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# Segmentation

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**Abstract:** Digital video processing and computer vision, one of the most challenging and active research areas is video object segmentation. A significant issue for the successful use of many video sequences is video object segmentation that accentuates partitioning the video frames to semantically meaningful video objects and backgrounds. Video object segmentation is a vital operation for content-based video coding, multimedia content description, intelligent signal processing and more. Various techniques are being used by the developers in reviewed. They are background subtraction method, CNAFCM, Kernal based fuzzy c means algorithm, Clustering and enhanced method, optimizing motion detection algorithm. In this paper, an FCM algorithm with SLIC algorithm is used. Clustering is done with the help of FCM algorithm. Because in this we compare the existed technique with the fcm algorithm. Then calculate the PSNR values of existed and proposed segmentation.

**Keywords:** Image Segmentation, Classification of segmentation, Moving objects, Motion Detection.

## 1. INTRODUCTION

Segmentation can be specified that it is a process of partitioning data into groups of potential subsets that share homogeneous characteristics. It has turn into a technique for semantic content extraction and plays an important part in pattern recognition, digital multimedia processing and computer vision.

### 1.1 Image Segmentation

In image processing, segmentation is the most important part. Fence off an entire image into several parts which is something more meaningful for next process and easier. These several parts that are rejoined will cover the entire image. Segmentation may also base on various qualities that are contained in the image. It may be either texture or color. Before denoising an image, it is segmented to recover the real image. The main motto of segmentation for easy analysis is to overcome the information. Segmentation is also useful in image analysis and image compression [1].

### 1.2 Classification of segmentation

Segmentation can be classified as follows:

1. Region Based
2. Edge Based
3. Threshold
4. Feature Based Clustering
5. Model Based [1]

### 1.2.1 Region Based:-

In this method for segmentation pixels that are related to an object are grouped. The thresholding technique is bound with region based segmentation. The field that is detected for segmentation should be closed. Region based segmentation is also known as Similarity Based Segmentation. There won't be any gap due to missing edge pixels in this type of segmentation [1].

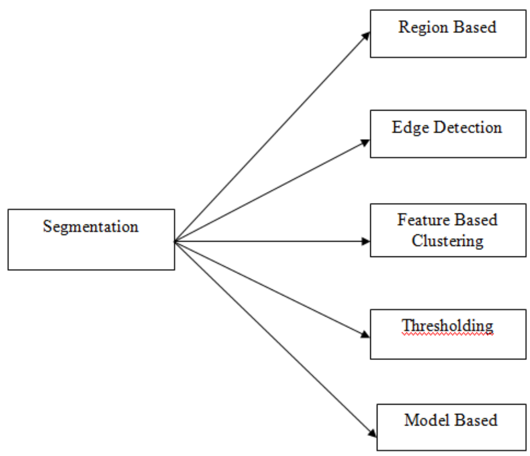


Fig 1.1 various types of segmentation [1]

### 1.2.2 Edge Based:-

Segmentation can also be done by using edge detection methods. In this technique the boundary is identified to segment. The discontinuities in the image are identified by the edges detection. Edges on the region are traced by identifying the value of pixel and it is compared with the nearest pixels. For this classification they use both adaptive and fixed feature of Support Vector Machine **(**SVM**).** In this edge based segmentation, there is not necessary for the detected edges to be closed. In this Canny edge detector, for segmentation some step by step procedure is mentioned in Fig 1.2

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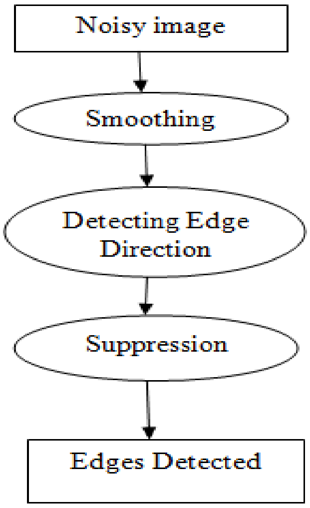


Fig1.2 Canny Edge Detector procedure [1]

**1.3 Moving Objects**

The moving target detection of video sequence is an important task in many applications, such as intelligent transportation, safety monitoring, etc. Now, the main presented approaches of moving target detection are background difference, optical flow and time difference (frame difference). In the past, there have been researchers investigating kinds of approaches for segmenting objects i.e dynamic in real time to achieve these vision-based applications. In addition, the current difference method, which didn't make overall use of rich color information, is generally narrow to two images of the brightness, but in practical application color information is indispensable [2].

**1.4 Motion Detection**

Motion detection is essential in many fields, such as pattern recognition, object tracking, traffic surveillance. At present the concerned approaches of dynamic target detection are background difference, time difference (frame difference) and optical flow. Motion detection algorithm operates in a specific area to observe the change of image for detecting the dynamic object.

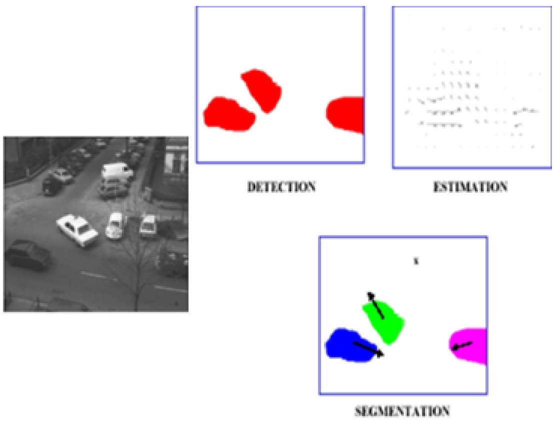


Fig1.3Detection, estimation and motion segmentation [3]

However, the change in the environment disturbs the motion detection sincerely: illumination, noise, shadow and so on. Lots of current motion detection algorithm fails to be effective and fast at the same time. Thus our task is to detect the motion detection algorithm which finds the balance between effectiveness and complexity [3].

**1.5Object Tracking**

In order to extract useful information of an object of interest from a video scene and keeping track of its orientation, motion, occlusion etc. is defined as object tracking. The goal is to review the state-of-the-art tracking methods, identify new trends and classify them into different categories. Object tracking, in general, is a challenging problem. Due to abrupt motion of object, changing appearance patterns of the scene and the object, object-to-scene and object-to-object occlusions, camera motion and non rigid object structures, there are many difficulties occur in tracking of objects.The object tracking can be complex, due to camera motion, loss of information caused by the projection of the 3D world on a 2D image, variations of object scale, partial occlusions, real-time processing necessities, clutter, and so on [4].

**1.6 Clustering**

An unsupervised learning task is clustering, where the pixels are classified in to a finite set of categories known as clusters or groups. It is an unsupervised classification because there is no available data to train the pixels. A similarity criteria is defined among pixels such as distance, intensity and colour, and then similar pixels are grouped together to make clusters. The grouping of pixels is done based on intra class similarity and enhancing the inter class likeness. Where intra cluster similarities is measured between the pixels in a cluster and inter cluster similarity is measured between the clusters. Clustering is necessary in several exploratory decision making, pattern analysis, and machine learning situations, document retrieval, including data mining, image segmentation, and pattern classification [5].

## 2. RELATED WORK

The research work performed in this area by diverse researchers is presented as follows:

**R. Yogamangalam et al.[1]**shows a describe outline on some of the most common segmentation techniques like thresholding, Edge detection, Model based, Clustering etc., noticing its advantages as well as the disadvantages. Many of the techniques are suitable for noisy images. (MRF) Markov Random Field is the strongest method of noise cancellation in images whereas thresholding is the simplest computationally fast technique for segmentation.

**Jinglan Li et al.[2]**presents a novel background subtraction method for detecting foreground objects in dynamic scenes. First obtained is the difference image of color distance between the reference background image

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and current image in YUV color space. According to the mono-modal histogram feature of the difference image, an adaptive clustering method based on histogram is given. With morphological filtering, the spot of noise existed in the segmented binary image can be removed. Finally, an updating scheme for background image is presented to follow the variation of illumination and environmental conditions. Practical results show that the proposed approach can detect moving objects effectively from video sequences.

**JiaminNing et al.[3]** introduce an optimizing motion detection algorithm for the modern intelligent video surveillance aim at overcoming the weakness of conventional background subtraction algorithm. The author integrate adaptive background model in HSV color space with dynamic object segmentation based on fuzzy clustering to extract dynamic objects from frame. The adaptive background model is capable to restoring the background due to the correct description of the HSV color space, and then the dynamic object segmentation based on fuzzy clustering is used to distinguish the noise area and moving area by the adaptive selection of threshold The experiments show that the background updating model work well and moving object segmentation based on fuzzy clustering could suppress the effect of noise.

**RadhakrishnaAchanta et al.[4]**introduce a novel algorithm that use clusters pixels in the integrated five-dimensional color and image plane space to productive originate compact, nearly uniform super pixels. The simplicity of this technique makes it extremely easy to use - a lone parameter describes the number of super pixels and it makes this algorithm very practical due to the efficiency. Experiments show that this approach produces super pixels at a minimum computational cost while achieving quality of segmentation equal to or higher than four state-of-the-art methods, as estimated by boundary recall and under-segmentation error.

**Zhiding Yu et al.[5]**introduce a modified FCM algorithm for color image segmentation in this paper. The proposed algorithm adopts a robust and adaptive initialization method, according to the input image which automatically, decides starting cluster center values and center number. In addition, by deciding the window size of pixel neighbor and the weights of neighbour membership according to local color variance, the recommended approach enhance the algorithm robustness to noise pixels and drastic color variance and adaptively incorporates spatial information to the clustering process.

**S.ArunInigo et al.[6]**presented various methods for segmenting the moving objects. These various techniques are background subtraction, edge detection, temporal segmentation, optical flow and the combination of spatial-temporal segmentation Moving object segmentation is an important process because it is used in many computer vision applications. In video surveillance field, especially for vehicles and humans segmentation, is currently one of the most essential research topics in computer vision. Object segmentation is very important for recognition the object and tracking the object in a video.

**ZHANG Wei et al.[7]**firstly introduced the common methods and some basic concepts of the video object segmentation technology, and then analyzed the merits and demerits of each method, finally development trend of the technology and forecasted the future. Video motion object segmentation becomes very important with the advent of video standard MPEG-4 and MPEG-7.

**Merin Antony A et al.[8]** presents with this survey paper three approaches of segmentation as boundary-based, region-based and combination of region and boundary-based methods. Segmentation of dynamic objects in video sequences is important for aspects of multimedia. The extraction of foreground (dynamic object)from background is called moving object segmentation. Object detection and motion detection are the different steps that are used in moving object segmentation. The object detection and motion detection are done using different methods. Compared to the region based approaches, the boundary based approaches are better in computational complexity but they are not so efficient in presence of occluded objects.

## 3. PROPOSED WORK

### 3.1 Problem Formulation

In the image segmentation using a novel cluster number adaptive fuzzy c-means segmentation algorithm (CNAFCM) for automatically combining the pixels of an image into different homogeneous regions when the cluster number is unknown .The advantage of FCM technique is that it yield regions which are more homogeneous also it reduces spurious blobs. Further it was less aware to noise. I have decided to modify/extend CNAFCM algorithm (static images) for video frame segmentation. So, the problem can be formulated as:

**"Video Segmentation Using CNAFCM Algorithm"**

In the modified (videos) algorithm, the motion needs to be extracted from multiple frames. And also, the modified algorithm need to be fast enough to act on different frame per second (FPS).

### 3.2 Proposed Work

SLIC Super pixels Algorithm, This approach generates super pixels by clustering pixels depend on their color similarity and proximity in the plane of image. This is done in the five-dimensional space[lab xy], where [lab] is the pixel color vector in CIELAB color space, which considered as perceptually uniform for minor color distances, and xy is the position of pixel. While the maximum possible distance is limited between two colors

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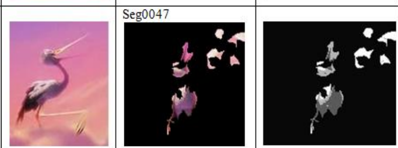
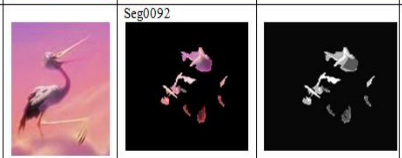
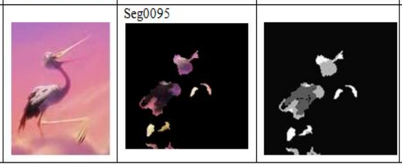
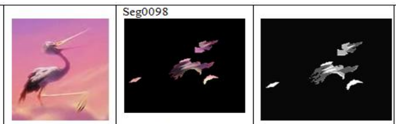
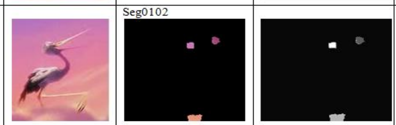
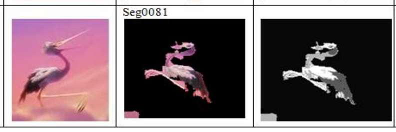
in the CIELAB space (assuming RGB input images), the spatial distance in the xy plane depends on the image size. It is impossible to simply use the Euclidean distance in this 5D space without assigning the spatial distances. We therefore introduce a new distance measure that takes upper pixel size in order to cluster pixels in this 5D space.

## 4. RESULTS AND ANALYSIS

Video contain many frames so first of all we take the frames from the video for the next segmentation process. Then using SLIC algorithm, track the object for the further segmentation. Because tracking of object is compulsory so that we perform the clustering and segmentation of that object. After tracking apply the segmentation technique. Now clustering is done with the help of FCM algorithm. Because in this we compare the existed technique with the fcm algorithm. Then calculate the PSNR values of existed and proposed segmentation. Make a table for existed and proposed segmentation values. We see in the table that the PSNR value of proposed technique is high. Hence it is better than existing technique.

TABLE 4.1 PSNR VALUES OF SEGMENTATION

| S. No | Original image | Segmented image | Fuzzy segmented image | PSNR value of Existing segmentation | PSNR value of proposed segmentation |
|---|---|---|---|---|---|
| 1. |  | Seg0097 | | 3.8539 | 4.2073 |
| 2. |  | Seg0010 | | 3.7592 | 4.1447 |
| 3. |  | Seg0018 | | 3.7277 | 4.1160 |
| 4. |  | Seg0025 | | 3.7305 | 4.1374 |
| 5. |  | Seg0039 | | 3.7932 | 4.1520 |
| 6. |  | Seg0047 | | 3.7665 | 4.0985 |
| 7. |  | Seg0053 | | 3.7505 | 4.0647 |
| 8. |  | Seg0078 | | 3.8572 | 4.1691 |
| 9 |  | Seg0065 | | 3.8050 | 4.1603 |
| 10. |  | Seg0086 | | 3.7614 | 4.1025 |
| 11. |  | Seg0092 | | 3.6915 | 4.0531 |
| 12. |  | Seg0095 | | 3.7428 | 4.2603 |
| 13. |  | Seg0098 | | 3.6855 | 4.0862 |
| 14. |  | Seg0102 | | 3.5436 | 3.9356 |
| 15. |  | Seg0081 | | 3.9382 | 4.2907 |

Taking that values we make a graph. Graphical representation shows that we get higher values of PSNR using Fuzzy C means algorithm which gives the better results of segmentation.

### 4.1 COMPARISON GRAPH

Now, we have shown the comparison in graphical way for more clearance of existed PSNR values and Proposed PSNR values. In this graph blue line shows the existing segmentation and red line show the proposed segmentation.

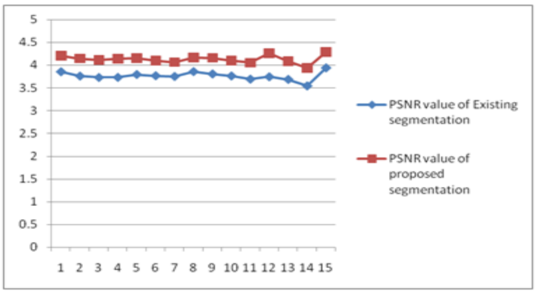



Fig. 4.1Comparison graph of PSNR values

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From these two lines it is clearly seen that we get higher result with our new proposed algorithm.

Now calculate the average values of both segmentation and make a graph of that calculated values and it show clearly that we achieve better segmentation result.
Avg. PSNR value of Existing segmentation = 3.7604
Avg. PSNR value of proposed segmentation = 4.1318

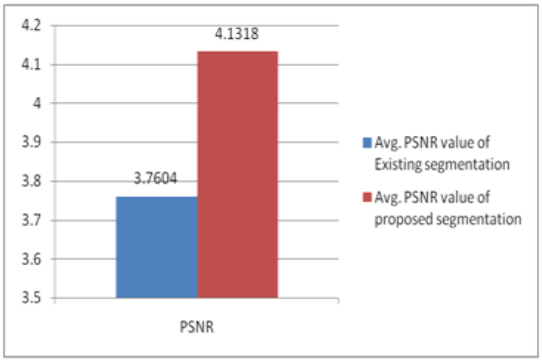


Fig. 4.2 Graphical Representation of average PSNR values
In this graph it is clearly seen that the proposed technique gives the better result of quality of the video segmentation.

## 5. CONCLUSION AND FUTURE SCOPE

in this dissertation two algorithms are used.SLIC is used for object tracking and FCM is used for clustering. SLIC algorithm is used for tracking of object from the frames. FCM clustering is a hard and an unsupervised clustering technique which will be applied to image segments to clusters with spectral properties. FCM use the distance between pixels and cluster centers in the spectral region to compute the membership function. In this dissertationwe calculate the PSNR (peak to signal noise ratio) values of existed segmentation and proposed segmentation. The comparison of techniques are based on the PSNR values. The Proposed technique gives the high values of Peak to Signal Noise Ratio. Graphical representation of PSNR values shows the higher values of segmentation. Hence from the compaision graph and average graph it is clearly conclude that we get higher values that gives us better quality of the segmentation. Hence this technique enhance the quality of the videos.Future work is
1. Evaluation of Time Complexity.
2. More parameters such as sharpness, variance, contrast can also be measure.

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