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# Interactive Segmentation using improved FLICM

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**Abstract:**

In this paper, aims interactive segmentation, first it which starts with the one seed point for the main object in the image, later it develops with the manner of region growing to the extent of reaching the boundaries of the image. For achieving this interactive segmentation we proposing improved FLICM which is a improved version of Fuzzy Clustering model (FCM) and complex Gaussian model. Using the improved FLICM reduces the cost function varies with the input membership functions.The proposed method is highly robust and efficient with the other conventional methods.

***Keywords****: Interactive segmentation, FCM, Cost function, Membership functions.*

## I. INTRODUCTION

Interactive segmentation is one of the activeproblem in image processing. In many conventional algorithms segmentation can be done automatically and isdifferent from the human performance. Furthermore, in many contexts For example in medical imaging, segmentation output accuracy can be decided by the specific application only. In such ones, an interactive segmentation is preferred, where the user an select the interested objects for segmentation.

## II. Review of Literature

Interactive segmentation is one of the challenging task in recent times. Inmarkers and watershedsmethodfrom morphology [1], segmentation is achieved by considering the regional minima using a set of markers.

Many recent methods on graph-cuts, used in developing the min-cut / max-flow method [2]. The work segmentation of [3] was improved in [4], with the Gaussian Mixture Markov Random Field model. In [5], the segmentation is obtained bycalculating the weighted geodesic distances.

InCanny's [6], used for discontinuities in the image, while considers onlycolor and texture information

Interactive foreground(object) and background segmentation [7] [8] [9]. The graph cut is used in solving the optimization problems.Grab Cut [7] and Lazy Snapping [8] apply different clustering algorithms They both require subtle user refinements for most cases,

In [10], boundary-based segmentation based on Ultra metric Contour Map (UCM). TheUCMs achieved the performance at best on the (BSDS) [11]. Further, in comparison with the other leading boundary detectors, Improving UCM by developing the thresholding for closed curves and boundaries.

In [12],[13],[14] have undergone research on detection of skin cancer based on ABCD parameters, research on skin cancer detection using modified whale optimization algorithm, and research on improved FLICM.

In [15],[16] have research on skin cancer detection using modified whale optimization algorithm, and research on improved FLICM In these methods a separate uses the segmentation process.

In [17], a front-view camera is used as a tool for considering the intial seed point. Separate scheme is employed for transparent segmentation and semi-transparent segmentation using wearable glasses.

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In [18],develops a constraint Fuzzy Clustering Model and Gaussian Kernel-Based for radiography images. The area of segmentation can be selected by the manual operator which depends the effectiveness of the membership functions and it reduces the disadvantages in segmentation for foreground and background images.

In [19] segmentation is divided into 3 different parts, In the first part it identifies coloured edges and prominent body part edges,Iin the second part , manually specifying area of prominent boundaries. In the third part , enlarging the prominent boundaries which results in animation of characters without any gaps in body parts. Here first two methods are will overcome the disadvantages in the existing models.

In [20],presents new segmentation algorithm which integrates user interactions from the feedback control system. Lyapunov stability analysis is used to develop an effective the interactive image segmentation model with the specific stabilization conditions are employed in algorithm design.

In [22], presents new region merging model by hierarchical clustering for both interclass and intra-class variances which . improves the region merging mechanism compared to hierarchical clustering. In this process which splitting the image into regions, manually selecting the sample for segmenting background ,object and merging the non selected region for the fully image segmentation.

## III. Methodology

In this proposed interactive segmentation is the introduction of modified FLICM.The Detailed flow chart of the Interactive segmentation is shown in the fig 1.

**Modified FLICM:**

In the FCM algorithm[22], Segmentation is the initial process of this work, At the cluster centers, cost junction must be minimized which varies with respect to memberships of inputs.

$$J_m(M,c)=\sum_{j=1}^{n}\sum_{i=1}^{C}M_{ij}^{m}E^2(f_j,c_i)\ (1)$$ n represents the no of feature vectors, C is the no of parts, $f_j$ is the feature pixel and $c_i$ is the center of circle,$E^2$ is the Euclidean distance, M is the membership function.

$$M_{ij}=\frac{1}{\sum_{k=1}^{c}(E^2(f_j,c_i)/E(f_j,c_i))^{2/m-1}} \quad (2)$$

.

$$c_i=\frac{\sum_{j=1}^{n}M_{ij}^{m}f_j}{\sum_{j=1}^{n}M_{ij}^{m}} \quad (3)$$

After converting the image into gray scale using the values of M and c this FCM algorithm is implemented under the constraint of M as

$$|M(l+1)-M(l)|<\varepsilon\ (4)$$

In the FLICM algorithm, clustering is done by considering interval between each neighbouring pixeland the central pixel. This can be achieved by H as follows.

$$H_{ij}=\sum_{j\in N}\frac{1}{d_{ij}+1}(1-M_{kj})^m\|fi-cj\|^2\ (5)$$

The cost function for FLICM as follows

$$J_m(M,c)=\sum_{j=1}^{n}\sum_{i=1}^{C}M_{ij}^{m}\|fi-cj\|^2+H_{ij} \quad (6)$$

Where, the membership function as follows

$$M_{ij}^{m}=\frac{1}{\sum_{j=1}^{c}\left(\frac{\|fi-ck\|^2+H_{ik}}{\|fi-cj\|^2+H_{ij}}\right)^{\frac{1}{m-1}}} \quad (7)$$

In Modified FLICM[23] , Minimize the cost function further, introduced one more term in the denominator of membership function and hence modified cost and membership functions is given by

$$J_m(M,c)=\sum_{j=1}^{n}\sum_{i=1}^{C}M_{ij}^{M}\|fi-cj\|^2+H_{ij} \quad (8)$$

$$M_{ij}^{M}=\frac{M_{ij}^{m}}{\|fi-c_k\|^2}\ (9)$$

The steps of Modified FLICM algorithm is given by:

1. Defined the number of clusters c,

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2. The modified membership function M is calculated in (9)
3. Calculate the cost function using the Eq. (8).
4.. The membership function and cost function is updated using Equation (9)& (8).
5. Repeat the above steps using the Eq.4.

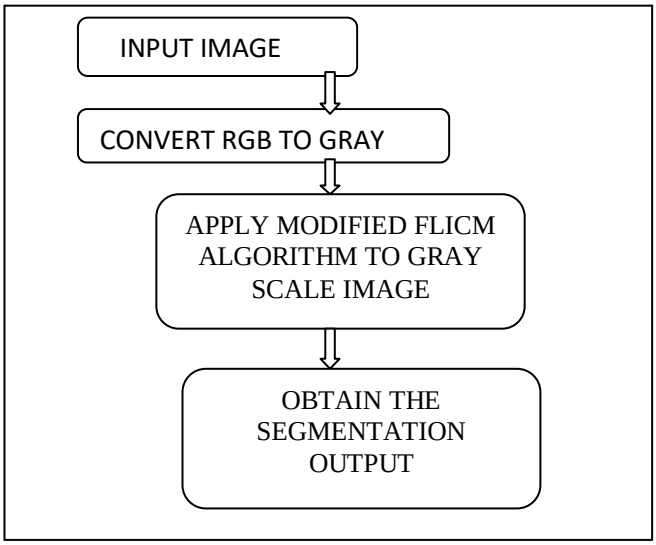
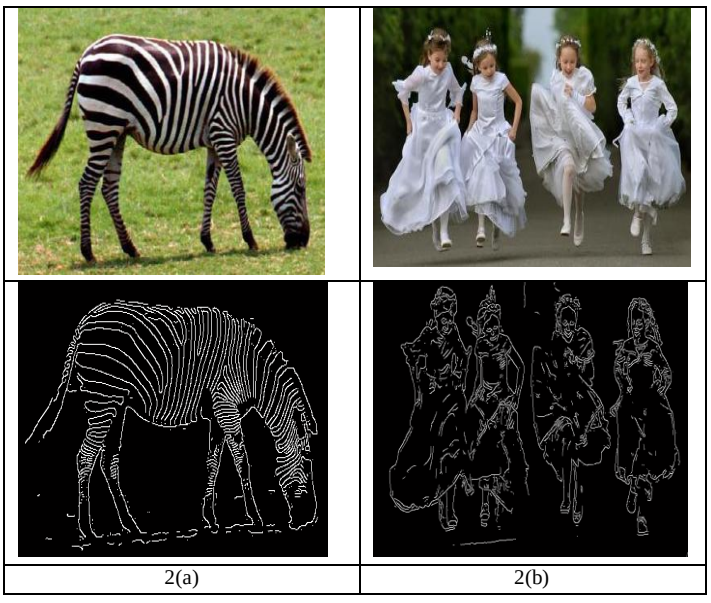



Fig.1 Flow chart of Interactive Segmentation.

## Results

The results for segmentation are obtained by considering the database of natural images Here for implementing the proposed modified FLICM algorithm, considering the fuzzy degree of m=3.



2(a) 2(b)

Fig.2(a) Input and Segmentation output of zebra image. Fig.2(b) Input and Segmentation output of girls image.

Separate evaluation procedure for single object and multiple objects From the obtained results we can clearly see the segmentation output is effective in both cases of single object and multiple objects. Results of single object is illustrated in zebra image (fig.2(a)) and results of multiple objects in image is illustrated in girls image(fig.2(b)).

## IV. Conclusion

In this paper, interactive segmentation, is done bystarts with the one seed point for the main object to segment, later it develops with the manner of region growing to the extend of reaching the boundaries of the image. For achieving this interactive segmentation we proposing improved FLICM which is a improved version of Gaussian model and Fuzzy Clustering Model. Using the improved FLICM reduces the cost function which in term reduces the computational efficiency. From the results it is very clear that segmentation provides the better inner edges and outer prominent edge of the images.

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