increasingly complex can lower the speed, the more simple can increase access speed. (Subrahmanyam, 2012) This method has a high degree of accuracy, because the stored templates totally directly compared with the candidate template, and the information contained is still complete. In this type requires accuracy in the extraction process in order to keep the information in original form.

PROBLEM DEFINITION

Direct access to content-based methods is defined as a method of accessing the faces of an object by making use of the characteristics of the face original object without going through the process of adding tags or attributes, whereas the standard access method is to use extended attributes. Direct access strategy is generally understood as a classification strategy (pre-filtering) for the reduction of the number of matching one-to-one on the identification of unstructured data.

Direct access method using feature extraction (dimension reduction) as an initial step to determine the template that is used as a keyword in the search process and then extracted templates are used to design the data structure. Facial image in this research is reduced to elements that have important information has still unique called template and serves as the keyword. The template is then stored in a stored template (feature database) that has

a specific data structure form (non alphanumeric). The new design featured database is one of the goals of this research. A number of indexing schemes use classification codes rather than keywords or subject descriptors to describe image content, as these can give a greater level of language independence and show concept hierarchies more clearly. A number of less widely-known schemes have been devised to classify images and drawings for specialist purposes.

Current image indexing techniques have many excess. Keyword indexing has robust power. It can be used to describe almost any aspect of image content. It is in main easily extensible to facilitate new methods, and can be used to describe image content at varying degrees and complexity. This process of conventional indexing, whether by keywords or classification codes, suffers from significant shortage. (Weiping Chen, 2013).

A significant limitation of current direct access method technology is the problem of efficiently retrieving the set of stored images most similar to a given query. One of the many fundamental ways in which direct access method differs from text retrieval is that it is based on a fundamentally different model of data. Most text retrieval systems associate each document with a variable number of descriptors representing its content. (Wang Y, 2002) A given descriptor is either present or absent in a given document. Searching essentially contains of identifying those documents associated with a given set of descriptors, and is thus governed primarily by the rules of symbolic logic. In such systems, search efficiency can be increased by the use of devices such as inverted file indexes, each of which holds a list of document identifiers associated with a given descriptor. Boolean searches can readily be implemented by comparing the indexes for each search term, yielding result sets which can be used directly to address the documents themselves. Probabilistic retrieval systems operate in a rather more complex way, but still rely on a variable number of descriptors to represent each document. (Kouzani, 1996).

Most current direct access method systems work on a completely different principle such as in biometric database (Jain AK, 1999) Stored images are typically characterized by fixed-length real-valued multi-component feature vectors, each image having a value for every feature in the database. In this case, searching designed by calculating the similarity between feature vectors from query and stored images, a process of numerical computation. (Kouzani, 1996) point out, the prime aim of traditional text retrieval systems is to *partition* a database into two sets relevant items and non-relevant items even if members of the first set may later be ranked by relevance. By contrast, the prime aim of direct acces method systems is to *sort* the database in order of similarity to the query.

Finding index structures which allow efficient searching of an image database is still an unsolved problem. None of the index structures proposed for text retrieval has proved applicable to the problem. A more recent approach, which seems to offer better prospects of success, is the use of similarity clustering of images, allowing hierarchical access for retrieval and providing a way of browsing the database.

DIMENSION REDUCTION

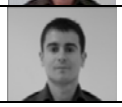
Indexing of facial image presents a number of specific challenges. Photographs, for example, are not self-identifying because of photographs often contain no indication of author, names of persons or place taken, dates, or any alphanumeric information whatever. (Queirolo, 2010).

In the stage of this research, applied approach based on direct access to content based on syntactic approach to collect information unique facial patterns more comprehensively.

Based on the syntactic approach, the human face (a photograph) can be used as a grammatical function by dividing the human face image into several layers of geometric (T. Ahonen, 2006) (S. Liao, 2006)

- **Layer one:** The face as a whole face (as Sentence)
- **Layer two (the word):** The face is divided into several components unique face (Region of Interest / ROI) include:
  Eyes, Nose, Mouth + (Eyebrow, Lip, Ear Tip
- **Layer three (the letter):** The information contained in the ROI based on pixel geometrically.

Table-1. Illustration of conversion multi dimension of face to string image.

Image type	Pixel data	Image format	View
RGB	3x Integer (0→1)	JPEG	
Gray scale	Integer (0→1)	GIF	
Binary	Integer (0 or 1)	PNG	
Floating point	Floating point value image	TIFF	
Binary (string)	Integer (0 or 1)	PNG	

The Table-1 above give a definition of direct access strategy, the access is directly to fixel point. The fixel is a lower component of an image that has unique pattern. The binarization is the process of converting gray level into two possible value (0's or 1's) using for syntactic approach shown at Figure-1 bellow.

SYNTACTICAL APPROACH

Syntactic pattern recognition can be used instead of statistical pattern recognition if there is a clear structure in the pattern. One way to present these structures is to use the symbol strings of a formal language. In this case the differences in class structure are encoded as part of the structure (structural) different grammar.

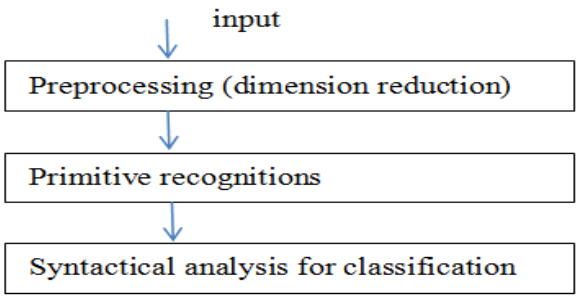


Figure-1. Diagram process of syntactical approach.

Structural methods provide a description of the information, which may be useful at the time of extracting information. For example, syntactic pattern recognition can be used to find out what information is contained in an image is unique or not. (Subrahmanyam, 2012). Furthermore, the method used to find the mapping of structural correspondence between the miraculous images in an object by reducing dimension shown at Tble-1 above. (Kouzani, 1996), (Zhang, 1996)

This syntactic analysis is to describe the activity patterns underlying the syntactic units and constituents. Syntactic pattern recognition or pattern recognition is a form of structural pattern recognition, in where each object can be represented by a set of variables-cardinality symbolic, nominal features. This makes it possible to represent the structure of the pattern, taking into account the more complex relationship between attributes than is possible in a numerical feature vector obtained in fixed dimensions, which are commonly used in statistical classification. (Hamilton, 2002)

Examples of the use of syntactic pattern based to determine the primitive pattern that has been specified using octal chain code is shown at Figure-3 bellow (Mehrnoosh, 2013):

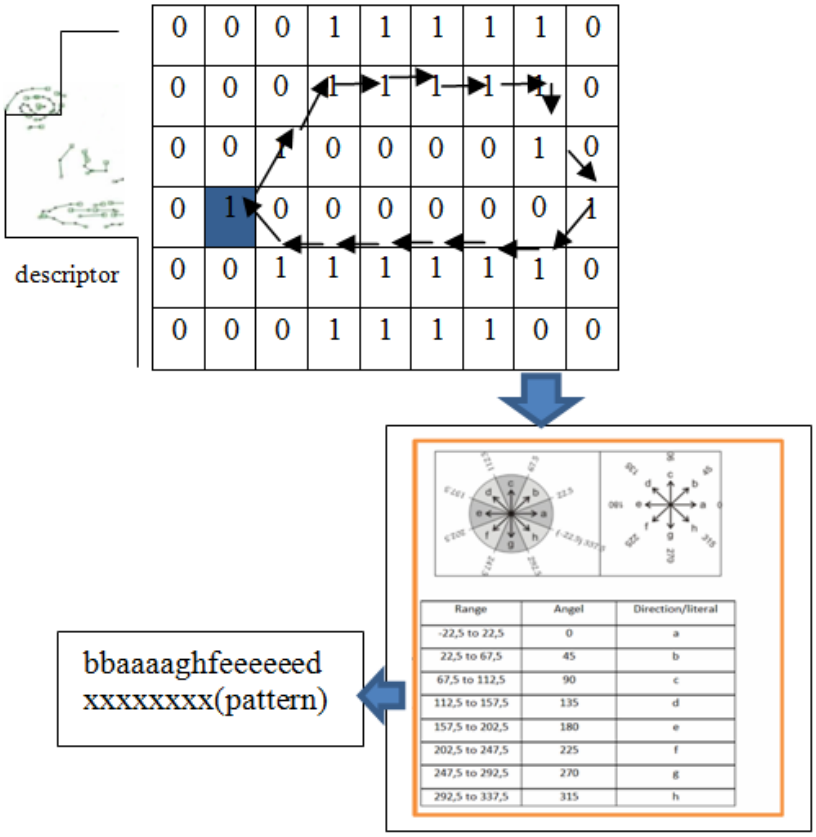


Figure-2. Illustration syntactic approach using octal chain code.

Direction of center and neighbor pixel replace by pattern direction *a-h* shown at Figure-2 above (illustration): the result pattern is *bbaaaaghfeeeeeed (word)* used as hidden indexing shown at Figure-2 above.

HIDDEN INDEXING STRATEGY

In Framework above, the use of the Literal Letter A to H based on Octal Chain Code are used for to replace the form of the relationship between the Pixels that are Part of The ROI. It is calculated based on the angle between the Main Pixel by Pixel Neighbors are traced based on string pattern formed. The result of this is forming the hidden indexing that sort by angle ascending order (hidden) illustrated by Figure-3 below.

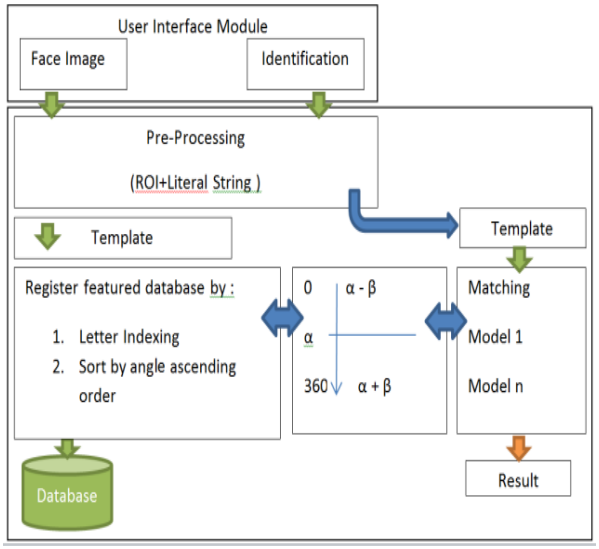


Figure-3. Indexing framework for identification.

To quantify how the interframe variation of a head rotation image affects the performance of a multi-frame fusion, it is necessary to know face pose angles in frames. Formation a face's pose angle can be done automatically or manually shown as Figure-6. An automatic method utilizes the geometric relationship

between a head rotation degree and the projected ROI position in a frame to calculate the face pose angle (Guo, 2010) but an automatic method requires that a subject kept his/her head and upper-body strictly along a vertical axis during a rotation, a condition that was not always satisfied in sets collections. A manual method relies on facial image to select a frame in which a face has a desired pose angle. Although a manual method is tedious and time consuming, it has the advantage of being able to handle non-ideal angle. (Zhang, 2010) To minimize the errors and uncertainties caused by human bias, we used the reference images and a set of empirical rules to guide the selection process (Ajma S, 2007) as being shown in Figure-4.

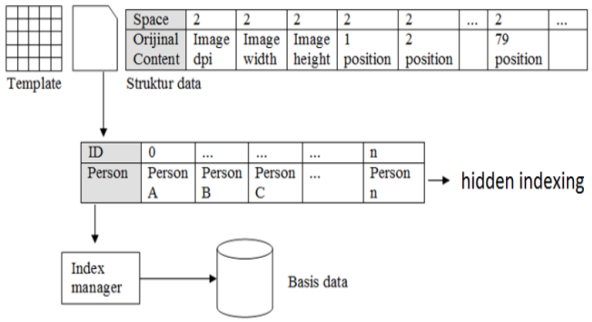


Figure-4. Illustration of hidden indexing of data structure.

EXPERIMENTAL RESULT

The system has been implemented and tested on a medium set of images. The face database contains more than 1000 images of different scenes collected. The input images benefit from different spatial and gray scale resolutions. Each scene contains varying numbers of objects, including human faces, taken under varying illumination and orientation. Some input images contain different levels of noise. As it was stated in the previous section, the system evaluates a membership degree in the interval for each detected face.

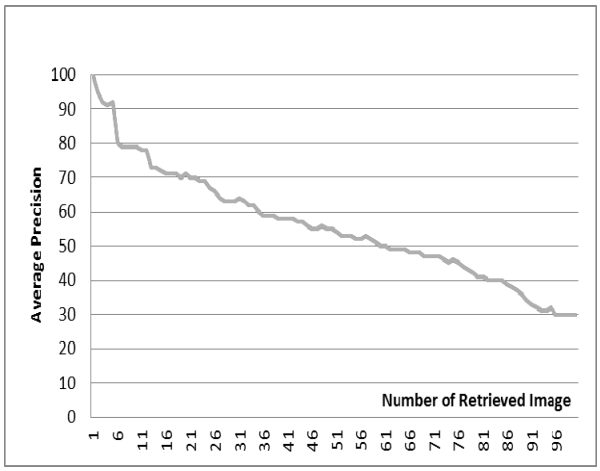


Figure-5. Average final precision chart.

We use 100 out of 1, 000 images to test the performance of the proposed method. To evaluate the retrieval performance, we used precision (*P*) is defined as the ratio of the number of relevant images retrieve person A to the total number of image retrieved Person B (Accuracy).

$$\text{Precision} = A/B \quad (1)$$

Average precision is plotted against a number of retrieved images for each query shown in Figure-5 above.

Angle (°) (Class number)	**Reference image**	**Hidden indexing pattern (illustration)**
0		*aaaaaaabbbbbccccddd*
15		*aaaaabbccdddeddddd*
30		*aaaaaabbbccddddff*
…	…	…

Figure-6. Illustration the result of hidden indexing in the database.

Figure 6 above displays illustration obtained for a medium image samples. Each detected face is identified by the system.

The result of accuracy rate is still relatively low, because of this research using a dynamic data model that have a higher degree of difficulty compared with the pose of static model, especially it has difficulties to finding the region of interest at the preprocessing stage in the binary form.

CONCLUSION AND FUTURE WORK

In this paper, we describe a biometric database that consists of syntactic approach using a hidden indexing technique which can be used in recognition system with facial biometric database. In addition to some commonly seen data types such as static frontal-view images and facial expressions, this database has three unique features: (i) Rotating head face under a strong shadow condition was acquired. This type of dataset is more challenging and has implications for certain realistic tasks such as facial surveillance; (ii) Frames of ten pose angles per subject were manually determined. Future work we will improve the accuracy by using a robust pre processing module.

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