



A Study on Feature Extraction Model and Approaches

Anupama¹, Kavita²

Student, CSE Deptt, Shri Baba Mastnath College of Engineering

Anupamasheoran8@gmail.com

Asstt. Prof, CSE Deptt, Shri Baba Mastnath College of Engineering

Abstract: The first stage of Image Processing is to present it in an organized way. When the primary image is collected, the image is having impurities, incompleteness and irrelevancy to the domain and application. To provide the effective image decision, there is the requirement of some Feature extraction model and method. The paper has presented a study based work on various issues of image extraction and provided the solutions in terms of approaches and the model. The paper has described some of the common approaches to represent the image in a descriptive form.

Keywords – Clustering, Extraction, Filteration, Density Based.

1. Introduction

To acquire the image or Feature from an image dataset, there is the requirement to extract the image and perform a series of relative operations. These operations are defined to customize the image or images so that meaningful decision regarding the image or image will be performed. This image extraction is represented in the images features that can be used by various other applications to take relative decisions. This all image can be statistical or descriptive. This all image is effective enough to perform prediction, pattern recognition, clustering, similarity group generation etc. There are number of approaches defined to acquire such kind of image from images such as image feature extraction, statistical image analysis, vector quantization etc. This image Extraction process is defined as a model defined under sub stages where each sub stage is able to acquire the image effectively. The simplest model of image extraction is shown in figure 1.

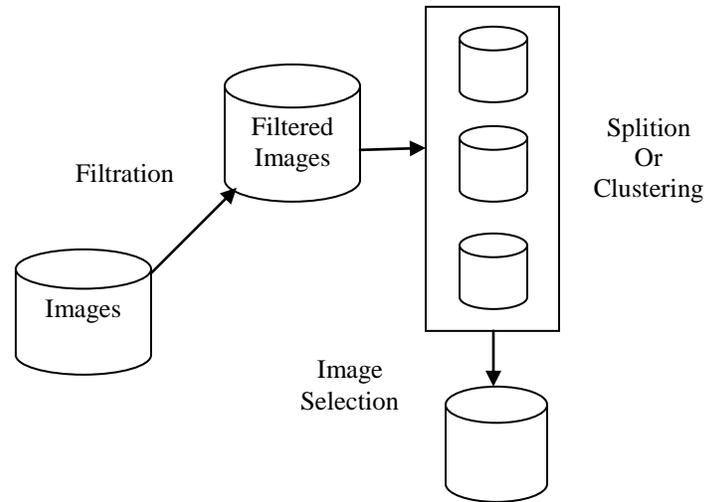


Figure 1: Feature Extraction Model

As shown in the figure, as the Extraction process is performed on a raw large images. This images can have number of impurities in the form of missing image or invalid image. To process on this images, the first requirement is to filter this images and remove these all impurities over the images. After this filtration stage, the meaningful image will be obtained from the images. This meaningful image will be processed under segmentation or clustering process to divide it in smaller subsets. This sub-images will be processed to acquire the Feature from it. This images division is performed based on the similarity analysis based of different image features and characteristics. The distance measures are apply to perform image clustering. Once the image is divided in N sub-images, the next work is to select the appropriate sub images for further Image Processing. The selection process is based on the application, domain and feature analysis. This whole Feature Extraction model will present the most effective image part that is having the most relevant image respective to the domain or the application.

A) Clustering

Clustering is one of the major Image Processing activity that is been used as part of feature extraction algorithm and statistical analysis methods to divide the images in different groups called clusters. Clustering process is defined on various associated parameters and to perform the dimension effective Image Processing so that more simple and easy form of image representation will be obtained from the images. This Image Processing is based on the various criteria specified to represent the image more effectively. In the raw form, complete images is represented in the form of single cluster. Later on images is divided in various clusters based on similarity analysis. The intelligent clustering process is also able to identify the outlier or the abnormal image from the images. These various criterions defined over the images includes the clustering process that divides the image in sub segments. The clustering can be performed on different types of image including the numerical image, textual image, descriptive image etc. There are number of approaches available to perform image clustering which are described in later section of this paper.

The Feature Extraction is always considered as the model to identify the meaningful image or image over the images. This Image Processing stages is here defined to extract the image features. In this paper, an exploration to the clustering approaches is defined. In this section, the basic model of image Extraction is presented. The section also defined an overview to the clustering process. In section II, the work defined by the earlier researchers on clustering and image Extraction is defined. In section III, different approaches presented by earlier researchers are discussed for image extraction. In section IV, the conclusion obtained from the work is presented.

2. RELATED WORK

Lot of work is already defined by different researchers to process on available images and perform image extraction using clustering approaches. Some of the work defined by earlier researchers on Image Processing is discussed in this section. Lei Jiang[1] has defined a work on optimization of clustering approaches using adaptive PSO approach. Author defined an improved clustering mechanism under fitness function specification to improve the clustering process. Author defined an adaptive niche approach based on comparative analysis so that effective image division will be performed. Author presented the dimension reduction approach with large difference analysis under cluster specification and obtained the effective image clustering. Shuai Li[2] has defined a work to improve the clustering process using spatial characteristics analysis and PSO approach. Author provided the estimation on available clusters and provide the unification to the PSO approach and Bayesian image criterion analysis and provided the numeric clustering algorithm. Author provided the characteristics idea analysis and provided the local optimal problem identification based on the analysis. Author provided the effective image estimation and achieve good performance and resolved most of the clustering errors. Rehab F[3] has defined a work to improve the clustering processing using improved PSO approach. Author provided a hybrid two phase approach with integration of PSO, genetics and k-means algorithm. Author avoided the premature local optima and provided the heuristic search mechanism to extract the image accurately. The parameters considered by the author include velocity and position updation based on rule analysis. Author defined an improved process for improving the selection, mutation and crossover options over the genetic approach. Author provided the solution space for initial cluster formation and centroid updation based on the globalized features over the images. Author provided the work benchmark images so that the effective Image Processing and image convergence will be obtained. Author also defined a comparative study on various optimization algorithms

Surat Srinoy[4] has presented an improvement to clustering for network security modeling using ACO integrated clustering approach. Author presented the work on raw clusters formed using Kmeans and PSO approach. Later on the identification of partitions is done to reduce the complications and complexities over the images. Author presented the clustering mechanism to reduce the images suspicious activities so that attack resolution over the images will be obtained. Author presented the experimental view to represent the images more effectively.

Shafiq Alam[5] has defined an improvement to the clustering mechanism using swarm intelligence approach. Author implemented the work in decentralized environment. Author also presented the comparative analysis on benchmark images and using standard approaches. Author provided the evidence of the image effectiveness so that more effective Image Processing will be done. Alireza Ahmadyard[6] has defined a hybrid approach using PSO and Kmeans algorithms for generating the clusters over the images/ Author defined the convergence over the initial stage and provided the global search so that Image Processing over the images will be obtained. Author defined a group division approach and analyzed it on various sub images and proved the reliability of work under experimentation.

Merwe et.al[7] defined a work on clustering approaches PSO approach. Author defined work in two main stages. In first stage, the identification of cluster centers is done based on image analysis and later on cluster elements are identified using PSO approach. Author defined the work on six different images and provided the comparative analysis between these approaches to show the work effectiveness. Kenyon et. Al.[8] has defined tag based survey analysis on gene expression to cover the problem identification for infection based disease. Author provided the characterization study for the work under the specification of disease and relative patterns. Pudilo et. al[9] has presented an improvement to the clustering approach using multi objective optimizer. Author provided an extension to heuristic search mechanism called PSO. Author presented the extension to the problem based on directional analysis and generated the sub swarms over the images to cover the images and to perform the image exchange effectively over the images. Author provided the a validated method to test the function under evolutionary function specification and respective to the images so that the effective Image Processing will be done. Yang et. al.[10] has defined a work to improve the quantum concept using particle swarm optimization. Author provided the methodology in evolutionary computation and provided the extremely effective Image Processing so that image exchange will be performed for discrete problems. Author provided the powerful tool to analyze the images and provided the equalized check over the images and provided the image transition effectively.

3. FEATURE EXTRACTION APPROACHES

The Feature Extraction is one of the major challenges in Image Processing. As the image is taken from raw sources, it can have some irrelevant image or the image that does not belong to specific application or sub domain. In such case, there is the requirement to filter the images as well as divide the images based so that the application and domain specific mapping over the images can be performed. Clustering is an effective approach that divides the available image in smaller groups where each group represents similar kind of image. These image values that are processed by clustering are unsupervised and not defined along with some prior class identified. So that there is the requirement of some potential mechanism that

will decide the parameters for the group selection and to perform the images division in these group. The number of clusters identification is based on the application or the domain. In this section, some of the significant approaches for image Extraction are explored.

A) Partitioning Methods

The partitioning is having the significance to reduce the images and to divide in smaller groups with m objects. This partitioning method is called clustering. It is defined with the specification of number of clusters and sometimes initial centers are also specified in these approaches. Once the cluster centers are obtained, the next work is to take the distance measurement on these cluster centers and identify the relative cluster to the image value. The strength of this method is the parametric specification. Generally, the distance measures are considered for election of cluster for specific images. The specification of these clusters is defined by analyzing the variant to the image values and by expecting the image updation specific to the image centers. The expectation maximization is here performed with specification of image models and provided the object clusters for the image values. These partitioning methods includes PAM, CLARA, CLARANS.

B) Hierarchical Methods

This method of image extraction is more innovative and intelligent. This method does not require any specification to the number of clusters before specification. This method itself identifies the need and start from the raw form. With each iteration it decides the clusters and the cluster members. The specification of this clustering is here done using tree view. This method uses the tree based approach for Image Processing called Agglomerative Method and Divisive Method. Agglomerative method starts from raw image and moves upward to form the clusters. During this the cluster merging is performed and the group formation based on the clustering process is defined. Divisive method is defined based on the split approach. In this approach, the cluster is divided to smaller clusters with each iteration. This image Extraction method includes the clustering algorithm like BIRCH, CURE, CHAMELEON, ROCK etc.

C) Density Based Method

In this method, the arbitrary shapes of clusters are analyzed to improve the clustering process. Here local criteria for cluster member and cluster selection are defined. Based on these constraints, the density connected points are defined to generate the clusters. There are some effective clustering methods comes in this category called DBSCAN, CLIQUE, OPTICS etc.

D) Grid Based Method

This methods are effective for multi resolution image structure and provide the clustering operations based on grid structure. It provides the quantization to the object space and provide the equalize cell based image distribution. This method includes fast Image Processing based on quantization methods and provides the cell division based on independent and dependent vectors. The dimension specific processing is done to handle different grid segments. These methods include TING, WaveCluser, CLIQUE and GRIDCLUST.

E) Model Based Methods

These methods are based on the certain specification of existing models and model parameters with available results. The image optimization is done using some training method that can fetch these existing methods and take the further decision to process on new image elements. These optimization methods include machine learning method, neural network approach, SVM etc. These methods use the self organizing maps to generate the analysis mapping on existing images. These methods take the analysis on the available images and generate the descriptive table on statistics. Once the statistics is obtained, the next work is to map the images with image group based on the probabilistic map. These methods also provide the image switching based on group. As the Image Processing is done, the result updation and final result modification is common in these methods.

4. CONCLUSION

In this paper, an exploration to the Feature extraction and processing model is defined. The paper has explored the significance of image Extraction and presented it as the model without specification of application domain and images. The paper also presented some of the common methods adapted to present the image effectively.

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