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# Image Processing Method Based on Algorithm-FGCA and Neural Network.

**Dr. A, Vijayaraghavan.**

Professor

Department of Computer Science and Engineering

HMS Institute of Technology, Tumkur, Karnataka, India.

**Abstract**

People are increasingly in need of medical treatment as human sub-health issues worsen. Doctors employ medical image analysis to intuitively get the morphological information of the diseased portion, allowing them to more accurately diagnose the disease in the face of an infinite stream of illnesses. The treatment of people's illnesses, as well as subsequent surveillance and recovery, depend on the analysis of medical pictures. As a result, it is important to keep up with the advancement and innovation in image processing. The current medical image processing technology still has issues, such as noise and low picture contrast, due to the ongoing rise in illnesses as well as technological innovation and progress. Artificial neural networks and fuzzy genetic clustering algorithms can be used to improve the precision and efficacy of image processing. In light of the aforementioned issues, data analysis and research on image processing techniques based on the fuzzy genetic clustering algorithm (FGCA) and artificial neural network (ANN) have been conducted for this study. According to the study's findings, the segmentation entropy is lowest (0.0885) and the FGCA segmentation coefficient is biggest (0.9756 and 0.9758, respectively), when there is no noise and 5% salt and pepper noise. The liver CT (Computed Tomography) image segmentation approach based on DeepLab V3+ has the greatest PA, Mlou value, and Dice coefficient, which are 88.8%, 95.9%, and 94.8%, respectively. This method has established the groundwork for the development and innovation of image processing techniques.

Key: Image, Processing, Method, Algorithm,FGCA, Neural Network..

## Introduction

Computer technology has largely taken the role of manual examination of medical pictures in the area of medicine with the advent of computer vision and image processing technologies. Medical imaging is a branch of technology that takes pictures of human organs and tissues using non-invasive techniques.

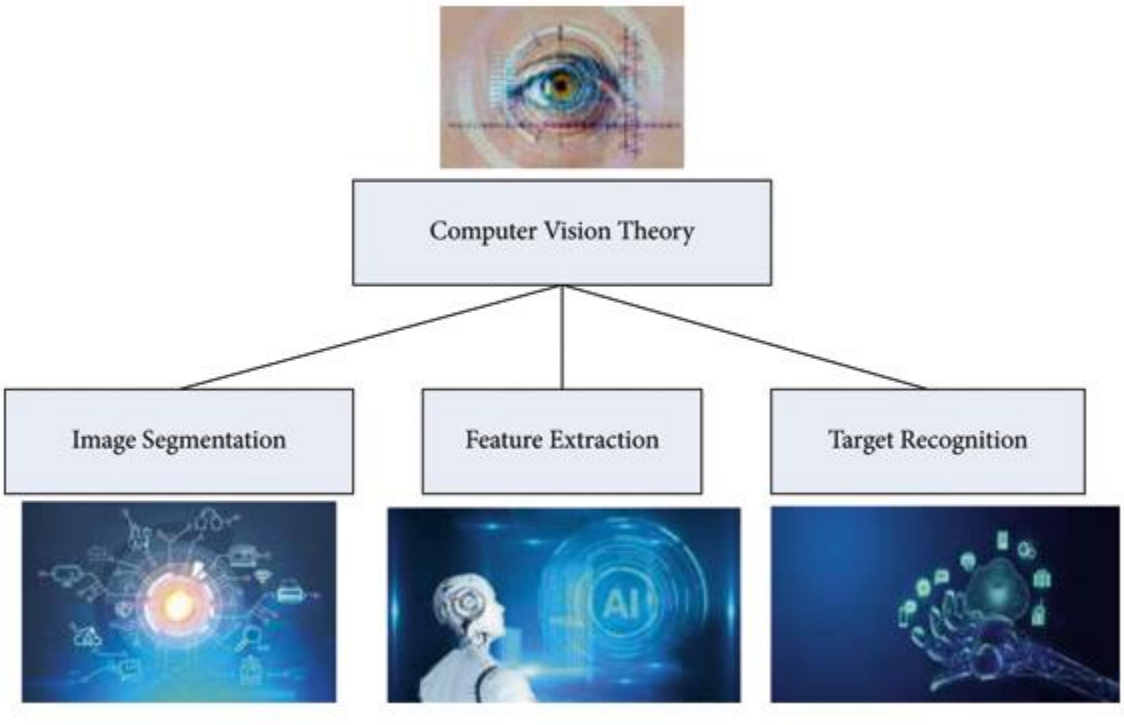


Fig.1: Computer vision theory

It is simple to tell whether the tissues and organs have lesions by looking at the photos. The morphological information about the sick sections of the illness may be more intuitively obtained by using computer-assisted physicians to analyse medical photographs, which is convenient for doctors to make more accurate disease evaluations. The advancement of medical imaging technology has made it easier for doctors to diagnose patients' illnesses quickly and accurately. It has also significantly aided the advancement of medical research. However, during data collecting, medical impact equipment is accompanied by noise, which causes issues including low picture contrast and deteriorated imaging quality.

It is difficult for doctors to diagnose patients using CT scans and other procedures, and it is difficult for patients to receive an early diagnosis and therapy. This research has explored image processing techniques based on FGCA and ANN in order to better comprehend and analyse them.

People's needs for pictures are progressively growing as a result of technological advancement and demand. Many academics have explored image processing in recent years. The ratio of the width of the beak to the distance between

the eyes and the beak, along with image processing and support vector machine classification algorithms, has been presented by Chandra et al. as a method for classifying birds [1].

A method for noisy colour picture segmentation and edge identification based on intuitionistic fuzzy hypergraphs has been suggested by Boutekkouk and Sahel [2]. Most e-commerce businesses use manual collection and payment procedures, which means they need more employees to increase their customer base. The correct image and pdf processing software can automate this procedure for more effective and economical outcomes. Arora's study has concentrated on automating the processes involved in processing invoices.

**Methods Based on FGCA and ANN**

Image segmentation, feature extraction, and object recognition are the three main goals of computer vision theory [11, 12]. Image segmentation is a crucial step in the processing of images, as seen in Figure 1. The practise of automatically extracting things of interest from photographs of diverse objects using various techniques is a crucial component of automatic image processing. The effectiveness of picture segmentation affects subsequent image processing techniques. As a result, picture segmentation influences whether image analysis is ultimately successful or not [13].

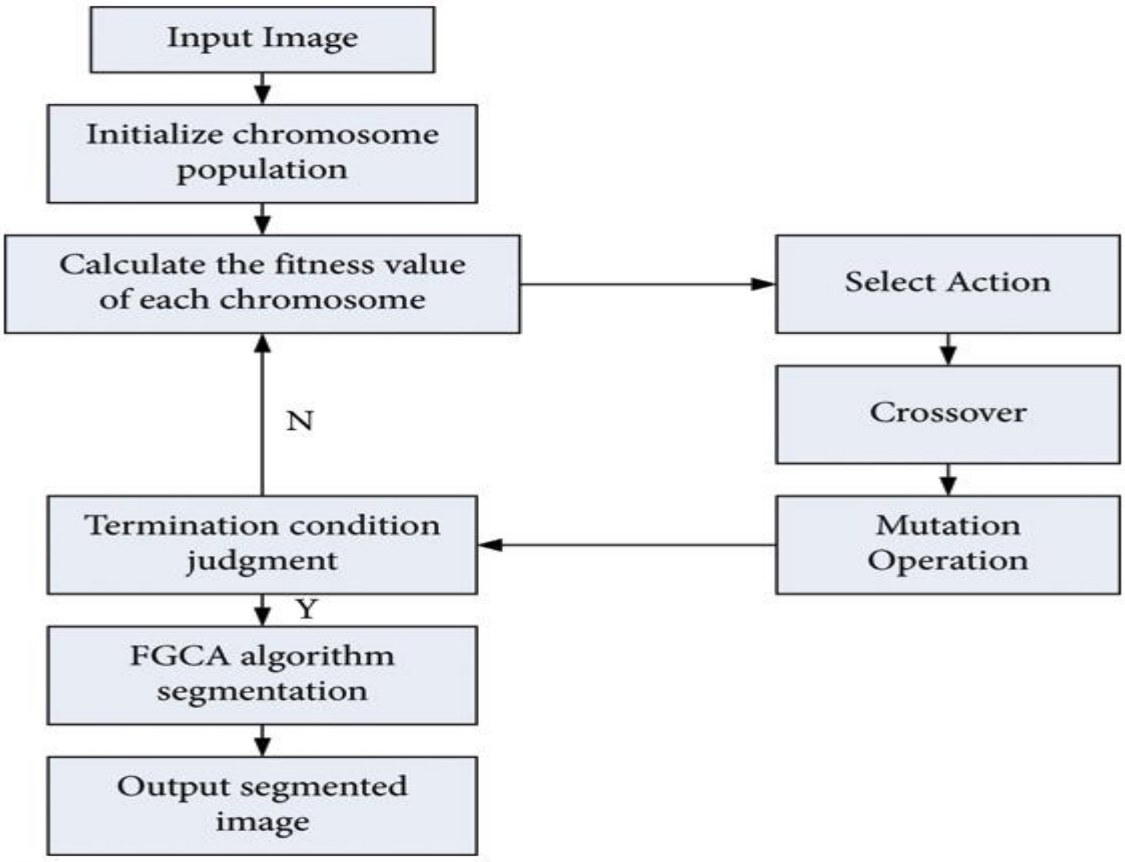


Fig.2: Algorithm flow.

**FGCA**

Nowadays, there is a lot more data than people can possibly analyse directly. The volume of data in many different industries has increased quickly. It is crucial to leverage the processing capacity of the computer in conjunction with the statistical properties of cluster analysis to comprehend and better portray this information sets. In unsupervised classification, a small number of partitions are searched for and identified in order to execute the analytical interpretation of the data. Clustering or unsupervised learning are some names for this unsupervised categorization technique [1-6].

**Clustering Algorithm**

The conventional FCM technique uses objective function optimisation to create unsupervised clusters. Currently, the FCM algorithm is one of the most efficient ways to segment images, but it also has several extremely noticeable flaws. It is simple to get stuck in a local optimum. The FCM technique is also vulnerable to noise since it only affects a single pixel, neglecting the impact of spatial neighborhood information [1=8].

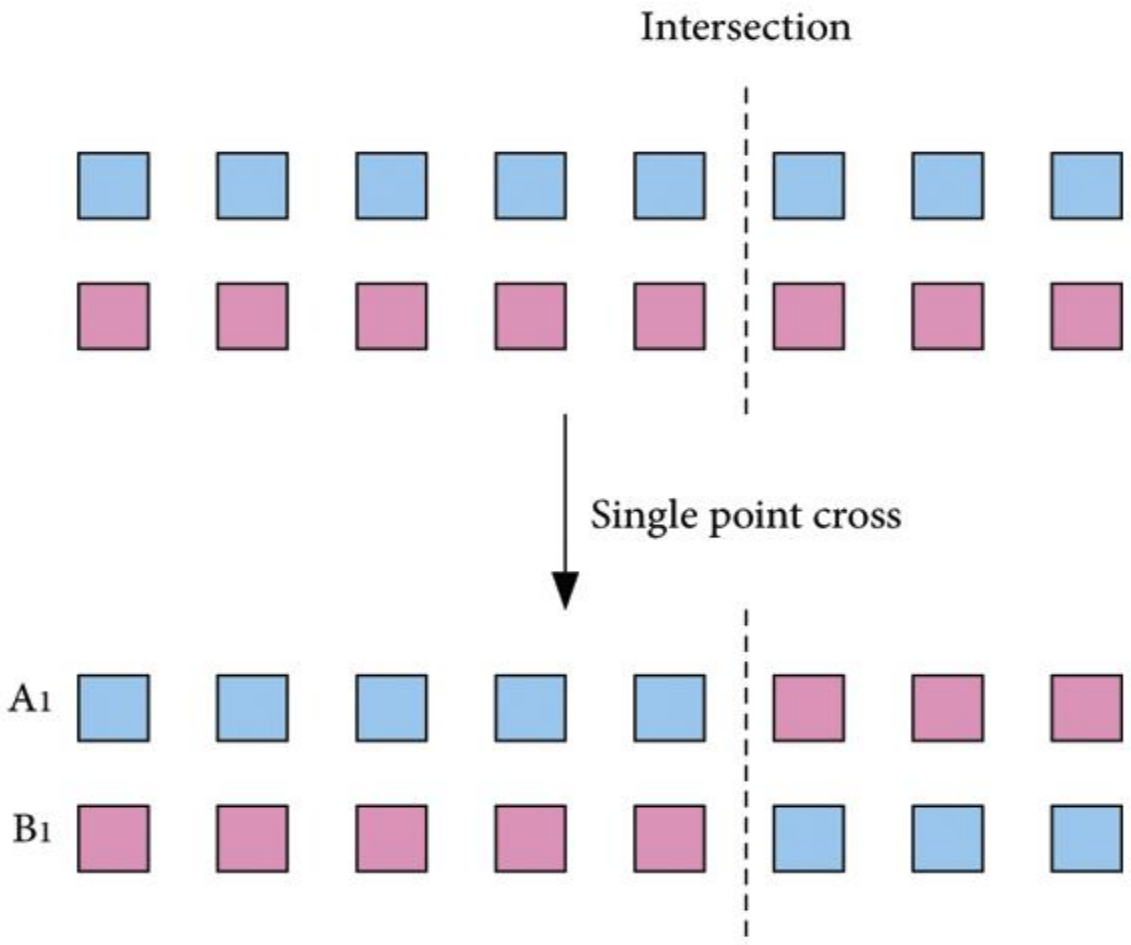


Fig.3: Single point crossover operation.

With its special global optimisation capability, GA is frequently employed in pattern recognition, function optimisation, and other domains. The local optimum issue may be successfully solved and the robustness of the technique is increased by the FCM algorithm, which is based on genetic optimisation [1-9].

FGCA is a fuzzy C-means clustering technique that has been enhanced using genetic programming. The GA method is used to first identify a group of cluster centres that are near to the global optimal value, and the resulting cluster centres are then utilised as the initial cluster centres of the FCM algorithm [2]. The local search capability of the FCM algorithm itself becomes advantageous since its value is quite near to the overall optimal solution. The ultimate global optimal solution may then be determined by simply locating the value that is closest to the cluster centre, successfully avoiding the flaw of slipping into the local optimal solution.

First, floating-point coding is used to calculate the cluster centre, thereby reducing the complexity of the procedure. At the same time, the selection process uses the roulette selection approach to maintain as much diversity among the candidates as feasible. The population fitness function's value affects the crossover probability and mutation probability adaptively, which may effectively preserve the GA's flexibility. Moreover, the FCM algorithm that introduces spatial constraints has better robustness, which improves the image segmentation performance.

**ANN**

The area of deep learning has grown since the introduction of ANN. ANN links neurons in a certain way and mimics the neuronal movement trajectories of living things. It abstracts the incoming input and replicates the neural network's actual movement in human brains. A unique ANN network is the foundation of the convolutional neural network model. Convolution operations, convolution, pooling, batch normalization, activation functions, and fully connected layers distinguish it from other neural network models. Convolutional neural networks, which excel in processing massive amounts of visual data, are built around these components.

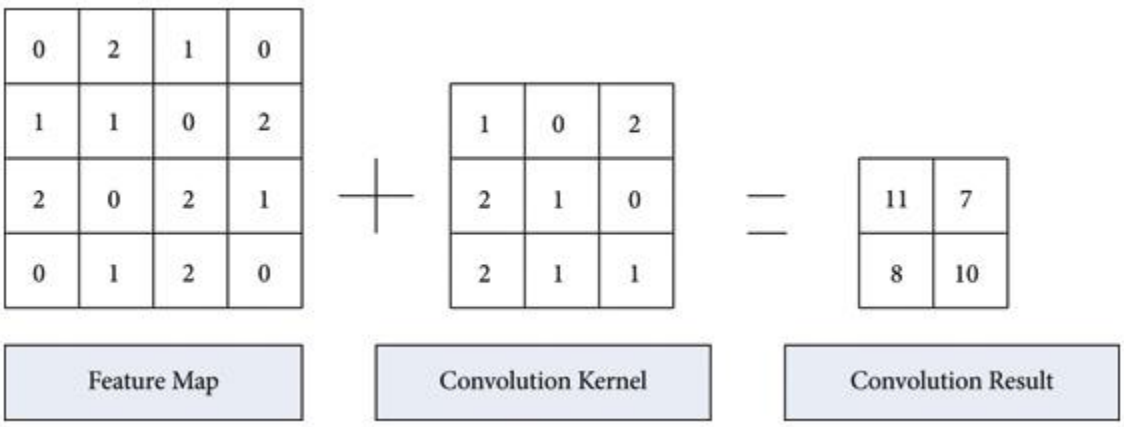


Fig.5: Convolution calculation process.

**Image Processing Experiments**

This research chooses the traditional Lena images and employs the FCM method, FGCA, and hybrid algorithm for simulation studies and comparisons in order to validate the performance of FGCA. The experimental setup includes a Windows 7 64-bit operating system, an Intel Core i5-3210M processor clocked at 2.50 GHz, 8.00 GB of RAM, and MATLAB2017b for programming. For segmentation studies, the following lena pictures with and without 5% salt and pepper noise were independently analysed. the outcomes of the trial. Segmentation entropy stands in for PC, the segmentation coefficient..

**Conclusions**

This study examined FGCA and ANN-based image processing techniques, which can offer more precise and effective image processing techniques. In the low-dimensional space of the picture, traditional image segmentation algorithms can only calculate low-dimensional spatial information elements like colour, shape, and texture information. Additionally, manually designing features is required, and effectively segmenting lesions in CT images is challenging. Deep learning technology must thus be applied to the realm of medical pictures.

Which, in addition to changing medical picture segmentation from typical manual segmentation to automatic segmentation, also somewhat raises the standard of medical care. For the creation of high-quality photographs, the application of FGCA reduces the impact of noise on image quality. But science and technology are always becoming better. In this work, the most cutting-edge technology is the sole one used to study image processing. It is hoped that advances in image processing techniques will continue to be made in the future.

**References**

1. B. Chandra, S. K. S. Raja, R. V. Gujjar, J. Varunkumar, and A. Sudharsan, "Automated bird species recognition system based on image processing and svm classifier," *Turkish Journal of Computer and Mathematics Education (TURCOMAT)*, vol. 12, no. 2, pp. 351–356, 2021.

2. F. Boutekkouk and N. Sahel, "Color image processing under uncertainty," *International Journal of Technology Diffusion*, vol. 12, no. 2, pp. 46–67, 2021.

3. H. Arora, "Electronic invoicing using image processing," *International Journal for Modern Trends in Science and Technology*, vol. 6, no. 12, pp. 520–523, 2021.

4. A. N. Ahmed, M. J. Alwazzan, and M. A. Ismael, "Study effects of pulse laser energy on human primary teeth and extraction caries area by using image processing techniques," *NeuroQuantology*, vol. 18, no. 6, pp. 36–44, 2022.

5. A. A. Makarenko, "Algorithm for determining the angular position of the ship's deck from an unmanned aircraft using digital image processing," *Radio Industry (Russia)*, vol. 30, no. 4, pp. 87–97, 2022

6. L. Jie, W. Liu, Z. Sun, and S. Teng, "Hybrid fuzzy clustering methods based on improved self-adaptive cellular genetic algorithm and optimal-selection-based fuzzy c-means," *Neurocomputing*, vol. 249, pp. 140–156, 2017.

7. Z. Dong, H. Jia, and M. Liu, "An adaptive multiobjective genetic algorithm with fuzzy c-means for automatic data clustering," *Mathematical Problems in Engineering*, vol. 2018, Article ID 6123874, pp. 1–13, 2018.

8. A. Goyal, P. A. Sourav, and P. Kalyanaraman, "Application of genetic algorithm based intuitionistic fuzzy k-mode for clustering categorical data," *Cybernetics and Information Technologies*, vol. 17, no. 4, pp. 99–113, 2017.

9. P. Bangalore and L. B. Tjernberg, "An artificial neural network approach for early fault detection of gearbox bearings," *IEEE Transactions on Smart Grid*, vol. 6, no. 2, pp. 980–987, 2015.

10. E. Hodo, X. Bellekens, A. Hamilton et al., "Threat analysis of IoT networks using artificial neural network intrusion detection system," *Tetrahedron Letters*, vol. 42, no. 39, pp. 6865–6867, 2017.

11. X. Zeng, Z. Wang, and Y. Hu, "Enabling efficient deep convolutional neural network-based sensor fusion for autonomous driving," in *Proceedings of the 59th ACM/IEEE Design Automation Conference*, San Francisco ,CA, U.S.A, July 2020.

12. A. A. Elngar, M. Arafa, A. Fathy et al., "Image classification based on CNN: a survey," *Journal of Cybersecurity and Information Management*, vol. 6, no. 1, pp. 18–50, 2021.

13. R. D. Reis, V. Dravid, and S. Ribet, "Towards quantum image processing for electron microscopy," *Microscopy and Microanalysis*, vol. 27, no. S1, pp. 1348–1351, 2021.

14. M. A. A. Hamid, W. Alhaidari, N. A. Khan, and B. A. Usmani, "Dynamic changes of multiple sclerosis lesions on T2-FLAIR MRI using digital image processing," *International Journal of Advanced Computer Science and Applications*, vol. 11, no. 2, pp. 200–209, 2020.

15. P. F. Shan, "Image segmentation method based on K-mean algorithm," *EURASIP Journal on Image and Video Processing*, vol. 2018, no. 1, p. 81, 2018.