

# A Hybrid Approach of Fuzzy C-Means Algorithm and Fuzzy Bit Plane Thresholding Using FDPSO for Image Segmentation

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**Abstract-** We studied that Picture Improvement strategies are applied to beautify photo with high-quality or summary the good information within the damage picture. We decided that many existing shade photograph enhancement strategies have 3 limitations: 1) coloration image enhancement approach applied only inside The RGB (red, green, blue) coloration area that is incorrect for the human seen system, 2) the identical division limitation that is applied not always suitable for human visible notion; 3) we examined that only one approach is appropriate for one form of degradations. After studied our previous techniques we proposed a brand new hybrid technique of Fuzzy C-Means Algorithm and Fuzzy Bit aircraft Thresholding Using Fuzzy Discrete Particle Swarm Optimization for Image Segmentation. We provide a brand new set of rules for fuzzy segmentation of MR mind pic. We maintain from the regular Fuzzy C Means and its bias-corrected representation Bias Corrected Fuzzy C Means set of rules, with predominant step and providing a new issue  $\gamma$  with needed controls. In this set of rules we deliver an exceptional best segmented mind photos to create an extraordinary tool to offer digital mind endoscopy. We tested that the implementation of medical picture segmentation is connected with the abstraction of anatomic manufacturing and to isolate the concerned areas from the associated smooth tissues.

We advise a fuzzy logic based bit aircraft strategies to repeatedly phase the associated pictures with regions of clinical photographs. This segmentation set of procedures entails 3 steps, which incorporates

documentation, regulation fire and deduction. We are locating the little airplanes that signify the pleura definitely. In the First step, the depth fee of a pixel is remote into bit planes. In the second one step, the three-way gesture characteristic allocates a final threshold primarily based on grey scale values. We studied that the Fuzzy rules are designed primarily based on the winning bit planes to make the club desk which is probably saved in an expertise base. Lastly, we concluded that Regulations are fired to allocate final segmentation values via the inference. We used our proposed new metrics to decide the correctness of the segmentation approach. We experimental that our proposed metrics are extra suitable for approximation of segmentation correctness. We advised an Operational form matching method based mostly on Ambiguous Isolated Element Group Observation (FDPSO) in this paper. This technique gives better output with our proposed methods that have robustness function.

**Keywords:** MR Imaging, Image Separation, Fuzzy logic, bit plane Approach, figured CAT scanning (CT).

## 1. INTRODUCTION

We delivered a well known Fuzzy C-Means Algorithm that provides a brain picture segmentation with out filtering, so the photo quality remains decreased. We are defining an

improved model BCFCM [2] of Fuzzy C-Means Algorithm for the optimization trouble which suggest the stepped forward photograph great, however the execution time could be very sluggish. Our intention is to decrease the calculations that made throughout the segmentation method to offer a excessive-pace better best segmentation of MR brain pictures.

We are defining a segmentation method wherein every fragmented item is similar With recognize to certain depth capabilities corresponding colour as well as quality. We are defining a segmentation method in which every segmented item is comparable with admire to certain depth capabilities like shade and texture. We added separation of scientific picture representation in this technique that is beneficial for removal of different tissues and organs information. We received the correctness and the higher decision self belief rate of any identification system that generally depend upon an green and powerful segmentation approach. We found some limitations in preceding clinical photo segmentation techniques in which we emphasis on unmarried organs segmentation. However, we require an more suitable segmentation set of rules that can phase the images of diverse human organs. We are introducing a blended method of background-elimination operator with iterative grey degree thresholding [12] for scientific image segmentation. We analyzed that history turned into now not eliminated efficaciously due to the presence of vagueness and noise. We are defining a unique method for separating the lung states by way of along with a level-centred technique with adjustable edge matching [15] wherein we analyzed an set of rules for 20 slices. We use metrics to calculate the correctness of segmentation that is quantity-based totally over- and beneath segmentation. We received 0.43% and 1.63% correctness of over-and beneath segmentation

for 20 slices. We are introducing a brand new threshold primarily based approach for lungs segmentation from diseased CT lung photographs by means of deciding on an best Threshold for a given photograph with comparative examine of the lung edge through the spines [10].

We hooked up the functioning of edge built absolutely lung separation procedures in a sizeable level strength evaluation [11]. We are introducing automated threshold based lung segmentation which might be tested in all of the slices. We are becoming 4.4% common error charge in 121 scans. We are offering an automatic multilevel-structure separation technique in place of 3-D belly CT pix primarily centred on a Three-Dimensional distributed probablistic chart in [19]. We are dealing with one hundred abdominal CT photos with our calculated proposed approach.

We introduced Element Group Observation Algorithm that is a novel nature-stimulated set of rules primarily based totally on iterations. We are defining a swarm that consists of a sure extensive sort of a particles shift inside the Multi-dimensional difficult area to discover the worldwide goals. We studied on previous techniques to increase the overall performance of Element Group Procedures [3,4] wherein most of them emphasis on the non-stop and standard troubles. We are adding the bushy Principle through the unique Element Group Observation technique to solve combinatorial obsevation trouble, form matching.

## 2. RELATED THEORIES AND METHODS

### 2.1 *Fuzzy C Means Procedure*

The widely recognized Fuzzy C Means procedure is a set of rules, delivered with the resource of Bezdek et al. In [1], agencies the costs  $x_k$ ,  $k=1\dots n$  into  $c$  groups, by the goal feature

A B

$$FB = \sum_{i=1} \sum_{k=1} v_{pi} k (y_k - w_i)^2, \quad (1)$$

Where  $W_i$  represents the prototype price of the  $i$ th collection,  $v_{pi} k$  represents the hairy club of the  $k$ th voxel with admire to cluster  $I$ , and  $p$  is a weighting proponent. By definition for any  $k$  we've got  $c$

$$\sum_{i=1} v_{ik} = 1$$

To decrease the aim aspect, it's miles vital to assign excessive club costs to those vertices, whose strengths are positioned near the prototype costs of their precise groups. Ahmed et al. suggested an exchange to the true goal characteristic by way of manner of introducing a time period that lets in the marking of vertices to be inspired by the resource of the trademarks inside immediately neighborhood [2]. This impact acts as regularizes, and preferences the answer towards bitwise-standard classification. It shown helpful in separating photographs spoiled via saline and scatter sound. The changed aim feature is specified by means of way of

$$FA = \sum_{I=1}^A \sum_{k=1}^B [v_{pi} k (y_k - w_i)^2 + \alpha o/k \sum_{r=1}^k v_{p^i} k (y_k - w_i)^2] \quad (2)$$

Where  $y_k, r$  signifies the close vertices of  $y_k$  and  $k$  positions for the huge kind of vertices within the network of the  $k^{th}$  vertices. Now, we will present few changes by a set of rules. *Magnetic resonance imaging* mind pictures are stacks of approximately 2 hundred slices, which at their turn constitute big metrics of voxels. A group of *Magnetic resonance imaging* mind pictures pieces includes round 10 billion (107) vertices. The depth of the voxels is generally encoded with 8-bit resolution, that is, and there are simplest 256 possible ranges of intensity for each voxel. With minimum calculations in the segmentation system, we are able to adjust the algorithm in the following manner:

Step1) initially we practice a limited cleaning to every vertex. Allow us keep in mind the closest of the  $k^{th}$  vertex, as specified inside [2]. Initially we denoted through  $\sum_j k$  the sorted depth diploma of the  $k^{th}$  vertex and we will calculate it as follows:

$$\sum_j k = 1/1 + \alpha \cdot (y_k + \alpha/k \sum_{r=1}^k y_{k,r}) \quad (3)$$

The vertex depth tiers are controlled. They are located within the [zero, 1] inner.

Step2) initially we signify the wide type of strength tiers with  $q$ . while it turns into earlier specified,  $q$  is plenty lesser than  $o$ . We signify a useful resource  $\gamma q$  with multiple vertices from the complete load of slices, taking the depth identical to one, wherein  $l = 1 \dots Q$ . By the use of definition, we've got

$$\sum_{l=1}^q \gamma l = O$$

Step3) the intention feature consumed for the separation of the cleaned indication might be:

$$E_s = \sum_{i=1}^B \sum_{l=1}^q \gamma l v_{pi} l (z_l - w_i)^2 \quad (4)$$

We require locating the costs of the constraints  $V_{il}$  as well as  $W_i$ , for the minimal charge. Initially we don't forget the Lagrange accumulator

$$E_s = \sum_{I=1}^a \sum_{l=1}^p [\gamma l v_{pi} l (z_l - w_i)]^2 + \sum_{l=1}^p \lambda l [1 - \sum_{i=1}^o v_{il}] \quad (5)$$

Step4) we require by-product of  $E_s$  with recognize to  $v_{il}$ , and equating it to  $o$ , we get:  $\delta E_s / \delta v_{il} = p \gamma l v_{pi} l (z_l - w_i)]^2 - \lambda l = 0$ , so

$$V_{il} = (\lambda l / p \gamma l) 1/p-1 (z_l - w_i) - 2/p-1$$

From  $\sum_{k=1} v_{kl} = 1$  we reap

$$\lambda l = p \gamma l \left[ \sum_{k=1}^a (z_l - w_k) - 2/p-1 \right] 1-p \text{ and so on}$$

$$v_{il} = \left[ \sum_{k=1}^a (z_l - w_i / z_l - w_k) 2/p-1 \right] - 1 \quad (6)$$

Step5) taking the spinoff of  $E_s$  with admire to  $W_i$ , and equating it to  $o$ , we get:

$$\delta E / \delta w_i = -20 \sum (\gamma l v_{ki} l (z_l - w_i)) = 0, \text{ so}$$

$$w_i = \left( \sum_{l=1}^P \gamma_l v_{k_{il}} z_l \right) - 1 \quad (7)$$

The more potent III Defined C Means set of rules for *Magnetic resonance* mind picture separation may be defined as follows:

a) Calculate the costs of  $\gamma_l$ , pick out initial cluster prototypes a

$$W_i = (2i - 1) / (2a) \quad i = 1$$

b) Change club feature costs constant with (6)

c) Calculate the contemporary costs for batch models consistent with (7)

d) Recap steps b – c till the Euclidean norms of the exchange of the model path is smaller than a earlier regular little awesome range E.

### 2.2 Defined sub plane Thresholding

We delivered; a vague right judgment through sub plane edging intended for actual separation of clinical pictures. This new effective technique designed for building powerful choice to avoid vagueness. We are introducing novel pattern in this approach intended for powerful dimension of separation correctness.

### 2.3 Down Covered

The manner of reworking the costs determined into unclear participants for approximate illustration is referred to as Down Covered. The conversion method is finished thru the development of eight sub plane, together with bitplane1, bitplane2, bitplane3 .... Bitplane8.

Each sub plane of the photograph includes 1 or zero. Hence, every sub plane is a dull picture. Through every sub plane, the pitch of the edge of pix is computed and high-quality is required at such pitches.

### 2.4 Function abstraction

It is a way of removal consultant values at one image from traditional pictures. We abstracted exceptional lung functions from different parts of lungs. Various approaches are available for

extracting capabilities of numerous equipment within the lung picture. These functions are typically standardized costs. The eight abilities obtained at each picture element are classified into sets, namely front (FG) and contextual (BG) competencies as proven in table1. Features (F8, F7, F6, F5) belong to the records and abilities (F4, F3, F2, F1) belong to the front.

### 2.5 Three-layered signed characteristic

In this method, we endorse a brand-new sign characteristic called Triple Signed Function that outputs the sign of an actual range. This function outputs someone price from the three values (-1, zero, 1), at the same time as a real variety is given as input to the proposed triple signup function. In order to suggest this selection, the present signup function has been modified on this photo for suiting our segmentation set of guidelines with the aid of outputting the bit values (1, zero) and in the end the outputs of the signup characteristic are (1, zero). This characteristic may be moreover called as step function given that high-quality (1, 0) is acquired.

### 2.6 Defined Isolated Element Group Observation for Figure Matching.

We will describe and speak the bushy isolated element group observation for incomplete and identical covered form.

Vague description of specified input form through n functions and a version form with m functions. We will concern identical figure through element group Observation set of rules as the most trouble of locating n identical image capabilities with m functions of the standard image. Every element inside the element group Observation signifies an applicant strategy to the identical system problem. Accordingly, every element can be observed as plotting all of the enter figure functions of the version form functions. Thus, all elements can be signified as a gradient wherein all entrance indicates its equivalent

characteristic of the identical system form as well as subsequent notations are used:

all enter figure may be represented as:

$$I = \{I_1, I_2 \dots I_n\}$$

Where  $I_k$  ( $K = 1, 2 \dots n$ ) is the  $k$ th function of the enter figure, containing of 4 elements:

$$I_k (M_k, Q_k, E_k, F_k)$$

### 3. HYBRID APPROACH OF FUZZY C-MEANS ALGORITHM AND FUZZY BIT PLANE THRESHOLDING WITH FDPSO

We introduced an algorithm that delivers a mild enhancement in the first rate of separated mind pictures, quicker than its descendants. These make it a beneficial tool to guide virtual mind endoscopy. We are defining a brand new ill-defined right judgment centered sub plane edge technique for separating the functional structures observed in various medical photos efficaciously. This approach covers the constraints of present methods in which whole gray scale rate of a picture element is considered. Ill-Defined common sense is expanded for each little bit of a grey scale. Hence, greater readability is received in finding out the pixel which involves separation. We can without problems measure the separation correctness centered totally at the kind of picture element, beneath and over/under separation proportion by means of manner of the usage of our new metrics. We are introducing an identical technique primarily centered on ill-defined separate element group observation (FDPSO).

Our experimental results illustrate that our new approach is strong and powerful for form reputation. For the recovery of form, our technique is much improved than its opposition. So, the ill-defined element group observation technique may be a high-quality desire to identify the incomplete or covered figures due to its strength.

## 4. RESULTS

This segmentation technique used in Medical programs for three clusters, related to historical past; gray matter and white are counted. The function of filtering relies upon on the selected neighbor hooding effect and its intensity cost  $\alpha$ . It extracts the fee of  $\alpha$  from the salt and pepper noise without misplaced of picture sharpness. It acquired the most fulfilling fee of  $\alpha$  that differs between 0.5 and 1.2. This technique has taken into consideration the community cardinality for each voxel that affects the fine of attained image. The method becoming desirable effects, if the neighborhoods have eight on the spot neighbors of the voxel.

This technique thinking about the space among the variety of centroids in an magnetic resonance imaging pieces or the entire mind space)(O), with the variety of gray power stages of the authentic shape (q), the quantity of wished computation at some point of every cycle is minimized with the aid of the new technique approximately 40 times. This method without problems calculates the correctness of separation so that you can degree the overall performance of our proposed set of regulations in segmenting unusual medical photos. This method effectively calculates the correctness of segmentation method if the smaller segment object in comparison to the same vicinity of the genuine picture primarily based definitely at the range of pixels inside the proper photograph. To calculate the separation improvement, it designed an errors metrics that might be used to diploma the above-separation and underneath-separation costs. In this planned separation method, it describes the above separation of a states because the area rate.

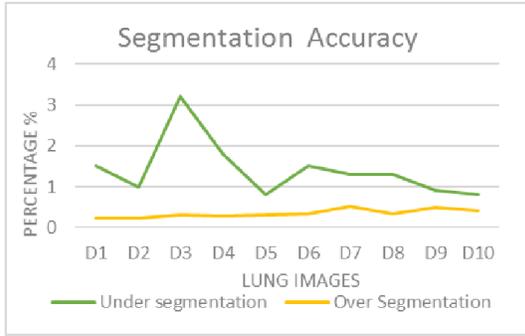


Fig. 1: above separation / beneath separation for lung pictures

The above-separation and beneath-separation proportions for the ten lung and retina database are exposed in figure 1 and figure 2. The regular above-separation extent fault consistent with instance is 0.32% and 0.38% of the whole capacity, even as the common beneath separation is 1.39% and 1.56% respectively. The Research will be based on combining Image Enhancement using Morphological Operators technique. Image Enhancement is a common approach to improve the quality of these images in terms of human visual discernment. Enhancement techniques can be divided into two categories:

Spatial domain methods: Spatial domain technique enhances an image by directly dealing with the intensity value in an image. These methods include histogram equalization. These methods have been also applied to color image enhancement in the R-G-B space.

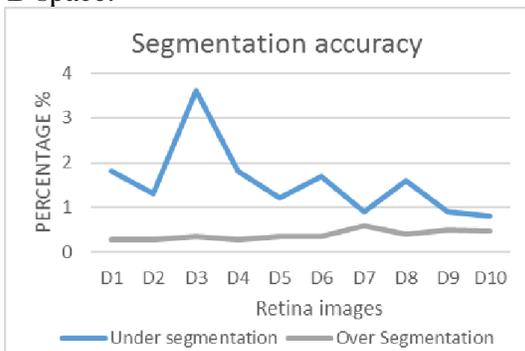


Fig. 2 above separation underneath separation for Retina photos

Transform domain methods

Transform Enhancement techniques such as Gaussian filtering which applies operation on the intensity of the image, and therefore high intensity content such as edges and other subtle information can easily be enhanced.

4. CONCLUSIONS

The future system gives a slight improvement in the separated brain photo and it is substantially faster than its descendants. Thus, it makes as a useful tool to useful resource virtual thoughts endoscopy. It brought a new ill-defined true decision centered sub plane edge technique for separating the functional structures observed in various health photographs correctly. This approach covers the restrictions of cutting-edge strategies wherein whole grey scale value of a picture element is measured. Ill-defined common place designed for every little piece of a grey scale. In future more precision is acquired in determining the picture element for separation. To diploma the entire improvement of the future separation technique, original metrics are planned with separation correctness centered totally on the sorted picture element, underneath and over /below separation proportions. In our technique, an identical figure method centered totally on ill-defined isolated element group observation will become proposed. Initially, a figure sketch of invariant elements collection is designed in the beginning form. The investigational outcomes verified that our introduced technique is more powerful with more reputation. In destiny works, we require to pick a higher advanced element group observation technique in ill-defined element group observation technique to decrease the calculated period.

REFERENCES

- [1] Diao Liming, Hang Caiming, Gao Shanshan, "A New Algorithm of Automatic Lung Parenchyma Segmentation Based on CT Images", International Conference on Consumer Electronics, Communications and Networks (CECNet), IEEE,2011.
- [2] Fraz, M.M., Remagnino, P., Hoppe, A., Uyyanonvara, B., Rudnicka, A.R., Owen, C.G., Barman, S.A., "An ensemble classification-based approach applied to retinal blood vessel segmentation", IEEE Transactions on Biomedical Engineering, 59 (9), 2538-2548,2012.
- [3] Lopes, N.V., Mogadouro do Couto, P.A., Bustince, H., Melo-Pinto, P., "Automatic histogram threshold using fuzzy measures", IEEE Transactions on Image Processing, 19 (1), pp. 199-204, 2010.
- [4] Marin, D., Aquino, A., Gegundez Arias, M.E., Bravo, J.M., "A new supervised method for blood vessel segmentation in retinal images by using gray level and moment invariants-based features", IEEE Transactions on Medical Imaging, 30 (1), 146-158, 2011.
- [5] Maulik, U., "Medical image segmentation using genetic algorithms", IEEE Transactions on Information Technology in Biomedicine, 13 (2), 166-173, 2009.
- [6] N. Poornima, T. Karthikeyan., "A survey on Image Processing Techniques used for Detection of leukemic Cells" International Journal of Advanced Research in Computer and Communication Engineering,5(4),2016
- [7] Pu, J., Roos, J., Yi, C.A., Napel, S., Rubin, G.D., Paik, D.S., "Adaptive border marching algorithm: Automatic lung segmentation on Chest CT images", Computerized Medical Imaging and Graphics, 32 (6), 452-462, 2008.
- [8] R. Helen, Dr. N Kamaraj, Dr.K. Selvi, V. Raja Raman," Segmentation of Pulmonary Parenchyma in CT Lung Images based on 2D Otsu optimized by PSO", Proceedings of ICETECT, IEEE.2011.
- [9] S. Ribes, D. Didierlaurent, N. Decoster, E. Gonneau, and L. Risser, Automatic Segmentation of Breast MR Images Through a Markov Random Field Statistical Model. *IEEE Transactions on Medical Imaging*, vol.33, no.10, pp.1986-1996, 2014.
- [10] Suzuki, M., Linguraru, M.G., Okada, K., "Multi organ segmentation with missing organs in abdominal CT images", In Medical Image Computing and Computer-Assisted Intervention. Springer, LNCS 7512, 418-425, 2012.
- [11] Thapaliya Kiran and Goo-Rak Kwon," An Advanced Segmentation Using Bit-Plane Slicing Technique in Extraction of Lungs Region", Second Asian Himalayas International Conference on Internet (AH-ICI) IEEE,2011.
- [12] T. Karthikeyan, B. Ragavan, N. Poornima., "A comparative study of algorithms used for leukemia detection" International Journal of Advanced Research in Computer Engineering & Technology (IJARCET),5(4),2016.
- [13] W. Cong, J. H. Song, L. Wang, H. Liang, and J. Li, A Fuzzy C-Means Clustering Scheme Incorporating Non-Local Spatial Constraint for Brain Magnetic Resonance Image Segmentation, *Journal of Medical Imaging and Health Informatics*,5(8),1281-1285, 2015.
- [14] Xinge You, Qinmu Peng, Yuan Yuan, Yiuming Cheung, Jiajia Lei., "Segmentation of retinal blood vessels using the radial projection and semi supervised approach", Pattern Recognition, 44 (10-11), 2314-2324, 2011.
- [15] Xu, L., Luo, S., "A novel method for blood vessel detection from retinal images", Bio Medical Engineering Online, 9(1), 2-10, 2010.