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RESEARCH ARTICLE

SURVEY OF IMAGE MINING TECHNIQUES FOR THE RECOGNITON OF INDIAN SIGN LANGUAGE

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ABSTRACT

Sign Language Recognition System is one of the most growing researches today. Many new Techniques are having been developed recently in the field of Sign Language Recognition. This system becomes popular because it is only one of the efficient way through which the deaf and dumb people can convey their message to other people. The main aim of this paper is to present a survey of the various techniques used for image mining techniques for the Indian Sign Language Recognition given by different researchers.

INTRODUCTION

A sign language (also signed language) is a language which, instead of auditorily conveyed sound patterns, uses manual communication and body language to convey meaning. This can include simultaneously combining hand shapes, orientation and movement of the hands, arms or body, and facial expressions to fluidly express a speaker's thoughts (Rekha *et al*., 2011). A translator is usually needed when an ordinary person wants to communicate with a deaf one. Sign Language is the only means of communication for deaf people. It has been observed that deaf people are facing difficulty to interact with normal people. The purpose of sign language recognition system is to provide an efficient and accurate system to convert sign language into text so that communication between the deaf and normal people can be more convenient. Sign language consists of vocabulary of signs in exactly the same way as spoken language consists of a vocabulary of words. Indian sign language (ISL) is sign language used in India. ISL involves both static and dynamic gestures, single as well as double handed gestures, in addition to this the hands involved in gesturing may have complex motion. Some signs include facial expressions too. Because of these difficulties, less research work has been carried out on ISL recognition system (DeepikaTewari and Sanjay Kumar Srivastava, 2012). A thorough literature survey covering almost all the aspects of the Sign Language Recognition is necessary to build an ISL recognition system.

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With the advancement of science and technology many techniques have been developed not only to minimize the problem of deaf people but also to implement it in different fields. Many research works related to Sign languages have been done as for example the American Sign Language, the British Sign Language, the Japanese Sign Language, and so on. But very few works has been done in Indian Sign Language recognition till date. One of the long term goals of gesture recognition is to develop a vision based sign recognition system that can recognize a subset of an existing sign language and translate it to text format.

It is an important research area not only from engineering point of view but also for its impact on the society. Sign languages are non-verbal visual languages, different from spoken languages, but they serve the same function. There are different sign languages all over the world such as American Sign Language (ASL), British Sign Language (BSL), Japanese Sign Language family (Japanese, Taiwanese and Korean Sign Languages), French Sign Language family (French, Italian, Irish, Russian and Dutch Sign Languages), Australian Sign Language, etc. There are extensive research in the field of image mining to develop the efficient Indian Sign Language recognition system. The next section briefly explain about the image mining and its advantages.

Image Mining

Image mining is an interdisciplinary endeavor that draws upon expertise in various fields like computer vision, image retrieval, matching and pattern recognition. Some methods allow image mining to have two different approaches. First

method extracts images from image databases or collection of images. Second method mines a combination of associated alphanumeric data and collection of images. Research in Image mining can be broadly classified in two main directions (1) Domain specific applications (2) General applications. Both are used to extract most relevant image feature and later to generate image patterns. A vast amount of image data is generated in daily life and in various fields like medical, astronomy, sports and all kinds of photographic images. It is still at the experimental stage and growing field of research. Lack of understanding in the research issues of image mining is the obstacle to rapid progress (DeepikaTewari and Sanjay Kumar Srivastava, 2012). Image data plays vital role in every aspect of the systems like business, hospitals, engineering and so on. Image mining normally deals with the study and development of new technologies that allow easy analysis and interpretation of the images. Image mining is not only the simple fact of recovering relevant images but is the innovation of image patterns that are noteworthy in a given collection of images. The establishment of image mining system is frequently a complicated process because it implies joining diverse techniques ranging from image retrieval and indexing schemes up to data mining and pattern recognition. This paper presents many different views about retrieval, matching, pattern recognition which will be very useful while extracting features like shape, color, size, texture, imprint etc from large image databases. The number of features required to represent an image can be very huge. Using all available features to recognize objects can suffer from curse dimensionality. Feature selection and extraction is the pre-processing step of image mining. Main issues in analyzing images is the effective identification of features and another one is extracting them (Anthony *et al*., 2007).

Shaikh Nikhat Fatma, (?) describes the importance of Image mining in which images can beretrieved according to some requirement specifications. Image retrieval can have logical features like objects of a given type or individual objects or persons using edge detection techniques to retrieve the specified image. Continuing advancements in both hardware and software coupled with higher end image processing and image vision tools, have made it possible to store huge amount of images. This increase in number of images and image databases has necessitated the need for image mining techniques. Image mining an important research area not only from engineering point of view but also for its impact on the society.

Indian Sign Language Recognition System using Image Mining Techniques

There are various research has been done to recognize the ISL using a image mining techniques. It is different in the phonetics, grammar, hand gestures and syntax from other country's sign languages. Designing a handgesture recognition system for ISL is morechallenging than other sign languages due to thefollowing reasons (Incertis *et al*., 2006):

- ISL uses both hands to make gestures torepresent most of the alphabets.
- ISL uses static and dynamic handgestures.
- Facial expressions are also included.
- One hand moves faster than the other attimes in dynamic hand gestures.
- Many of the gestures result inobstruction.
- Complicated hand shapes.
- Locations of the hand with respect tobody contribute to the Sign.
- Head/Body postures.
- ISL Involves both global and local handmotion.

Many novel and interesting applications of hand gesture recognition have been introduced in recent years. Generally, such systems are divided into two basis approaches namely glove based and vision based approaches. In glove based analysis, detection of the hand is eliminated by the sensors on the hand and 3D model of the hand is subjected to the virtual world so that body motion can be easily captured. Christopher Lee and (Christopher Lee and Yangsheng Xu, 1996) developed a glove-based gesture recognition system that was able to recognize 14 of the letters from the hand alphabet, learn new gestures and able to update the model of each gesture in the system in online mode, with a rate of 10Hz. Over the years advanced glove devices have been designed such as the Sayre Glove, Dexterous Hand Master and Power Glove. The most successful commercially available glove is by far the VPL Data Glove (Kim *et al*., 2009) .On the other hand vision-based analysis is more natural and useful for real time applications0.

Many researchers (Gopalan and Dariush, 2009; Yewale and Bharne, 2011) used skin filtering technique for segmentation of hand. This technique separated the skin colored pixels from the non-skin colored pixels, thus extracting the hand from the background. Fang (Fang *et al*., 2007) used Adaptive Boost algorithm which could not only detect single hand but also the overlapped hands. In (Shaikh Nikhat Fatma, ?; Carlos Ordonez and Edward Omiecinski, 1998) external aid like data gloves, color gloves were used by the researchers for segmentation purpose **Error! Reference source not found.**.

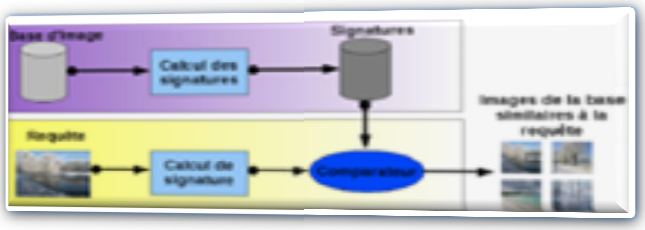

Fig. 1. Content Based Image Retrieval (CBIR) SystemArchitecture

Lamar (Lamar *et al*., 1999) in his paper for American and Japanese alphabet recognition used PCA for extracting features like position of the finger, shape of the finger and direction of the image described by the mean, Eigen values and Eigen vectors respectively. The limitations were accuracy rate obtained was 93% which was low and the system could recognize gestures of only single hand.

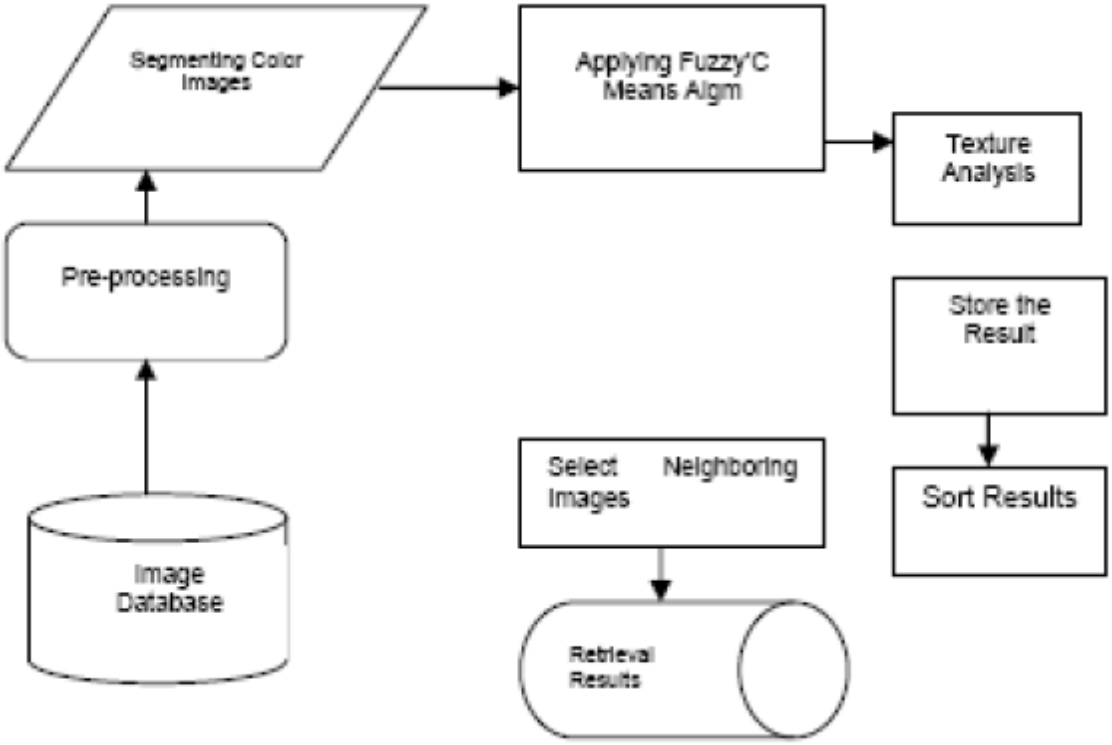

Fig. 2. Block Diagram of Color Image Classification and Retrieval System

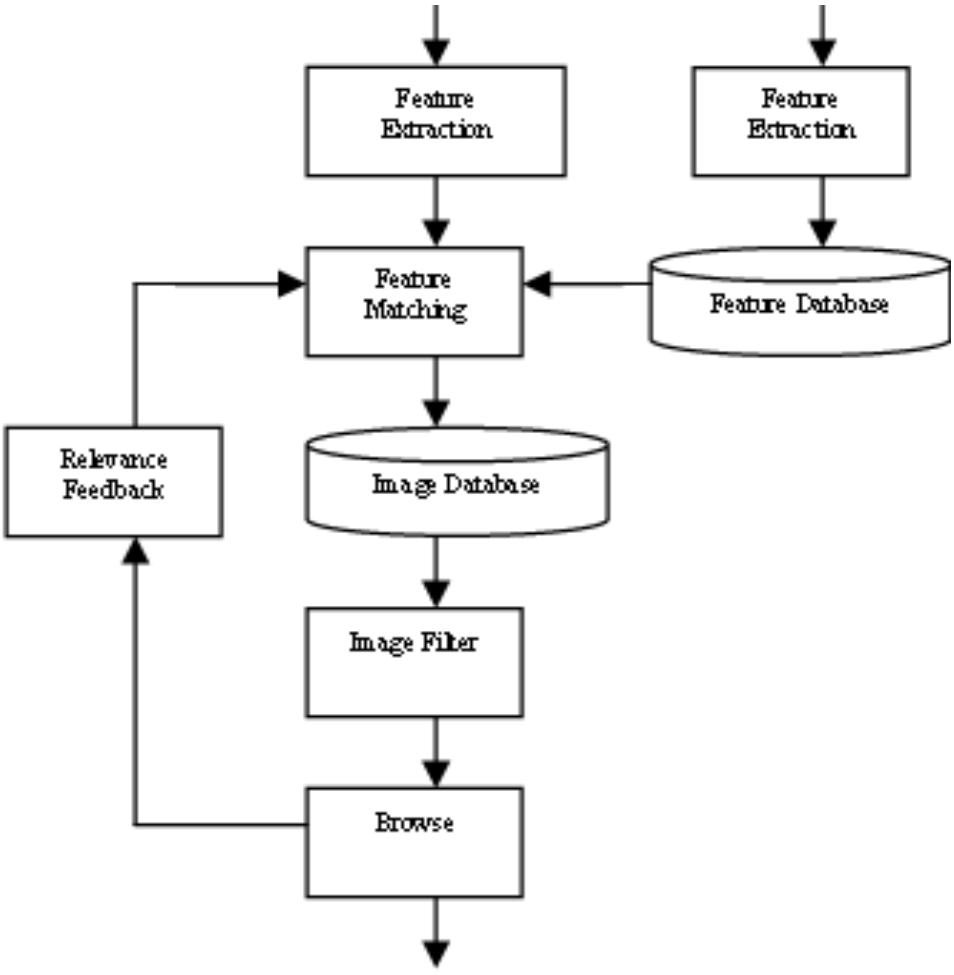

Fig 3. Image Retrieval System

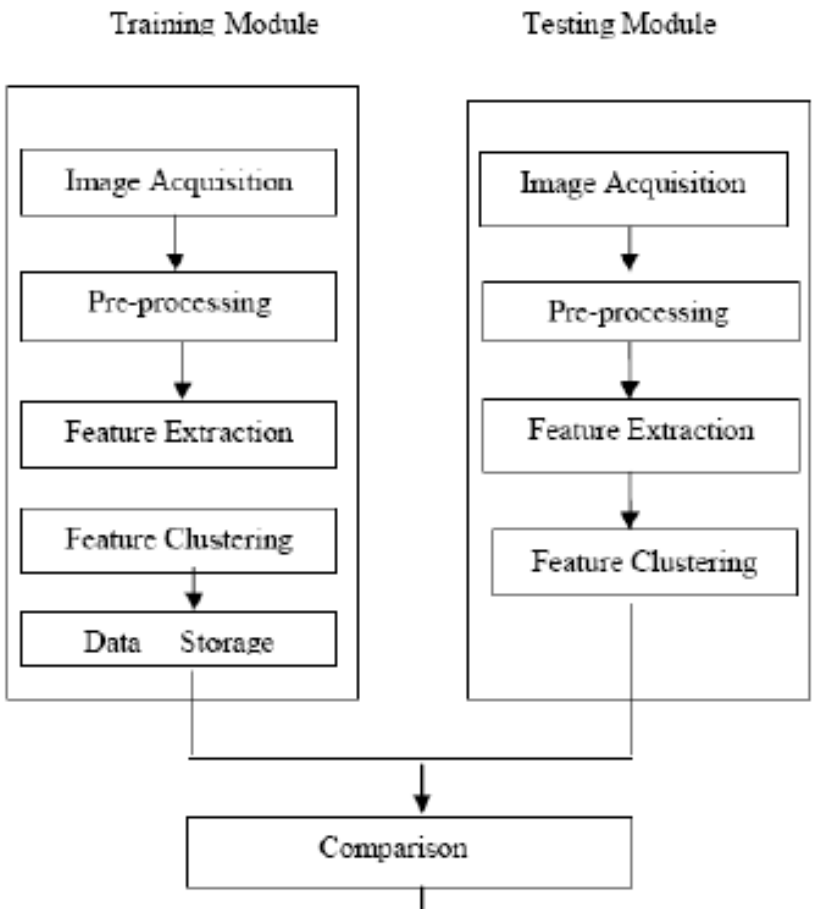

Fig.4. Framework of Image Mining System based onconcept lattice and cloud model theory

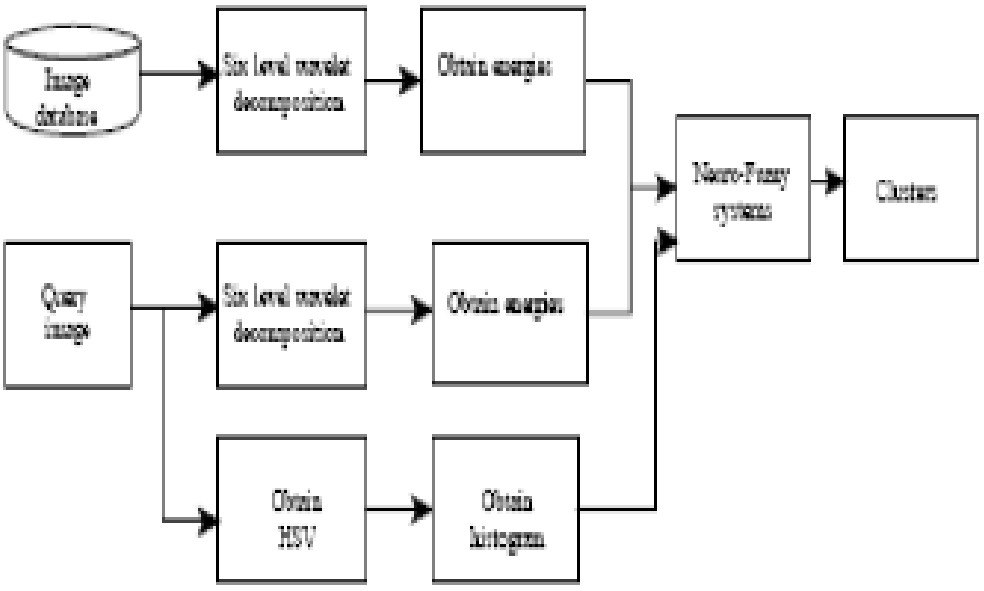

Fig. 5. Neuro-Fuzzy based clustering approach forimage retrieval using 2D- WT

(Kapuscinski and Wysocki, 2001) proposed Hit-Miss transform for extracting features like orientation, hand size by computing the central moments. Accuracy rate obtained was 98% but it lacks proper Skin filtering with changes in illumination. Generic Fourier descriptor and Generic Cosine Descriptor is used Shaikh NikhatFatma, (?) for feature extraction as it is rotation invariant, translation invariant and scale invariant.

Rotation of the input hand image leads to shifting of hand in polar space. Rotation invariance is obtained by only considering the magnitude of the Fourier coefficient. While using centroid as the origin translational invariance is achieved and finally ratio of magnitude to area scale invariance is obtained. Rajshree and Dubey, 2010 described about an Imagemining techniques which can be used for ISL

recognition. It is based on the Color Histogram, texture of that Image. The query image is taken then the Color Histogram and Texture is produced and based on this the resultant Image is found. They have investigated a histogram-based search methods and color texture methods in two different color spaces, RGB and HSV. Histogram search differentiate an image by its color distribution. It is shown that images retrieved by using the global color histogram may not be semantically associated even though they share similar color distribution in some results (Fig.1). Carlos Ordonez and Edward (Carlos Ordonez and Edward Omiecinski, 1998) presented a data mining algorithm to find association rules in 2-dimensional color images. The algorithm has four main steps: feature extraction, object identification, auxiliary image creation and object mining and it does not rely on any type of domain knowledge. This resembles the CBIR system architecture shown in Figure 2. Mohan and Kannan, 2010 proposed a new technique Color Image Classification and Retrievalusing a Image (Figure 2) for improving userinteraction with image retrieval systems by fullyexploiting the similarity information. In thattechnique retrieving the images from the imagecollection involves the steps like Preprocessing,Color image classification, Preclustering, Texture feature extraction, Similarity comparison and Neighboring target image selection. Brown and Pham, 2005 described in detail a general hierarchical image classifier approach, and illustrated the ease with which it can be trained to find objects in a scene using support vector machine concept. (Ji Zhang, Wynne Hsu and Mong Li , 2001) proposing new representation schemes for visual patterns and to facilitate fast and effective access we need to frame efficient content-based image indexing and retrieval techniques. The words in the images, called visual words, are calculated to form a vocabulary of N words. Then each image was represented by a word histogram.The construction of visual words is evaluated in two steps:

- Computation of local descriptors for a set of images
- Cluster the previous descriptors by K-means. SIFT algorithm is then employed to extract the features due to its impressive performance in image recognition. (Peter Stanchev, ?) proposed a new method for image retrieval using high level semantic features is proposed. It is based on removal of low level color, shape and texture characteristics and their translation into high level semantic features using fuzzy production rules derived using an image mining technique. One of the leading frameworks for image object mining is the bag-of-words (BOW) approach. The idea is to encode an image as a collection of visual words of the quantized local patches. Objects in the image can then be retrieved through inferring the semantic topics associated with the set of visual words. However, the visual BOW mining frameworks apt to suffer from the so-called term-mismatch problem.

(Jen-Hao Hsiao *et al*., ?) proposed a novel language model-based approach with pseudo-relevance feedback for tackling the vocabulary problem in visual BOW mining. Due to improvements in image acquisition and storage technology, terabyte-sized of image databases leads to two basic problems: how to exploit images (image mining)? how to make it accessible to human beings (image retrieval)? The specificity of image mining /retrieval techniques operates on the whole collection of images, not a single one. Under these circumstances, it is natural that the time complexity of related algorithms plays an important role. (Iwaszko, Mahmoud Melkemi and Idoumghar, ?) suggested a novel general approach applicable to image mining and retrieval, using compact geometric structures which can be recomputed from a database. (Mohan and Kannan, 2010) Anbazhagan formulated a new technique called Image retrieval based on optimal clusters is proposed for improving user interaction with image retrieval systems by fully exploiting the similarity information. The technique involves steps as shown in Figure 3. (Dipesh Dugar *et al*., 2010) proposed a novel discriminative learning framework based on canonical correlations for object recognition with image sets. Anthony J.T. Lee, Ruey-Wen Hong, Wei-Min Ko, Wen-Kwang Tsao, Hsiu-Hui Lin (Anthony *et al*., 2007) proposed anovel spatial mining algorithm, 9DLT-Miner. This is used to mine the spatial association rules from an image database. In the image database e every imageis stored in 9DLT representation. Two phases are there in this method. First phase finds all lengthier frequent patterns. Second phase generates all candidate (k + 1)-patterns using frequent k-patterns(k P1). For each candidate pattern generated, the frequent supporting patterns in the database were counted. The steps are repeated until no more frequent patterns can be found. Ashok *et al*., 2004 presented a methodology for automatic knowledge driven image mining using the theory of Mercer Kernels. Mercer Kernels are extremely nonlinear symmetric positive definite mappings from the original image space to a very high, probably infinite dimensional feature space.

(Rupali Sawant, 2010) presented a framework of image mining based on concept lattice and cloud model theory shown in Figure 4. The methods of image mining from image texture and shape features are introduced here, which include the basic steps: preprocessing the images, using cloud model to extract concepts, and then using concept lattice to extract aseries of image knowledge. (Balamurugan and Anandhakumar, 2009) introduced a neuro-fuzzy based clustering approach for content based image retrieval using 2D-wavelet transform (2D-DWT) as shown in Figure 5.

Conclusion

This paper compared many of the proposed techniques in image mining used by the earlier researchers in the image retrieval, matching, pattern recognition etc, which is used while extracting features of the images like shape, color, size, texture, imprint etc for Indian sign language recognition. Because, Image mining presents special characteristics due to the richness of the data that an image can show. Effective evaluation of the results of image mining by content requires that the user point of view is used on the performance parameters. The Main goal of image mining is the discovery of image patterns that are significant in a given collection of images for deaf languages. New techniques are being generated and many area left for the future enhancement and this study of review is found that still few more methods needed to identify the imprint which is one of the important notable feature of the

image mining and can be effectively use for ISL implementation.

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