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PREDICTION OF LEUKAEMIA CANCER IMAGES USING PARALLEL SALIENCY ALGORITHM

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ABSTRACT

Parallel Saliency algorithm is applied to solve the medical issues and to reduce the doctors' work in the society. Prediction of specific area of a leukemia, cancer image can be made using a Parallel Saliency algorithm (PSA). Firstly, most affected phase of the leukemia cancer is possible by applying the parallel saliency algorithm over cancer images, secondly, PSA works in a multi-core environment in comparison with the existing saliency algorithm. As a whole, the paper deals with PSA, which provides efficient performance to researchers and scientist.

KEYWORDS: Parallel Saliency Algorithm, Leukemia Cancer Images, Saliency Map, Naive Bayes and Decision Tree

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INTRODUCTION

Leukemia cancer images and parallel saliency algorithm are useful for design prediction of the leukemia cancer from the body. The parallel saliency algorithm which is applied on Leukemia cancer images will produce the parallel saliency map (PSM). The saliency map means a map arranged topographically which shows visual saliency of a corresponding visual scene. Based on literature survey, the paper is carried on with the proposed work discussing about the multiple techniques and producing a new research for image processing researchers and animators. Combination of multiple techniques and parallel saliency algorithm for leukemia images is the proposed work of the paper. In the existing system, applications dealing with more objects, separation of the objects are major issues. The issue becomes very easy through the human eyes to find the variance between foreground and background. But the issue becomes complex using software and machine to separate the objects. The solution is given by using a proposed parallel saliency algorithm to solve the cancer separation object problems from the images which in turn yield efficient performance. Besides the above merits, application of the parallel saliency algorithm is helpful for finding the area of cancer and stage of the cancer (minor or major) for patients and thus serves the society by a diagnosis of cancer also. Algorithms developed by the author for checking comparisons between serial and parallel environment approach, producing performance between algorithms. The principle of the parallel environment is to find a good performance for the user in comparison to the existing saliency algorithm which was based on serial environment. This paper explains the algorithms for saliency algorithm using image signature in parallel environment, and presents the results of comparisons between serial saliency algorithm and parallel saliency algorithm. In addition, we explore additional techniques to improve the performance[1]. Approximation of the foreground of an image is made with the help of an image signature, within the region of signal mixing. Meanwhile, it is experimented using different trials to check whether the approximate foreground overlaps with locations which are visually conspicuous. Also the paper is carried based on the development of a saliency algorithm based on the image signature[5]. The paper[14] presents a Convex Hull BASED WBC Computation for Leukemia Detection which involves three steps. In this paper, image enhancement techniques have been applied to the blood sample image to obtain a better image for Blood Cell Ratio calculations. Convex hull of blood cells are calculated to decide the number of cells in an image. The Blood Cell Ratio is computed by applying convex hull to get number of connected components. The method has shown promising results and has great future scope. Since the paper is written on the basis of ongoing study, the method can be further enhanced and modified. The objective of the research paper is to get solution for the medical issues and to give novel research based study which may solve leukemia cancer problems. Parallel saliency algorithm is the best solution for separation of the cancer area from the main image. Parallel saliency algorithm gives efficient results compared to the existing saliency algorithm in terms of performance. Parallel saliency algorithm is experimented with the assistance of image signature as well as channel map to get a saliency map. The approximation of the foreground of an image is made with the help of an image signature, within the region of signal mixing. Further, it is studied through various implementations to test whether this approximate foreground overlaps with locations, which are visually conspicuous. Parallel saliency algorithm plays a significant role for image processing researches which deals with proposed algorithms using saliency map to prove the efficiency of algorithms using saliency mapping concept in parallel environment approach compared to existing algorithms. In this paper, leukemia cancer image concepts and the results are retrieved by applying parallel saliency algorithm resulting finally with a saliency map.

METHODOLOGY

A. *Parallel Saliency Algorithm*

The proposed work is based on parallel saliency algorithm with an image

transformation technique with the help of image descriptor to find the saliency map using image transformation. Image transformation refers to a function or operator which considers an image as an input and gives an image as an output. Based on the type of the transform, the input and output images may appear entirely dissimilar and have improved interpretations. As a study, various applications have been under experimentation using parallel saliency algorithm. The separation of the objects from whole, the wall is referred to as FGS which stands for Figure Ground Separation. Thus the proposed work is to make parallel saliency algorithm by applying on image transformation to find the saliency map using different processes like Input image, RGB Colour, Channel Map and Saliency Map using Image Descriptor is given in figure 1. According to Parallel Saliency Algorithm, the split up of the color image into constituent channels which then combines the output into saliency map. All the channel maps of parallel saliency has been retrieved by transforming the channel to the DCTD that is Discrete Cosine Transform domain which signs all values in this domain for reconstructing the signs in the image domain, squaring each value and smoothing by convolution with a Gaussian-kernel. It is possible to parallelize the proposed algorithm even further by parallelizing the computation of the IDCT, DCT, convolution sign and squaring functions. This can be made by distributing the calculation of every matrix across dissimilar cores. K-Means Cluster algorithm using image transformation results have been obtained by applying parallel saliency algorithm which resulted in the saliency map for each module. The memory usage is also lesser as it uses only more one of the core to execute, other cores also work.

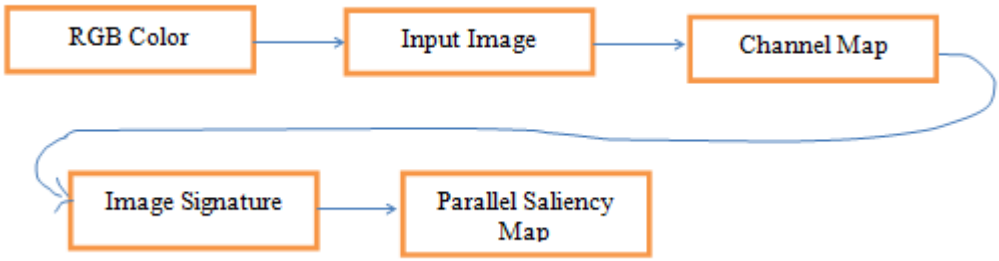

Figure 1
Parallel saliency algorithm

B. Leukemia Cancer Images

Leukemia cancer image is classified by a large quantity of abnormal white blood cells in the body. This affects blood forming cells in the body. Leukemia initiates in the bone marrow and spreads to other parts of the body of a patient. Leukemia cancer effects on blood. The blood cancer is called as bone marrow or Leukemia cancer which can be able to increase abnormal immature blasts in the form of white blood cells as well as Leukemia cancer able to cover a spectrum of diseases.

C. Parallel Saliency Algorithm using Leukemia Images

Parallel saliency algorithm is able to separate from foreground to background objects by using parallel saliency environment. The region behind that will separate leukemia cancer phase from the main image of the leukemia cancer image.

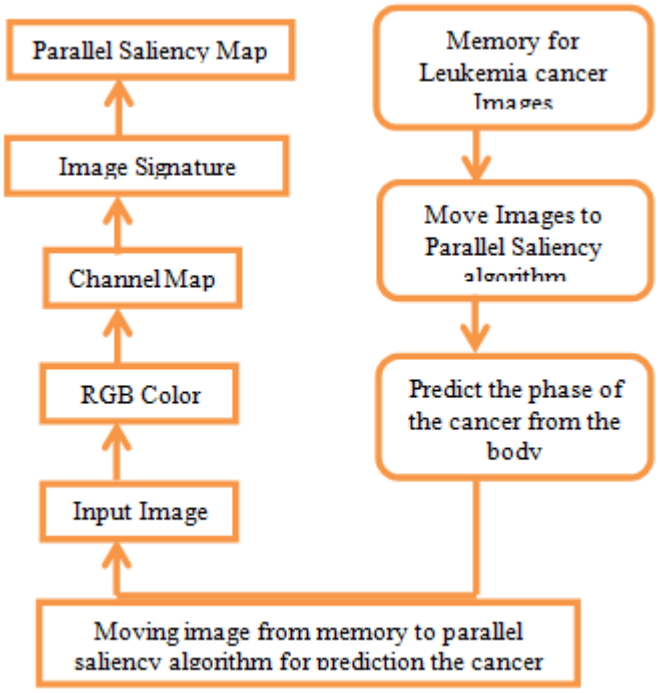

Figure 2
Proposed method for cancer prediction using parallel saliency algorithm

(ii) LEUKEMIA CANCER USING CLASSIFICATION TECHNIQUES

The classification methods are applied on leukemia cancer images with parallel saliency algorithm to justify the efficiency of proposed algorithm of the paper. It deals with Rule Model, Naïve Bayes and Decision tree approaches.

A. RULE MODEL

if AFFX-M27830_3_at > 6.941 then Normal (0 / 0 / 0 / 7 / 0)
if AFFX-HUMISGF3A/M97935_5_at > 4.077 then RARa insertion (0 / 2 / 0 / 0 / 0)
if Age ≤ 24.500 then PML/RARa (1 / 0 / 0 / 0 / 0)
if Age ≤ 36 then CBFB/MYH11 (0 / 0 / 1 / 0 / 0)
else MLL deletion (0 / 0 / 0 / 0 / 0)
correct: 11 out of 11 training examples.

B. Naive Bayes (SimpleDistribution)

Distribution model for label attribute
FISH studiesb
Class PML/RARa (0.083)
103 distributions
Class RARa insertion (0.167)
103 distributions
Class CBFB/MYH11 (0.083)
103 distributions
Class Normal (0.583)
103 distributions
Class MLL deletion (0.083)
103 distributions

C. DECISION TREE

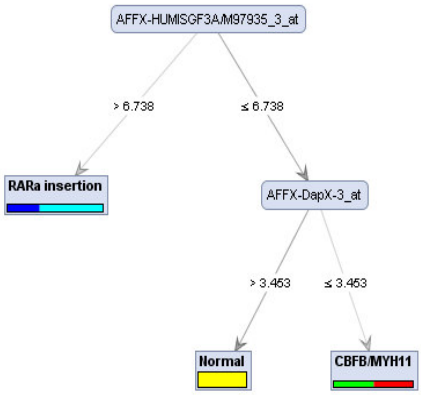

Figure 3
Sample Decision Tree Classification of Leukemia Data Set

The figure 3 shows the decision tree classification of leukemia data set to analyse the classification of classes(normal, MLL deletion,etc)

RESULTS ANALYSIS AND DISCUSSION

1. Input images with Parallel saliency map

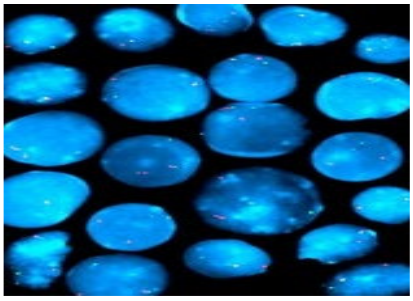

Figure 4. ***Input images***

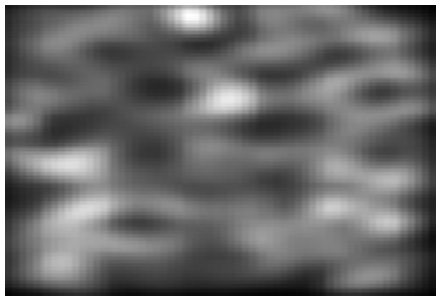

Figure 5. ***Parallel Saliency Map***

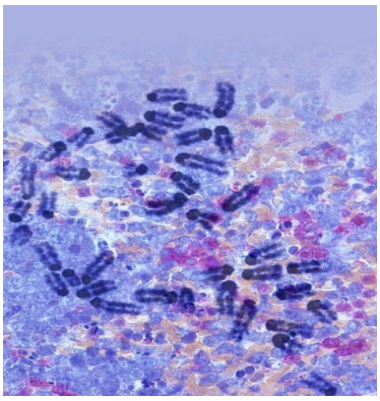

Figure 6. ***Input Images***

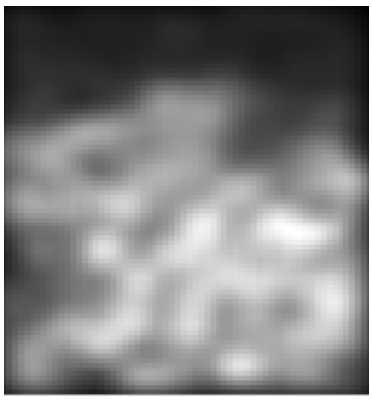

Figure 7. ***Parallel Saliency Map***

The figures 4 and 6 deals with leukemia cancer images and figures 5 and 7 shows the parallel saliency map which is an output of the research paper.

Sample Acute Leukemia Data Set with FISH studies, which gives the prediction of cancer as Normal, PML/RARa, MLL deletion, etc., which classifies the gender that deals with possibility of occurrence of cancer. The graph has been given for better interpretation of classification of data set. Data fields states the blood test which was recorded for different dates. The table I deal with sample leukemia data set for experimentation purpose which involves data field I, data field II Karyotye and FISH studies as parameters for classification.

Table 1
Sample Leukemia Data Set

Data Field-I	Data Field-II	Karyotype	FISH studies
11.51172	12.131075	47,XY, +8, t(15;17)(q12;q21)	PML/RARa
11.201722	12.038811	46,XX	RARa insertion
10.696158	12.685975	NM	Normal
11.236153	12.27515	46,XY	Normal
11.298522	12.906307	46,XX	Normal
11.38206	12.984067	46,XX	Normal
11.225701	12.78344	46,XY	Normal
11.749893	12.678351	46,XY	Normal
11.122779	12.564059	NM	Normal

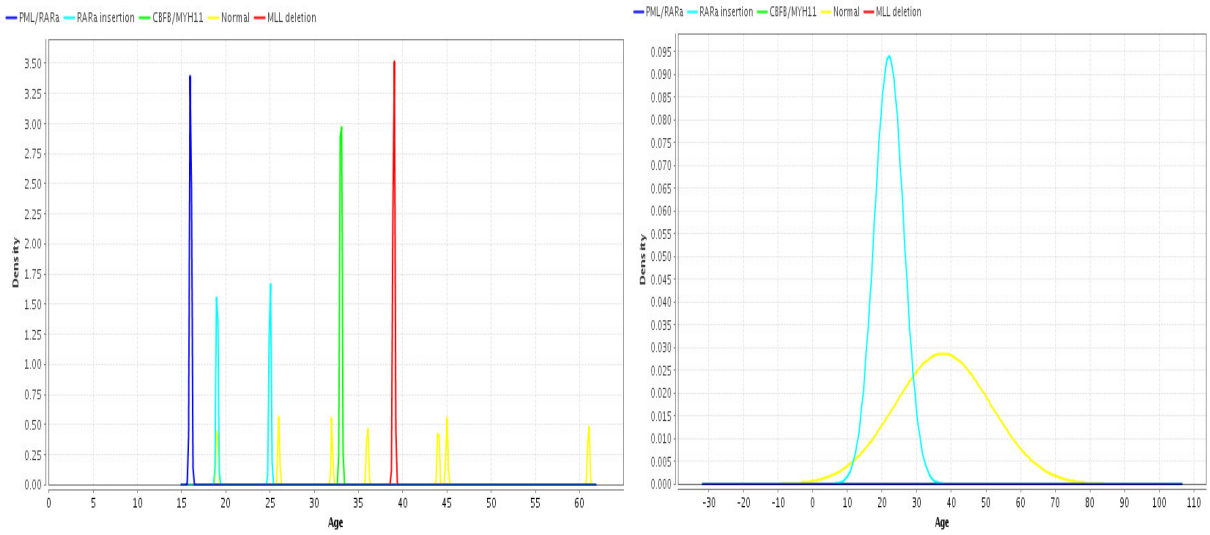

Figure 8 Classification of Leukemia cancer for 60 data set
Figure 9 Classification of Leukemia cancer for 110 data set

The figures 8 and 9 gives pictorial representation of classification of leukemia cancer images for 60 and 110 data sets for clear understanding of the experimentation.

FUTURE ENHANCEMENT

We can apply various C-Means algorithms and proposed C-Means algorithm also with parallel saliency algorithm to still more get efficient performance of the prediction of leukemia cancer images[14][15][16]. Reconstruction of saliency map of leukemia images also may give improved performance of the objective of the paper with required computation of depth [17][18].

CONCLUSION

The parallel saliency map algorithm can be applied using K-Means clustering algorithm also. The combination of existing algorithm with the parallel saliency algorithm resulting using parallel saliency map gives satisfactory performance compared to using with only existing saliency algorithm. The prediction of cancer will be helpful for researchers, students and scientist who are involved in computer science research and development.

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