

**Object Based Feature Extraction Technique to Analyze Image**Kanika Garg<sup>1</sup>, Goonjan Jain<sup>2</sup><sup>1</sup>School of Computer & Systems Sciences, Jawaharlal Nehru University, Delhi<sup>2</sup>Department of Applied Mathematics, Delhi Technological University, Delhi

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**Abstract** —Feature extraction is one of the most important techniques used to fetch or retrieve the data from any classification. In this paper, we have discussed about the basic concept of feature extraction and feature selection. There are several techniques for feature extraction but here mainly focus is on the image analysis technique, which tells about the extraction of objects in any image. The image analysis steps are discussed which consists of several mathematical tools and methods. The aim of this paper is to discuss about the several features used under object analysis of an image. This paper is more focus on the theoretical ways of extraction technique and significance of several features used in the object analysis in an image. This paper discuss about the approach to analyze the object features using the feature extraction method.

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**Keywords**-Features Extraction, Feature Selection, Object Features, Image analysis, Binary Object.

**I. INTRODUCTION**

In recent years, several techniques for features extraction exists which have their own advantages and disadvantages. The feature extraction is done after the pre-processing tasks which consist of input set of large data. Now the data in like a warehouse which consists of several unnecessary required for future use. This data consists of noise, repeated, incomplete which is comes from the different source. The main focus is to obtain information from this huge data which can be done by several techniques and the process of extracting this data can be known as Data Mining. Now, this data is very huge in number which is in complex form and required several techniques and needed several tools to extract the knowledgeable information from it. Feature extraction is done after applying the input set of data and help to extract the data which are in the multimedia form. This data is fetch after some pre-processing techniques and make classification based on the properties of each set of data item. Some of steps that are involved in the data mining are transducers, feature extraction, feature selection, classification and learning. This feature extraction provides the data in the machine acceptable format which makes easy to analyze the data and make classification. Now the feature selection process if followed after extraction process, which is used to count the number of features or data sets observed from the previous step. This step used several methods like transformation and sub-setting method to obtain the set on input data which helps in classification process. The extraction of image components can be done using the feature extraction techniques which help to identify several features in the object analysis of an image. The features of colors, ratio can help to analyze the pigments in an image. The color is one of the major components in any image which can be represented in different color formats and consists of several pixels intensities of different colors. This paper tells about the some of the features that can be used to analyze the object features of an image.

**II. RELATED WORK**

Wong T. H.[1] discuss about the supervised classification technique which gives the knowledge about the disadvantage of several traditional image processing system analysis. He gave the idea of object oriented image processing system which is classical image and help to work on multiple rather than an individual. The main focus is on the shape and size of the image. In the several techniques like pixel based techniques. The classification is a complex process which requires to work on single pixel which takes so much time and not easy to perform the process. This concept was help in the semantic information also to find the mutual relation between the pixels. They provide the methodology and classification of object oriented image analysis.

J.A. Recio[2] uses the concept of tools and software approach to analyze the image. He provides the information about the techniques that can be used in image analysis. The main focus is on segmentation and partitioning the image. He tells about the new tool which is used for object extraction and does not require any manual task and a piece of software program known as FETEX. He provides the description of the software which includes the input files and several other features attributes. This FETEX tools is used for graphical user interface and help to identify several features in object analysis of image like spectral features, texture features and structural features. He provides the information about this new software tool with its application and methodology which help in analyze the object features in the image.

Divya Srivastava[3] used the image retrieval process popularly known as content based technique. The name content is given on the basis of three features including in this technique known as shape, color and texture. She discussed about the

methods to extract the color components from the image like Image Bitmap, Histogram type techniques and several color features. The discussion about the two main color extraction method namely, global and local are discussed by her. The main focus is on central Based Image Retrieval which used the content based technique helps in extraction the color features from the multimedia database also. Some color techniques like color descriptor, histogram for K means, chromaticity are discussed in detail with the procedure for extraction.

### **III. FEATURE EXTRACTION AND FEATURE SELECTION**

Feature[4] is defined as the properties in any input set of data that help in differentiate from group of clusters or patterns. Feature Extraction refers to extracting or fetching some properties in any categorical data. The properties which are similar in nature can be known as cluster. Features extraction plays a vital role in reducing the time and maintains accuracy in analysis of data. It is nothing but conversion of large set of data into small set of data which can also know as Dimensionality reduction. Now, the extraction should be done very carefully so that attributes must be desired and increase efficiency in analyzing the data. Features extraction analysis helps to maintain flexibility on data set items which help in classification and making grouping of clusters or finding similar properties.

Machine learning requires data in the converted form so, extraction use set of techniques to convert the data which is in the form of images and text to the machine algorithm. The output can be used as an input for the machine learning algorithms to find further analysis.

#### **Areas on which features extraction can be applied:**

There is various application of features extraction or several areas where this technique can be applied. Some of the areas can be Face recognition, Texture classifier, Image analysis, Image detection.

### **IV. IMAGE ANALYSIS TECHNIQUE**

This is one of the techniques that is used by feature extraction to find the features on input patterns which can be further used by classification process to find the knowledgeable data. This method is used in application based problems to extract the most important features in the image. It helps to reduce the dimensionality and size of image and convert in machine learning algorithm. This machine algorithm provides the classification on the basis of pre-defined features.

#### **4.1 Various steps in extracting features from the image:**

**Step1-**The most basic is to reduce the shape and size of the object of an image. It can be done by reducing the dimensions of an image. Some of the techniques which can be applied to reduce the dimensionality are defined as:

- **Image Segmentation[5]-** It refers to divide the large size of data into chunks or blocks which makes easy to analyze and makes clusters. This technique converts a simple image into multiple sub images or sub-pixels. It used several techniques like edge detection, contour extraction to update, format in the image.
- **Filtering a frequency domain[6]-** It refers to technique which use statistical data and make a group of range and find the attribute fall in the given range. Frequency used the mathematical tools and probabilistic methods to transform the data into multiple dimensions. It uses some mathematical tools to find the calculations like correlation or convolution theorem.

**Step2-** Next step would be to find the features that can help to solve computer imaging problems. This tells about the dependency of features in applications. After these all extraction implementation, analysis is done on the observed data set.

### **V. OBJECT ORIENTED TECHNIQUE**

Object is nothing but a real world entity that related anything with physical presence. The object based technique [7] is modern approach to analyze the image features which consists of class based methods. This technique provides the various methods to reuse the data of any process using the concept of inheritance and also provide several other new techniques that makes analysis more reliable and faster. This approach consists of grouping the pixels into several clusters and provides the classification of an object. Several features which can be used to analyze the image are discussed below which can be perform using the object technique.

#### **5.1.1 Shape Feature:**

This feature is required a binary image which help in analysis. It is dependent on the outline or edges of an image.

#### **5.1.2 Binary Image Object Features[8]:**

This is the pro-processing step which can be perform after the output we get in our first step. After the segmentation and filtering, the analysis can be done to extract the binary features in an image. The objects can help to identify inter dependencies on each data set and we can have labeled on each features using this object. After labeling the image using the object technique, we can categorize the images into two categories:

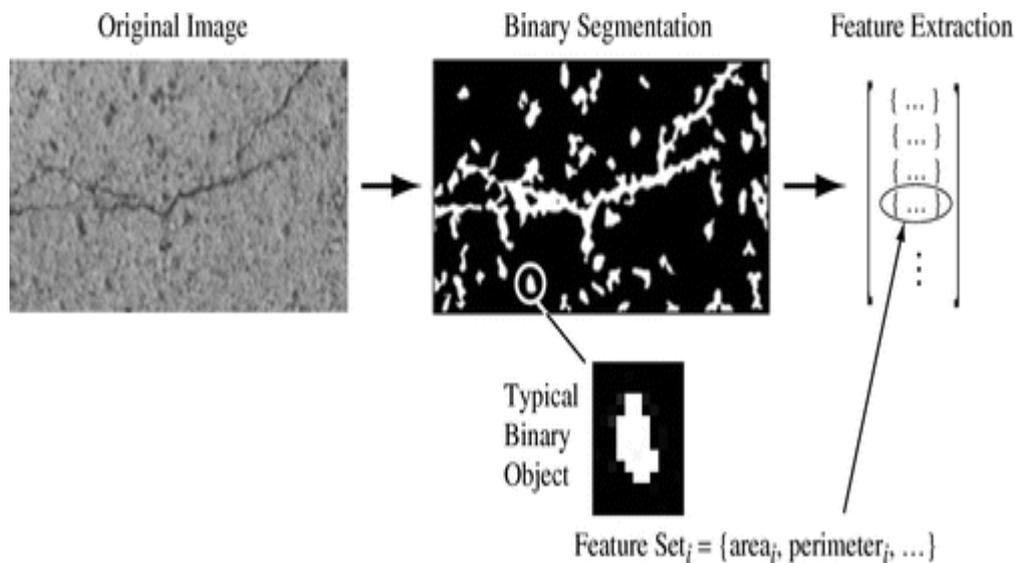
The image with object has label as “1” is consider and else the images which are not label through the object are considered to be “0”.There is a process to label the image which includes the following steps to follow:

- Connectivity should be defined
- All the images should be scanned and make the symbol for the connected objects which are labeled.

After labeling, the object number is applied to each image which helps to fetch interest of features from the produced image.Binary object features includes several methods like area, centre of area, axis of least second moment, perimeter, Euler number, projections, thinness ration and aspect ratio.

To extract the features from each object as an individual, we need to create a binary image for each one of them individually.

We can success in above step by making the labeling “1” as an image pixel and other as “0”.Now, when the labeling process is done and we get 3 different labels in the final steps, then we are required to make 3 individual separate images for these objects.The given diagram represents the process of extracting the binary object from the input image using the process of segmentation.



**Figure 1. Binary Object Extraction[9]**

**5.1.3 Binary Image Feature area:[10]**

Nth object area in this object features can be consider as:

$$P_n = \sum_{r=0}^{height-1} \sum_{c=0}^{width-1} I_n(r,c)$$

P<sub>n</sub>- area which can be measured in pixel and help to find out the relative size in binary image of any object.

**5.1.4 Binary Object Features – Axis of Least Second Moment**

The above method is used to calculate the angle relative to vertical axis in the object features. The angle can be represented by the symbol Q.

The below diagram represents the angle for the axis of least second moment in the binary image analysis. The features on image are:

- The origin is considered as the centre to find the area.
- The above features help to fetch knowledge about the orientation of any object in an image.
- The axis is used to represent the least energy which provides spinning of an object.

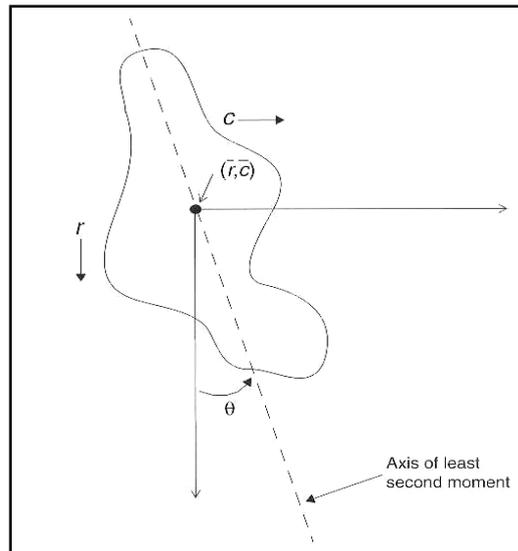


Figure 2: Diagram representing angle of axis

### 5.1.5 Binary Object Features – Perimeter[11]

Perimeter for any object or shape is defined as the total number of pixels or any components around the edges. The number of pixels present in the outline or boundaries of an image is represent perimeter in binary image analysis which help to calculate the pixels at any boundary in any image. Perimeter provides the knowledge about the objects in the space and tells about the number of lines in any object. This also helps to understand the shape of any object. The process to found the number of pixels in quite easy. It can be done by counting the pixels that have labeled as “1” and having neighbor as labeled “0”. Edge detection is also a technique which helps to determine the shape of any object or number of pixels at each corner. So, edge detection technique also helps to find perimeter in of any object in image analysis of feature extraction. Edge detecting used the technique to count the number of pixels which are labeled as “1”. The above method provides the actual perimeter calculation. For further improvement or more corrected result we can product or multiply the result by “ $\pi/4$ ”.

### 5.1.6 Binary Object Features – Thinness Ratio

Thinness ratio is an important component analyze in object analysis which tells about the relation between the area and the perimeter calculated above in the object extraction.

The ration can be derived by dividing the area with the square of perimeter and multiply by  $4\pi$ . The ratio of thinness is represented by the symbol T.

The mathematical equation for thinness can be represented as:

$$T_i = 4\pi (\text{Area} / \text{perimeter}^2)$$

From the above mathematical equation, we can say that increase in parameter will leads to decrease in area relatively which will affect the ratio of thinness. In short, we can conclude that the perimeter is inversely proportional to the ratio.

### 5.1.7 Binary Object Features – Irregularity Ratio

When the thinness rasion inverse, it canbe transform into new features of object analysis which can be known as the “irregularity” ratio of the object. It means it can be represented as the  $1/T$ .

As the name suggests, the above technique is used to find the irregularity or regularity of any object in any image analysis.

Regular object can be identify with less vertices or no. of branches, which means that less perimeter give rise to same areas for the irregular objects.

### 5.1.8 Binary Object Features – Aspect Ratio

It is the most widely term used in our daily life. It I used in watching videos, photos or any multimedia files. It provides the details about the resolution of any multimedia file. It tells about the components in number of rows and number of columns. It is like to make boundary or box of an image which also provides the calculation about the highest and lowest values in columns and rows of the object.

It can ne understand as the vertical and horizontal lines in any images and each box can be treated as an individual pixels. More the number of pixels will be bounded in an image, more will be aspect ratio and clarity if image will enhanced.

The equation can be represented as:

$$\frac{c}{r} = \frac{-c}{-r} = \frac{+1}{+1}$$

It is used to find pixels or tells about the location of object in vertical and horizontal axis.

**5.1.9 Binary Object Features – Projection (Multi dimension Space)**

Projection is term refers to find the shape of any object in difference space with different dimensions along different axis. The main used of projects in object extraction technique is used to find the correct shape of any object which makes easy to analyze the extraction. The shape can be found by calculating the total number of pixels in both the direction. Like Horizontal projection can be calculated by adding all the pixels in the rows. Similarly, vertical projects can be calculated by adding all the pixels in the column.

**5.1.10 Histogram or Graphical representation Features[12]**

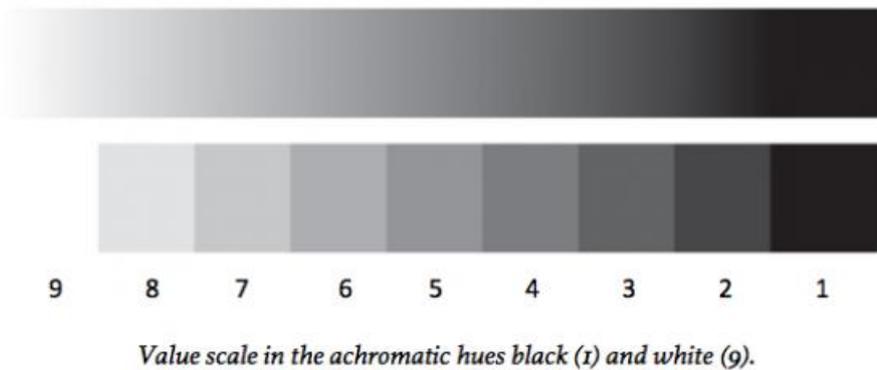
Histogram is one of the best techniques which represent the data in the form of bars. This provides easy to analyze the data and provide an statistical data. It makes easy to analyze the minimum, maximum number of objects as well. The histogram in the object analysis provides the relation between the number of pixels and the gray-level values. The histogram helps to provide the several characteristics of an image which are discuss below:

- It helps to identify the nature of any image by observing the shape of any histogram received.
- It is used to find the darkness and brightness of any image which provides the clarity of any image.

The images can be shows in the form of difference levels like high contras level or low contrast levels. It is a probabilistic technique which consists of the gray levels distribution. Histogram also helps to find the several mathematical techniques like mean, median, standard deviation, energy [10].

**5.1.11 Color Combination[13] Features**

In the process of retrieval of image and classification, the color is considered as the most important features. The color can be represented in several forms like RGB, grey scale or black and white. This color histogram is used to extract the gray level intensity pixels with related to each pixel. The color features is insensitive to size, independent on the zooming and shape of an image even after rotation. The typical color scheme is RGB but it is not robust. Using RGB color we can make all the possible of color intensities. Like the best live example of color feature is color printer, the color printer cartridge consists of RGB ink only which can be used to distribute all the color intensities including black and white also. The given diagram shows the grey scale intensities [14].



*Figure 3: Grey level Intensities[15]*

**VI. CONCLUSIONS**

In the above paper, we have discussed about the features extraction and features selection techniques. Features extraction is done after pre-processing technique which can be applied on the input set data items to find out the classification or making grouping to extract the knowledgeable data from huge available data set. There are some methods which can be used in features extraction, one such method which is known as image analysis is discussed in this paper. The steps involved in the image analysis are provides which consists of two techniques to analyzing the image. The binary image concept is told which helps to extract the features from the image and help in extraction of several image components to find the input patterns. The graphical feature knows as histogram is told about the several methods which can be used to analyze the set of data. From the above theory, we can conclude that object oriented is new modern approach that can be used to extract the pigments in image components which helps to make classification techniques.

The paper discuss about the advantages of object oriented technique and disadvantage of traditional technique that was used to extract the objects or pixels from the image. The different types of colors can be proposed to represent any image. The methodology tells about the binary image features and process involved in it. Several software tools are available now in classical technique to find the pixels from the image. The pixels can be found multiple instead of an individual which makes fast process and easy to solve complex data.

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