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Application of Feature Extraction Technique: A Review

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***Abstract* — Extraction of features can be viewed as a preprocessing step which eliminates distracting inconsistency from a dataset, so that downstream classifiers or regression estimators perform better and hence various applications can be implemented from it. The area where feature extraction ends and classification, or regression, begins is necessarily gloomy: an ultimate feature extractor would simply map the data to its class labels, for the categorization task. These features can be used for image matching or recognition techniques or learning in supervised algorithms. Here in this paper all methods that are implemented for the extraction of features is converse about and a relative investigation is exposed in the paper so that by analyzing the various limitations of the algorithms in the future a more modified and effective feature extraction based technique is implemented.**

***Index Terms*—Image Processing, Feature Extraction, DCD, CCV, CM, CSD, SIFT, SURF.**

I. INTRODUCTION

Digital Image dispensation is a method of processing the image whether colored images, Gray Scale Image or Binary Images. Using any of these images that may process of images can be done using Feature extraction techniques, classification techniques or clustering or recognition techniques. The image feature set needs to take out the most appropriate features for object detection or classification while on condition that invariance to changes in illumination, differences in viewpoint and shifts in object contours. To accomplish this, to a certain extent than in a straight line using raw images intensities or gradients, one frequently uses some form of more go forward local image descriptors.

To make available an express feature extraction for compressed domain, consequently, an innovative flourish of research hard work is straight right of entry to feature extraction in compressed domain [3, 4]. The wide-ranging image retrieval system is revealed in Figure 1. It consists of three main modules such as input module, query module, and retrieval module [6].

In the input module, the feature vector is extracted from input image. It is then stored along with its input image in the image database.

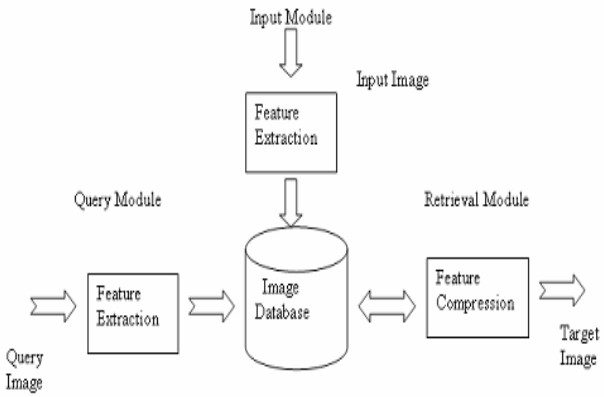

Fig.1. Block diagram of image retrieval system [6].

1. 1 Image Feature Extractions using Color Space Models

Although there are various techniques implemented for the extracting the features of images, but image feature extraction using color based feature extraction is an important technique. There are various color space model discussed in the survey of [1]. Image can be classified as colored, gray or binary images. Color histogram [2] is also a technique which is based on the extraction of colors in image processing, in spite of this Color Coherence vector [3] and Color Moments based [4] and color correlogram [5] is also used for the extraction of features in image.

In all the above techniques mean, skewness and standard deviation is computed so that the features can be extracting easily.

$$\mu_i = \frac{1}{N}\sum_{j=1}^{N} f_{ij}$$

$$\sigma_i = \left(\frac{1}{N}\sum_{j=1}^{N}\left(f_{ij}-\mu_i\right)^2\right)^{\frac{1}{2}}$$

$$\gamma_i = \left(\frac{1}{N}\sum_{j=1}^{N}\left(f_{ij}-\mu_i\right)^3\right)^{\frac{1}{3}}$$

The above formulas are used to calculate mean and standard deviation and skewness respectively. Where fij is used for the color value and N is the total number of pixels in the image.

The various color methods that are described are as follows:

Color Method used for Extraction	Usages of the methodology
Histogram	Simple to Compute
CM	It is must compact and robust to use.
Correlogram	It provides spatial information
CSD	It provides spatial information
CCV	It provides spatial information
SCD	It is scalable and compact.
DCD	It is compact to use and robust as well as perceptual.

Table 1. Various Colors Space models for feature extraction

1.2 Image Feature Extraction using Textual Features

Some of the images can be processed using feature based, since texture is an important and common way of detecting the features of images so that they can be used for recognition and interpretation. Texture based Feature extraction can be classified as spatial and spectral texture based on their various advantages to use in the image processing.

Texture Method for Extraction	Usages of methodology
Spatial texture	It is easy to use and understand and can be extract information from any shape.
Spectral texture	It is robust and requires less computation.

Table 2. Various texture based feature extraction

The figure shown below is the example of feature points extracted from image

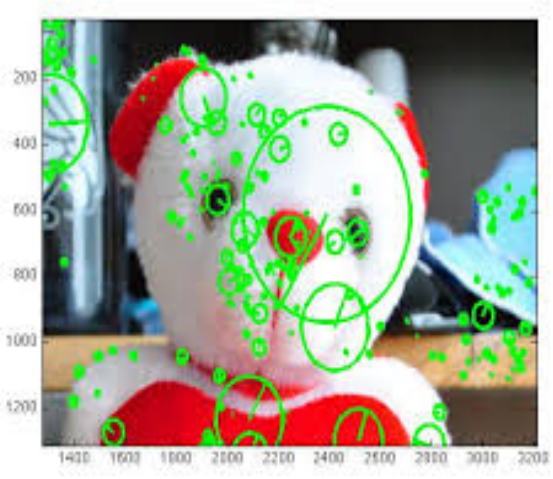

Figure 2. An Example set of Feature Extraction

II. Related Survey

Jean-Philippe Vert et. al's proposed a new and effient technique for the feature extraction using a new concept of SVM based feature extractor with kernels that is being used in walk based on graphs [7]. The image from which features are extracted is first segment into a number of finite regions and hence from each of the segmented regions a set of connected graphs is fetched and features are extracted from each of the vertex. Here images can be segmented using these random walks that are being segmented using SVM.

Minh HoaiNguyen with FernandodelaTorre implemented a new methodology for the extraction of features and selection of these features based on the concept of Support Vector Machine [8]. It's a learning approach which works on the concept of linear SVM and Gaussian SVM. The technique is used both for clustering and classification. The image pixels are first preprocessed and then features are selected from the image and then classification is done using SVM. The technique also uses the convex framework for the energy based concept for the selection of features from the images using linear kernel based SVM.

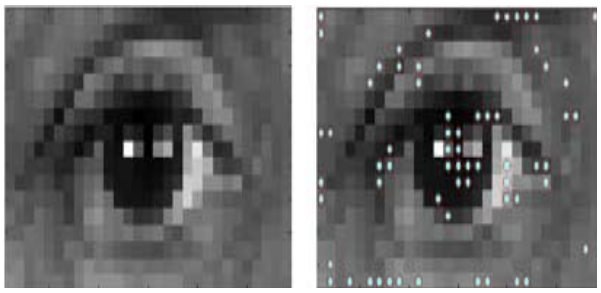

Figure 3. Proposed Feature Extraction technique [8]

Aleˇs Proch´azka et. al's presented a new approach for the classification of signals based on EEG using wavelet based transformation [9]. The technique implemented here uses Discrete Wavelet Transformation and then segmentation is applied using signals based segmentation and clustering is done using Neural Networks. The technique implemented extracts more number of features as compared to the existing techniques implemented for the feature extraction.

Suganthy, M. with P. Ramamoorthy also implemented a new approach for the feature extraction and selection using the concept of principal component analysis on morphological images and the images containing morphological detection of edges and for the fast iris recognition [10]. The technique implemented here uses the concept of K-Nearest Neighbor which is used for the filtering of wanted and un-wanted and the removal of redundant data from the images.

Marcin Grzegorzek et. al's proposed a new technique for the feature extraction using the concept of wavelet transformation and from a set of statistical objects and hence provides pattern recognition of objects from the image [11]. The paper implements the concept of 3-D objects that are present in 2-D images from which features can be extracted. The technique uses the concept of dividing the image into a number of block of 8*8 or into a block region of 4*4 or 2*2. The methodology uses the concept of retrieving features from the image using the concept of heterogeneous background.

Aamer. S. S. Mohamed, Ying Weng, Jianmin Jiang proposed a new methodology for the new features extraction from the image using the concept of discrete cosine transformation and face retrieval [12]. The proposed methodology implemented here uses the concept of 8*8

block region with six coefficients per block in the image and hence the features can be extracted from the image. The extracted features from the image are then compared with the stored features in the database. Hence on the basis of extracted features from the images and the resultant features performance factor can be detected.

Tienwei Tsai et. al's implemented a new and efficient technique for the discrete cosine transformation based feature extraction [13]. The proposed methodology implemented here uses the conversion technique of converting from one color model to other color model using RGB→ YUV Color Space model. The converted color space model is then divided into a number of four block regions and then DCT transformation technique is applied on the input image to extract the features from the image. The 'N' number of features extracted from the image is then integrated to form a single vector which can be used for the feature extraction and indexing such that image retrieval can be done.

Rosdiyana Samad and Hideyuki Sawada implemented a new approach for the Gabor filter and convolution filter for the feature extraction using the concept of edge feature extractor from the image [14]. The proposed technique implements the concept of various expressions from the image including sadness, angry, happy and neutral and fear and various other expressions based on the features from the image. The principal component analysis is used for the edge filtering based feature extractor [15].

Figure 4. Proposed Model used for Feature Extraction [14]

III. CONCLUSION

Since various Feature Extraction technique are implemented this can be used for a variety of applications such as iris recognition and object recognition. The paper discusses and analyzed various feature extraction techniques which can be used for a variety of applications. The various feature extraction technique and their various applications and their performance measure can be analyzed so that on the basis of various performance measures a new and efficient technique can be implemented in future for feature extraction.

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