www.ijifr.com | Volume 5 | Issue 1 | September 2017

International Journal of Informative & Futuristic Research | ISSN: 2347-1697

Study of Techniques used for Medical Image Segmentation

Paper ID	IJIFR/V5/ E1/ 013	Page No.	8701- 8708	Subject Area	Computer Engineering
Key Words	Medical Image Processing (MIP), Medical Diagnosis, MIP Methods And Applications				

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Abstract

Image segmentation might even be a method of partition of a picture into absolutely completely different objects. There's a significant distinction between image sweetening and segmentation. In image sweetening technique is to boost the given image quality with connectedness image look (brightness, contrast, texture).In this segmentation technique, the actual portion of a image is highlighted keep with the matter written Here throughout this paper we've a bent to examine the performance of varied} algorithms for numerous footage Medical image technique desires continuous enhancements in terms of techniques and applications to assist improve quality of services in health care business. The techniques used for interpolation, image registration, compression, diagnosis unit of measure to be improved to be abreast with growing demands at intervals the business and rising technologies regarding mobile computing and cloud computing. The mixture of medical instrumentation and applications with wearable devices is additionally promising house for lots of study. This paper provides helpful insights into the sphere of medical image technique and tries to stipulate the end of the day scope of labour.

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I. INTRODUCTION

Medical image segmentation refers to the method of partitioning discovered image knowledge to a serial of non overlapping regions .These regions denote completely different human tissue structures and apply appropriate method for accuracy of clinical identification..Generally the fundamental theory of image segmentation could be a method of partitioning a digital image into multiple segments. The goal of segmentation is to alter and alter the illustration of a picture into one thing that's additional meaning and easier to investigate. There's sizable amount of applications like content-based visual data retrieval (CBVIR) system for looking of digital pictures in giant databases. In Object detection, police investigation instances of linguistics objects of a definite category (such as humans, buildings, road ,forest) in a very automatic face recognition system could be a pc application for mechanically distinctive or edificatory someone from a digital image. Fingerprint recognition refers to the machine-controlled technique of edificatory a match between 2 human fingerprints, for clinical functions is employed to form a picture to reveal, diagnose or examine the a part of anatomy. Growing interest in health care domain has made-up method for innovative approaches for diagnosing and clinical practices. Since health is taken into account to be wealth, the care business has been try to use innovative medical procedures and treatment practices plus technologies in computations, harnessing advances in hardware resources. preciseness in unwellness identification and accuracy in clinical practices and improvement in progressive instrumentality is that the ever-ending necessity within the health care business. This has crystal rectifier to numerous best practices that area unit clinically verified. However, additional must be through with ever-growing medical knowledge, known as huge knowledge currently days, so as to find hidden information from the info.

1.1 EDGE DETECTION METHOD

Edge detection is one altogether the fundamental steps in image method, image analysis, image pattern recognition, and computer vision techniques. Usually edge refers to a boundary between two regions throughout a image. Region boundaries and edges unit of measurement closely connected, since there is usually a sharp adjustment in intensity at the region boundaries. the aim of exploitation edge detectors to identify the points throughout a digital image at that the image brightness changes sharply or, lots of formally, has discontinuities. Discontinuities of intensity constituent see either line edge, step edge or ramp edge. If the sting detection step is productive, the subsequent task of deciphering the data contents at intervals the first image would possibly therefore be significantly simplified. Edge detection could also be a elementary tool in image method, machine vision and computer vision, notably at intervals the areas of feature detection and have extraction. There unit of measurement two main ways for edge detection like search-based and zero-crossing based. The search-based ways police work position and direction of edges by estimating gradient magnitude exploitation first order spinoff methodology. In zero-crossing based ways, edge smoothness is enumerable by applying

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International Journal of Informative & Futuristic Research (IJIFR)
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Laplacian operator. the foremost common problems with edge-based segmentation is to hunt out a approach real border exists.

II. REGION-BASED SEGMENTATION METHOD

Region-based segmentation is also a method for crucial the region directly. Region primarily based methods are sturdy as the results regions cowl extra pixels than edges thus|then|so|and then} have additional information on the market so on characterize image region. Once police investigation a locality, use texture that won't easy once handling edges. Region growing techniques ar sometimes higher in clangourous photos where edges ar powerful to find.

A. Region split and merge algorithmic program / Watershed algorithmic program

i) The given image is split in to four unconnected Regions. As an example P(Ri)=false. if all pixels have wholly completely different gray levels in associate passing region.

ii) The Partition methodology is continual until to induce no extra partition.

iii) Merge the neighbourhood regions, if they have to share the same element intensity. as an example P(Ri U Ri)=true.if a pair of region share same gray level.

The prime advantage of this algorithmic rule is generally less advanced, and simple to hunt out region for object detection

B. Watershed Algorithmic Program

A watershed is also a basin-like landform made public by highpoints and ridgelines that descend into lower elevations and stream valleys. Watershed algorithmic program is also a neighborhood primarily based segmentation techniques image that uses image morphology. Watershed algorithmic program is associate unvarying adaptative threshold algorithmic program.

i) Check the consistent and inconsistent between attempts of regions. ii) for each region in segmentation, check the price of predicate P with its neighboring regions.

ii) Merge the pairs of neighboring regions whose predicate of P is true.The prime advantage of this rule that provides connected components and former information is also implemented by pattern markers. the foremost disadvantage of this algorithm is fragmentation and over fragmentation problem.

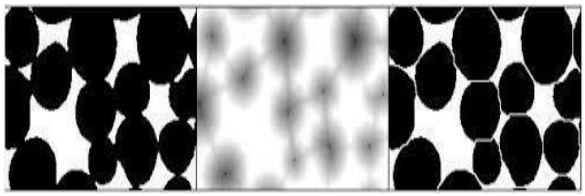

Figure 1: Shows an example of watershed method.

C. Region growing algorithmic rule

A simple approach to image segmentation is to start out from some pixels (seeds) representing distinct image regions and to grow them, till they cowl the complete image. For region growing, have to be compelled to follow a rule describing a growth mechanism and a rule checking the homogeneity of the regions when every growth step.

i) Choose a collection of seed points, those that have sure grey level vary.

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ii) Grow regions solely as long because the component that has same property. (Intensity, grey value)
ii) The higher than method is continual till to grow no additional region.
The advantages of region growing technique ar the construct is easy, solely tiny variety of seed purpose enough to grow region. By mistreatment this technique we are able to properly separate the regions that have a similar properties and supply original pictures with have clear edges. The disadvantage of this technique is, it consume high computation power and tough to seek out sensible start line.

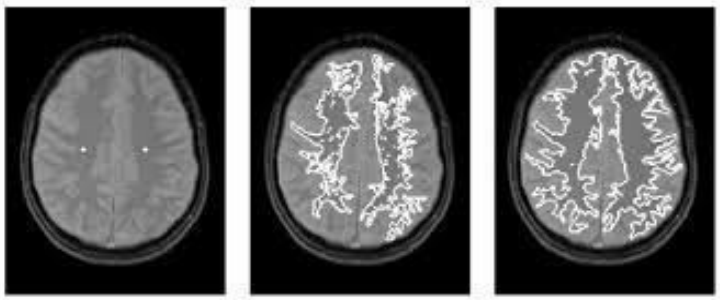

Figure 2:An example process of region growing method

III. Pervious Methodology

A. KNN Algorithm

KNN is a non parametric lazy learning algorithm. KNN assumes the data in a feature space. The data can be scalars or multidimensional vectors. The data points are in feature space, so there is a need of distance methods to calculate the distance of all training vectors to test vectors.
Each of the training data consists of a set of vectors and class label associated with each vector. The class label can be either Positive or Negative. KNN will work evenly well with random number of classes.
There are various distance metrics to determine the distance between query instance and training
Samples
a. Euclidean Distance
b. Manhattan Distance
c. Minkowski Distance
d. Chebyshev Distance
a. Euclidean Distance: The Euclidean Distance between points X(x1,x2,…,xn) and (y1,y2,…..,yn) can be defined as

$$d(x,y) = \sqrt{(x1-y1)+(x2-y2)+....+(xn-yn)} = \sqrt{\sum_{i=1}^{n}(xi-yi)^2}$$

Where n is number of attributes of Xi and Yi respectively.
B. Manhattan Distance: The Manhattan distance function calculates the distance that is to be travelled from one point to the other. The Manhattan distance between two points is

ISSN: 2347-1697
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the sum of the differences of their corresponding components. The Manhattan Distance between points X(x1,x2,…,xn) and Y(y1,y2,…..,yn) can be defined as

$$d(x, y) = (x1 - y1) + (x2 - y2) + ...(xn - yn) = \sum_{i=1}^{n} |x_i - y_i|$$

Where n is number of attributes of Xi and Yi respectively.

C. Chebyshev Distance: The Chebyshev distance function calculates the distance that is to be travelled from one point to the other. The chebyshev distance between two points X(x1,x2,…,xn) and Y(y1,y2,…..,yn) can be defined as

$$d(x, y) = \lim_{x \to \infty} \left(\sum_{i=1}^{n} |x_i - y_i|^r \right)^{1/r}$$

Where r is a parameter, n is the number of attributes Xi and Yi respectively

D. Minkowski Distance: Minkowski Distance is a generalization of Euclidean Distance that calculates the distance from one point to another point. The Minkowski distance between two points

X(x1,x2,…,xn) and Y(y1,y2,…..,yn) can be defined as

$$d(x, y) = \left(\sum_{i=1}^{n} |x_i - y_i|^r \right)^{1/r}$$

Where r is a parameter, n is the number of attribute and Xi and Yi respectively.

IV. HYBRID GENETIC CLASSIFIER MODEL (HGCM)

In the proposed Hybrid Genetic Classifier Model (HGCM), first the Data set is divided into training data and Testing data using 10 –fold cross validation method. Then dataset is reduced by removing redundant features by means of feature selection. Then the selected features are then given as input to GA Classifier. GA Classifier randomly generates train data and test data. Finally GA Classifier will generate two rules for prediction of diabetes.

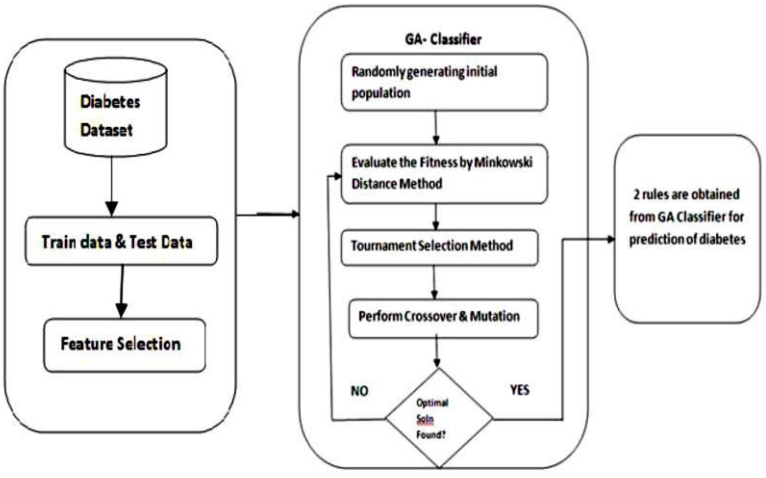

Figure 3: Block diagram of Proposed Hybrid Genetic Classifier Model

Feature selection is a data pre-processing step applied to diabetes dataset. It selects subset of features from whole feature set based on some statistical score and removes

ISSN: 2347-1697
International Journal of Informative & Futuristic Research (IJIFR)
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redundant features that do not contribute to performance. There are three main approaches in feature selection: filter, wrapper, and embedded methods. Filter methods select high ranked features based on a statistical score as a pre processing step. Wrapper and embedded approach require considering the design of a classifier to select subset of features.

V. PROPOSED METHODOLOGY

In our methodology we use ANN method instead of KNN method. KNN is slow as compare to ANN. ANN uses canny edge detection for edge isolation. This method is very useful for recognising the edge of images and finally takes a resultant data in form of many edges in single image. This method finally uses Genetic algorithm to find its ultimate output.

ANN Method

Artificial neural networks (ANNs) or connectionist systems are computing systems inspired by the biological neural networks that constitute animal brains. Such systems learn (progressively improve performance) to do tasks by considering examples, generally without task-specific programming. For example, in image recognition, they might learn to identify images that contain cats by analyzing example images that have been manually labeled as "cat" or "no cat" and using the analytic results to identify cats in other images. They have found most use in applications difficult to express in a traditional computer algorithm using rule-based programming.

One of the most impressive features of artificial neural networks is their ability to learn. You may recall from the previous tutorial that artificial neural networks are inspired by the biological nervous system, in particular, the human brain. One of the most interesting characteristics of the human brain is it's ability to learn. We should note that our understanding of how exactly the brain does this is still very primitive, although we do still have a basic understanding of the process. It is believed that during the learning process the brain's neural structure is altered, increasing or decreasing the strength of it's synaptic connections depending on their activity. This is why more relevant information is easier to recall than information that hasn't been recalled for a long time. More relevant information will have stronger synaptic connections and less relevant information will gradually have it's synaptic connections weaken, making it harder to recall.

Algorithm:

1. Produce blood sample.
2. Apply color segmentation in original image using color segmentation.
3. After color segmentation ANN method will be applied for edge detection in images
4. GA will be applied to get clearer image.
5. Calculate the fitness using estimation of capacity φ(x) of every particle's x in the blood test.
6. Repeat until the positive points are made:

ISSN: 2347-1697
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a. Select atoms from current blood test for highlighting positive estimation.
b. High light the blood molecules having the effect of diabetes.

7. Detect the percent of diabetes using the resultant data.
8. Go to Step 2

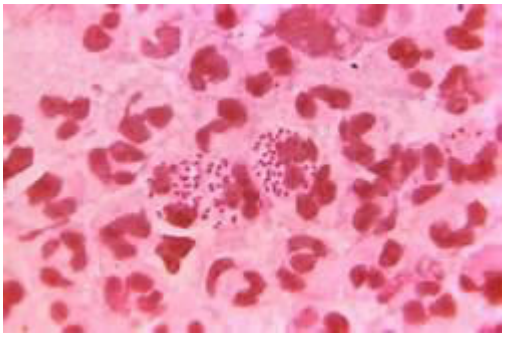

Figure 4: Original Image

Figure 5: Color Segmentation on Image

Figure 6: Edge Detection

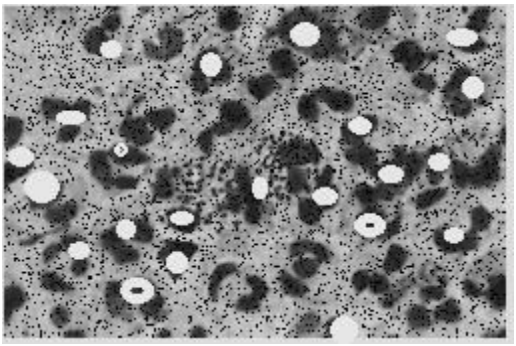

Figure 7: Final Output with diabetes symptoms

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Table 1: Resultant Table

Original Image	Color Segmentation	ANN GA Algo	Proposed Algo	Result
Input Image	Color segmented image	Highlighted molecules	Highlight clear	Count diabetes symptoms

VI. EVALUATION OF PROPOSED ALGORITHM

The diabetes dataset has been divided into training and testing datasets and were arranged by normalizing the instances of the data. By taking different distance metrics like Manhattan Distance Method, Euclidean Distance Method, Chebychev Distance Method, and Minkowski Distance Method along with ANN algorithm it is more efficient to find such result which is useful to detect diabetes in blood sample. After ANN Genetic Algorithm as fitness function to analysis the result. From the above said ANN method is getting more accuracy when compared to others. Hence for the proposed algorithm, we are using ANN algorithm instead of KNN method as fitness function.

VI. CONCLUSION

In this methodology, the result for predicting diabetes present in blood sample gets very easy by using ANN method. In future it can be improve by filtering the result of diabetes. ANN algorithm improves the result of diabetes present in blood sample. By analysing the result it is found that images would be clearer than the previous result. This methodology aims to supply a straightforward guide to the research worker for those applied their analysis study within the image segmentation. Image segmentation incorporates a promising future because the universal segmentation algorithmic rule and has become the main focus of latest analysis. In spite of many decades of analysis up to currently to the information of authors, there's no universally accepted technique for image segmentation, because the results of image segmentation is littered with various factors, such as: homogeneity of pictures, special characteristics of the image continuity, texture, image content. Therefore there's no single technique which might be thought of smart for neither all sort of pictures nor all strategies equally smart for a specific sort of image. because of all higher than factors, image segmentation remains a difficult drawback in image process and laptop vision and continues to be a unfinished drawback within the world.

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TO CITE THIS PAPER

Kaur,G., Chhaterji,J. (2017) :: "Study of Techniques used for Medical Image Segmentation" ***International Journal of Informative & Futuristic Research (ISSN: 2347-1697)*****, Vol. (5) No. (1), September 2017, pp. 8701- 8709, Paper ID: IJIFR/V5/E1/013. Available online through- http://www.ijifr.com/searchjournal.aspx**