Abstract: Image segmentation plays a significant role in computer vision. It aims at extracting meaningful objects lying in the image. Generally there is no unique method or approach for image segmentation. In this paper, a simple algorithm for detecting the range and shape of objects in images is described. This image is visually examined for detection and analysis of object. To avoid that, this paper uses computer aided method for segmentation (detection) of objects based on the combination of two algorithms. This method allows the segmentation of objects with accuracy and reproducibility comparable to manual segmentation. In addition, it also reduces the time for analysis. At the end of the process the object is extracted from the image and its exact position and the shape also determined. The object is analyzed based on the amount of area calculated from the cluster. The key concept in this color-based segmentation algorithm with K-means is to convert a given color space image into a gray scale space image and then separate the position of objects from other items of an image by using K-means clustering and histogram-clustering.

Keywords: Fuzzy C-means, k-means, Thresholding.

1 INTRODUCTION

Image segmentation was, is and will be a major research topic for many image processing researchers. The reasons are obvious and applications endless: most computer vision and image analysis problems require a segmentation stage in order to detect objects or divide the image into regions which can be considered homogeneous according to a given criterion, such as color, motion, texture, etc. Segmentation can be a fully automatic process, but it achieves its best results with semi-automatic algorithms [1], i.e. algorithms that are guided by a human operator. This concept of semi-automatic process naturally involves an environment in which the human operator will interact with the algorithms and the data in order to produce optimal segmentations. The simplest example of the need of a human intervention during the task of segmentation results from the specificity of the existing algorithms: depending on the type of input data, the operator will have to carefully pick the best adapted algorithm, which most of the time cannot be done in an automatic way. The subjective point of view of the human is required.

Clustering is the search for distinct groups in the feature space. It is expected that these
groups have different structures and that can be clearly differentiated. The clustering task separates the data into number of partitions, which are volumes in the n-dimensional feature space. These partitions define a hard limit between the different groups and depend on the functions used to model the data distribution. Image segmentation is an important and challenging problem and a necessary first step in image analysis as well as in high-level image interpretation and understanding such as robot vision, object recognition, and medical imaging. The goal of image segmentation is to partition an image into a set of disjoint regions with uniform and homogeneous attributes such as intensity, color, tone or texture, etc.

2 RELATED WORKS

Clustering [2] can be considered the most important unsupervised learning problem because no information is provided about the "right answer" for any of the objects. It classifies a set of observations in the data and it finds a reasonable structure in the data set. Here priori information about classes is not required, i.e., neither the number of clusters nor the rules of assignment into clusters are known. They have to be discovered exclusively from the given data set without any reference to a training set. Cluster analysis allows many choices about the nature of the algorithm for combining groups. There are two basic approach to clustering, which we call supervised and unsupervised. In the case of unsupervised classification [3] on clustering, we do not have labels. If we know the labels of our input data, the problem is considered supervised [4], or otherwise it is called unsupervised.

2.1 K-Means Algorithm:

The K-means algorithm is an iterative technique that is used to partition an image into $K$ clusters[2]. The basic algorithm is:

1. Pick $K$ cluster centers, either random or based on some heuristic. Assign each pixel in the image to the cluster that minimizes the variance between the pixel and the cluster center
2. Re-compute the cluster centers by averaging all of the pixels in the cluster.
3. Repeat steps 2 and 3 convergence is attained (e.g. no pixels change clusters)

In this case, variance is the squared or absolute difference between pixel and cluster center. The difference is typically based on pixel color, intensity, texture, and location, or a weighted combination of these factors. $K$ can be selected manually, randomly, or by a heuristic.

This algorithm is guaranteed to converge, but it may not return the optimal solution. The quality of the solution depends on the initial set of clusters and the value of $K$. The detailed description of clustering methods for images is given in a source. The other approach to partition an image into $K$ clusters is the statistical hierarchical agglomerative catarization technique for identification of images regions by the color similarity. This method uses a binary mask and ranks the color components of the
clusters’ central components [5]. The basic algorithm is:

- Each pixel is replaced with the mean value of its cluster.
- In the center, segmentation obtained using only the intensity information.
- At the right, segmentation obtained using color information.
- Each segmentation assumes 5 clusters.
- On the left, an image of mixed vegetables, which is segmented using k-means to produce the images at center and on the right.

### 2.2 Fuzzy C-Means Algorithm

The fuzzy c-means algorithm [6], like the k-means algorithm, the fuzzy c-means aims to minimize an objective function. Instead, the fuzzy c-mean relax the condition, and it allows the feature vector to have multiple membership grades to multiple clusters, Suppose the data set with known clusters and a data point which is close to both clusters but also equidistant to them. Fuzzy clustering gracefully copes with such dilemmas by assigning this data point equal but partial memberships to both clusters that the point may belong to both clusters with some degree of membership grades varies from 0 to 1.

The fuzzy c- mean algorithm is better than the k-mean algorithm, since in k-mean algorithm, feature vectors of the data’s set can be partitioned into hard clusters, and the feature vector can exactly be a member of one cluster only. Some of the input samples are given in Fig 1.

![Fig 1: Some sample inputs](image)

### 3 METHODOLOGY

Preprocessing is done by filtering. Segmentation is carried out by advanced K-means algorithm [7]. Feature extraction is done by thresholding and finally, Approximate reasoning method to recognize the object shape and position in image using edge detection method. The proposed method is a combination of two algorithms were developed for segmentation and outline is sketched in Fig 2.

![Fig 2: Outline of the work.](image)
4 PROCESSING

4.1 Pre-processing

According to the need of the next level the preprocessing step converts the image. It performs filtering of noise and other artifacts in the image and sharpening the edges in the image. RGB to grey conversion and Reshaping also takes place here. It includes median filter for noise removal.

4.2 Segmentation

Segmentation is carried out by advanced K-means and Fuzzy C-means algorithms [4].

4.3 Feature extraction and approximate reasoning

The feature extraction is extracting the cluster which shows the predicted object at the FCM (Fuzzy C-means) output. The extracted cluster is given to the threshold process [8]. It applies binary mask over the entire image. In the approximate reasoning step the object is calculated using the binarization method [9, 10].

5 RESULTS

PROCESSED IMAGE:

Here the image is processed and produce RGB separation of the image using hexadecimal values and Create image method. Find the histogram of the RGB. Histogram means that, the frequency range of RGB. Our segmentation is based on this histogram values.

GRAY:

This stage is to convert the colored image into gray. This is done because the supporting algorithm SOM can be applied only to the gray images. This is done using the method TYPE_BYTE_GRAY. The output is as in Fig 3.

Fig 3: Gray scale image

SOM INPUT:

This stage calculates the standard deviation and mean of the given image. To calculate the mean we use the pixel values gathered by the Pixel Grabber class in the first stage. This represents the sum of pixel values. To find the mean we need the total number of pixels. This is calculated by multiplying the height of the picture with its width. We get the mean by dividing the sum of the pixels by total number of pixels. To get the standard deviation we find the sum of squares of pixel values and divide it by the total number of pixels and square root will be the standard deviation of the image. The output of this stage is in Fig 4.

SOM MAPPING:

This stage takes input as the previous stage’s output and process SOM (self-organizing map) algorithm to produce final segmentation of that image. Here the pixel
value of each pixel is gathered and they are grouped into clusters with the closer pixel values. The pixel values written into the text file.

6 CONCLUSIONS AND FUTURE WORK

There are different types of objects available. They may be mass in image. Suppose if it is a mass then K-means algorithm is enough to extract it from the image cells. If there is any noise present in the image it is removed before the Kmeans process. The noise free image is given as input to the k-means and object is extracted from the image. The proposed method gives more accurate result. The future work concentrates on segmentation using Fuzzy C means for accurate object shape extraction of object and thresholding of output in feature extraction. Finally approximate reasoning for calculating object can be carried out.

The results show that this method can successively segment the object provided the parameters are chosen properly. In this study, the object identification and the investigation are carried out for the potential use of data for improving the object. This initial partition is the input to a computationally efficient seed region that produces the suitable segmentation. It is observed that the proposed method has shown higher robustness in discrimination of regions because of the low signal/noise ratio characterizing most of images.
References