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PERFORMANCE ANALYSIS OF DISTANCE MEASURES FOR MEDICAL IMAGE SEGMENTATION

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ABSTRACT

Method proposed use the k-means clustering algorithm with hybrid mathematical law derived from the laws of former scientists that extracts the least distance to segmentation for medical image containing the disease . Proposed method evaluation is based on the comparison with the results of skin cancer images in previous researches using performance criteria sensitivity , specificity ,accuracy .in our research we obtained the following criteria .accuracy 94.28%,specificity 93.75%,sensitivity 100% with 2 false diagnosis of the 35 samples.

KEYWORDS: k-means clustering , image segmentation ,Euclidean distance, Manhattan distance.

I. INTRODUCTION

Image segmentation important stage in image processing, a process of segmenting the image into coherent and homogeneous regions according to a specific criterion such as color. image segmentation algorithms, is used in biomedical applications image, quantification of tissue volumes, diagnosis, localization of pathology , anatomical structure , treatment planning, and computer integrated [1,2,5] .

The paper structure consists of in section 2 discussion Clustering and Clustering and K means cluster Steps, While we discussed in the section 3 Common distance measures, section 5 consists of Proposed method, section 6 contains Experimental and Results, Finally section 7 give conclusions on the proposed method.

II. CLUSTERING & K MEAN CLUSTER STEPS

Clustering is method of showing repetition which leads to the optimization of the objective function. In data clustering mainly the centroid is used to classify each cluster on the basis of similarity **[2].** K means cluster can be defined from the point of view of statistical operations is steps of cluster analysis which partition n observations into k clusters in each observation belongs to the cluster with the nearest mean[3].

III. COMMON DITANCE MEASURES [9,10]

Euclidean Distance

computes the root of square difference between co- ordinates of pair of objects and p=2

$$Dist_{XY} = \sqrt{\sum_{k=1}^{m} (X_{ik} - X_{jk})^2} \quad (1)$$

Manhattan Distance

Manhattan distance computes the absolute differences between coordinates of pair of objects and p=1(p is the order).

$$Dist_{XY} = |X_{ik} - X_{jk}| \quad \textbf{(2)}$$

IV. PROPOSED METHOD

Presents the practical implementation of segmentation the medical images by using k-means algorithm and by using of a hybrid mathematical law to extract the least distance.

Hybrid mathematical law

The hybrid distance where we derived a distance law from two previous laws Euclidean and Manhattan to get the least distance to segment the medical image named modified Manhattan Distance.

$$h.m = [|x1 - x2| + |y1 - y2|]^p \qquad (3)$$

where $p=\frac{1}{2}$

k means steps clustering

k means steps cluster algorithm is hard clustering which partitions data groph into clusters according to distance measure and extracting the information can be used for other tasks Such as slicing images and getting the desired transactions[11].

The following flow chart for k means algorithm in figure 1.

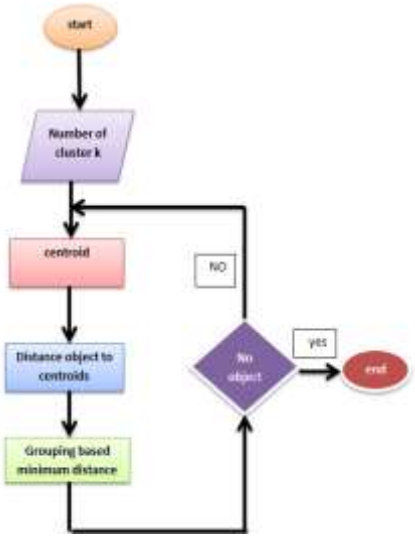

Figure 1: Flow chart for k means algorithm

The main condition in segmentation by using k means clustering is find extract the least distance.

Flow diagram of overall process segmentation by using k-means clustering is showed in Figure 2

We performed a segmentation in the threshold method using the K-means algorithm with hybrid distance measures. our experiments on different medical images after converting them into gray images and then improved them with the mean filter(select randomly two centers) Figure 2 showed flow diagram of overall process segmentation by using k-means clustering

. The algorithm selects the largest pixel for each region and then selects the lower value of the previous steps as a threshold. and then converts the image into a binary image according to the threshold and then we take the opposite values. In the following we provide flow diagram of overall process segmentation by using k-means clustering.

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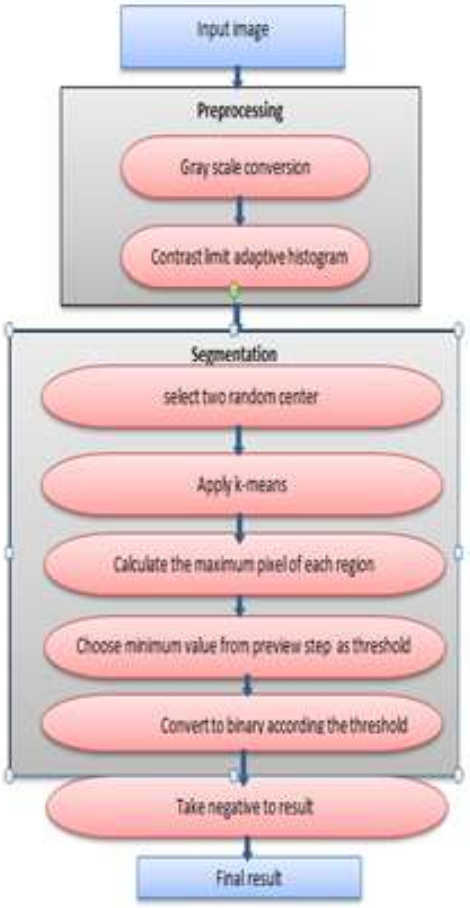
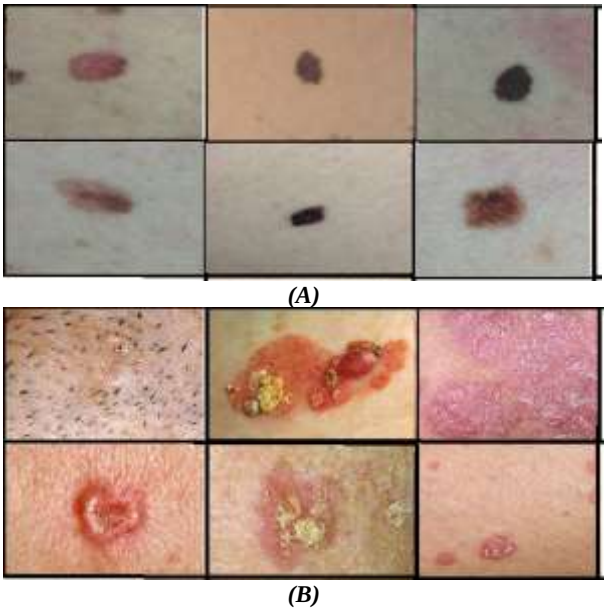


Figure 2 :Flow diagram of overall process segmentation by using k-means clustering

The named database was used Skin Vision and database Medicine Net For photos of skin cancer[12,13]. Figure 3 represents samples of the first and second database



(A)

(B)

Figure 3 : (A)sample image for Skin Vision cancer image, (B) sample image for medicine net skin cancer image

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V. EXPERIMENTAL & RESULTS

After applying the segmentation on medical image(skin cancer) with the K-means algorithm, we applied this algorithm within modified Manhattan Distance law where we obtained the following results (Figures 4, 5, 6, 7,8 and 9 show the main and sub-results obtained from the proposed method).

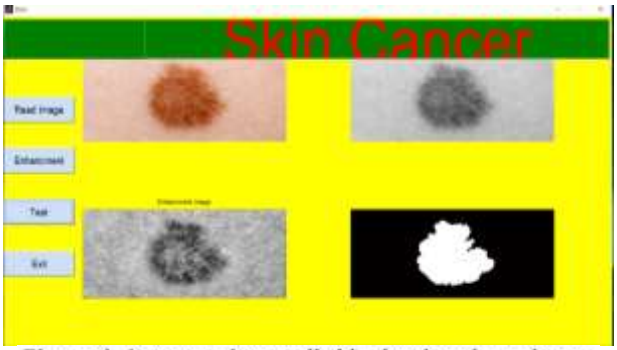

Figure 4: Segmentation applied in the given input image

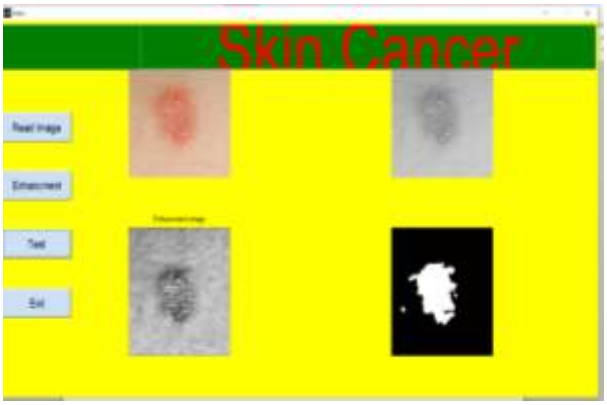

Figure 5:Segmentation applied in the given input image

Tables 1 and 2 show the results obtained from the proposed method of using the new distance Table 3 shows the comparison of the results of the proposed method with some other methods.

Table 1 : Parameters for Performance evaluation analyses

PARAMETERS	CLASSIFIER
TRUE POSITIVE(TP)	3
TRUE NEGATIVE(TN)	30
FALSE POSITIVE(FP)	2
FALSE NEGATIVE(FN)	0

VI. PERFORMANCE ANALYSES MEASURES

The impact of proposed distance metric in K-means algorithm has been evaluated in terms of performance metrics. Performance evaluate of the proposed method several performance metrics are available. This paper uses the Precision Rate, Recall Rate, Sensitivity, Specificity and F-Measure to analyses the performance.

Sensitivity=TP/(TP+FN) **(4)**

Specificity=TN/(TN+FP) **(5)**

Accuracy=(TP+TN)/(TP+FN+TN+FP) **(6)**

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Table 2: Performance evaluation analyses

PARAMETERS	CLASSIFIER
TRUE POSITIVE(TP)	3
TRUE NEGATIVE(TN)	30
FALSE POSITIVE(FP)	2
FALSE NEGATIVE(FN)	0
ACCURACY	94.28%
SPECIFICITY	93.75%
SENSITIVITY	100%
PRECISION	60%
RECALL RATE	100%
F-MEASURE	75%

es

Table 3: Performance evaluation analyses compare with previous works

	sensitivity	Specificity	accuracy
Nadia Smaoui [7]	88.88%	92.3%	92.5%
M. E. Celebi[6]	87.4%	91.5%	90.3%
C. Serrano[8]	92.2%	85.5%	85%
M. Celebi[4]	88.7%	93%	92.6%
modified Manhattan Distance method	100%	93.75%	94.28%

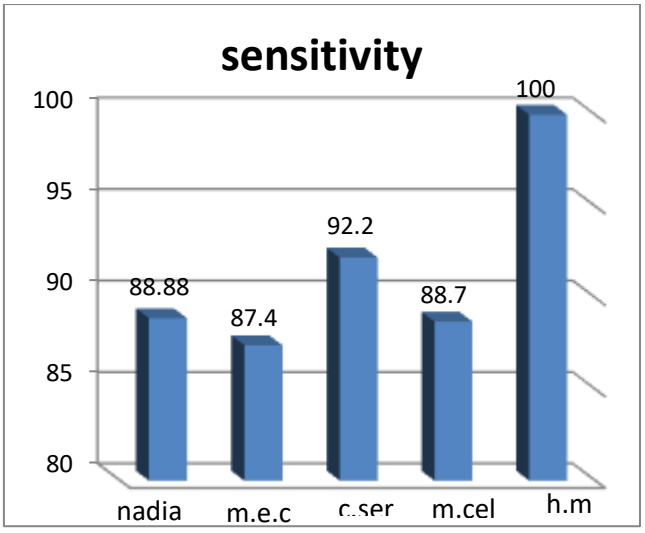

Figure 6:Performance Evaluation according sensitivity metrics

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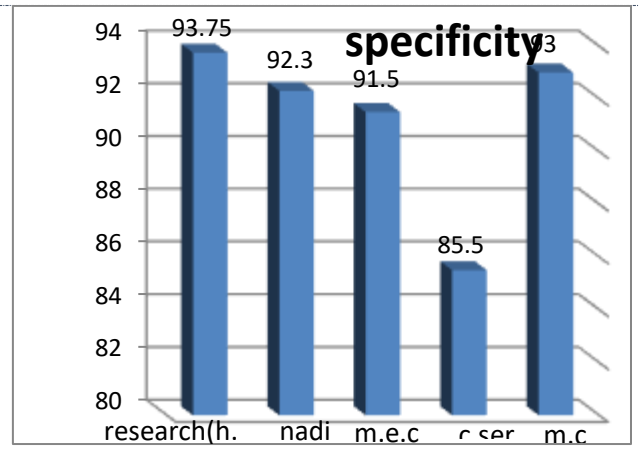

Figure 7 :Performance Evaluation according specificity metrics

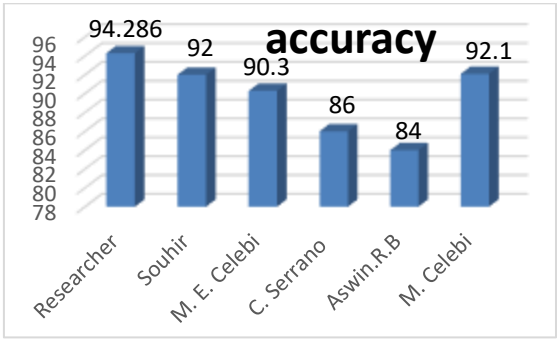

Figure 8:Performance Evaluation according accuracy metrics

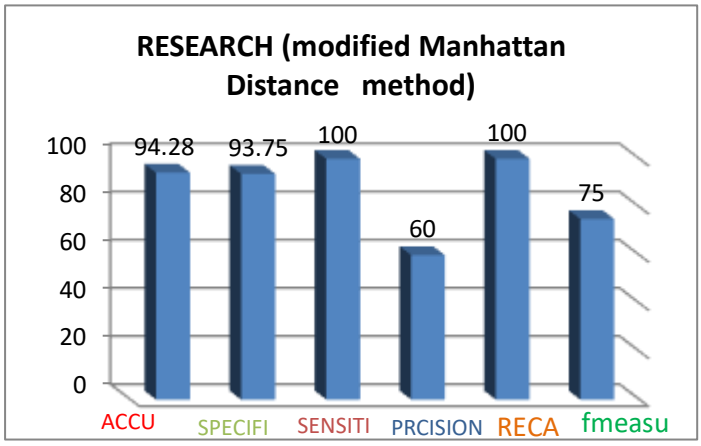

Figure 9 :Performance Evaluation according RESEARCH (modified Manhattan Distance method)

VII. CONCLUSION

1. Produce hybrid mathematical law that extracts the least distance to segmentation by k-means algorithm to see the effect of this distance function on clustering The success rate for the hybrid distance was 100%.
2. The experimental result prove the efficiency of our work such as accuracy and specificity and sensitivity compared to performance standards for the same purpose for other researchers

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