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A Novel Approach for Segment and Detects Damaged Blood Cell in Hematoxylin-Hosin (H&E) Images

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Abstract: Blood cell is very important part of human body. It contains lot of information. Early detection of damage cell can help to cure many diseases. There are many segmentation techniques are used but k-mean clustering gives more appropriate results. Cluster index is assigning to each cluster for L*a*b colour space w.r.t rgb components and it detect nuclei of each component. Further this nulii is used to calculate percentage of damage cell in each test using a novel approach inhematoxylin-eosin (H&E) images.
Keywords: Cluster, blood, cell, H&E, k-mean.

I. INTRODUCTION

Blood cell analysis is the key to diagnose several blood-related diseases and also to find out possible reasons for the patient's health condition Blood cell analysis is the key to diagnose several blood-related diseases and also to find out possible reasons for the patient's health condition Blood cell analysis is the key to diagnose several blood-related diseases and also to find out possible reasons for the patient's health condition

Blood cell analysis is the key to diagnose several bloodrelated diseases and also to find out possible reasons for the patient's health condition.Image processing techniques are being widely developed for helping specialists in analysis of histological images obtained from biopsies for diagnoses and prognoses determination. Several types of diseases can be diagnosed using segmentation methods that are capable to identify specific neoplastic regions. The use of these computational methods makes the analysis of experts more objective and less time-consuming. Thus, the progressive development of histological images segmentation is an important step for modern medicine.

To diagnose damaged cell, a specialist analyses tissue samples stained with, for example, hematoxylin-eosin (H&E) to identify damaged regions. These distinctions are essential for disease monitoring, identification of its stage and orientation towards appropriate treatments for the patient [2]. However, visual evaluation is a complex task due to experience level, subjective analysis and inter-pathologist'svariability [6].Therefore, a numerical value in percentage of the damaged cell is introduced using a novel approach in this paper.A color-based segmentation method using the k-means clustering technique is to track the damaged blood cell in the hematoxylin-eosin (H&E) images. K-means is a widely used clustering algorithm to partition data into k clusters.

II. RESULTS

There are three different H&E images to find damaged cell, first the nucleus and cytoplasm is detected using k-means clustering then a novel approach to find damaged cell and percentage of damaged cell.

Fig1 shows the original hematoxylin-eosin (H&E) image no1.

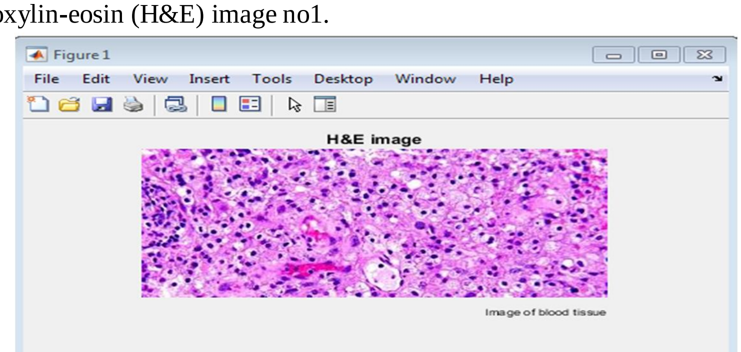

Fig 1: original image 1

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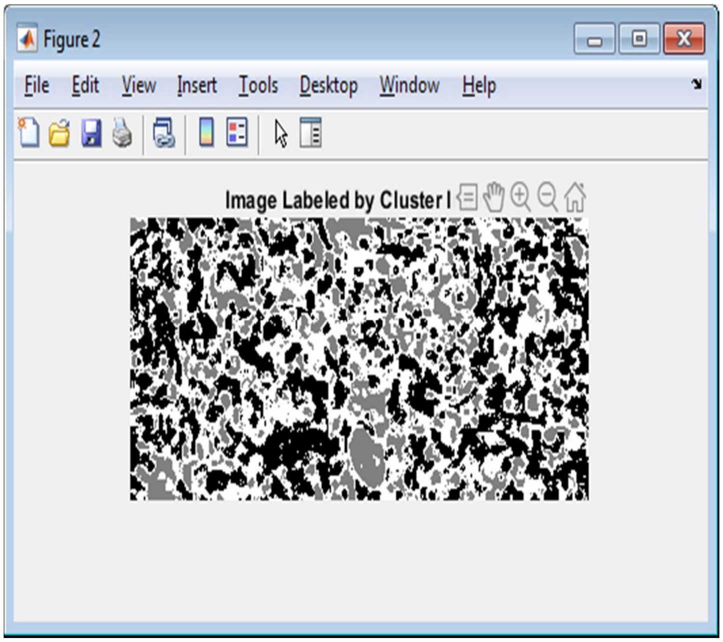

Fig 2: image 1labeled by cluster Index

L*a*b color space which is known to better represent human vision and perception is used in the paper. The image statistics for detecting the cluster index (shown in fig 2) that contains H&E images.This is primary stepsince the K-means clustering algorithm is fully unsupervised and thus the blood cells may result in a random cluster. The clustering is based on color featureas RGB and divided into three clusters according to colour RED, GREEN and BLUE. As shown in figures 3, 4 and 5 respectively.

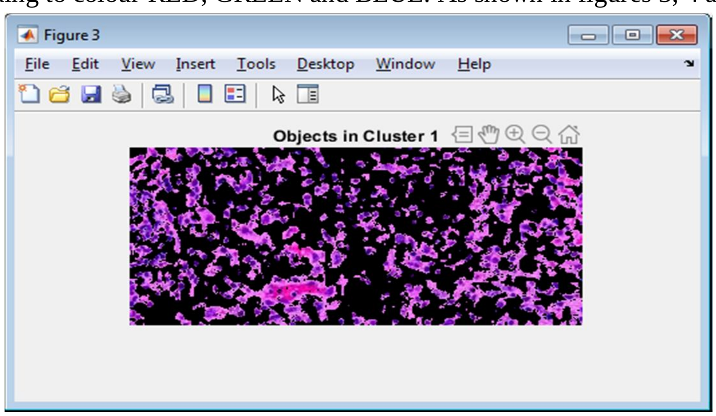

Fig 3: objects in cluster 1 (RED)of image 1

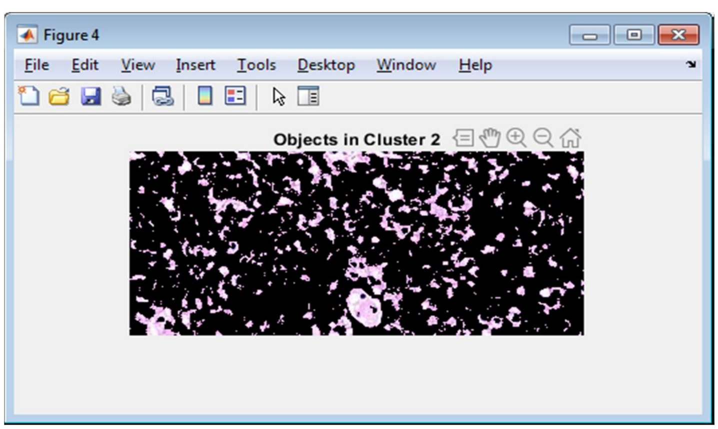

Fig 4: objects in cluster 2(GREEN)of image 1

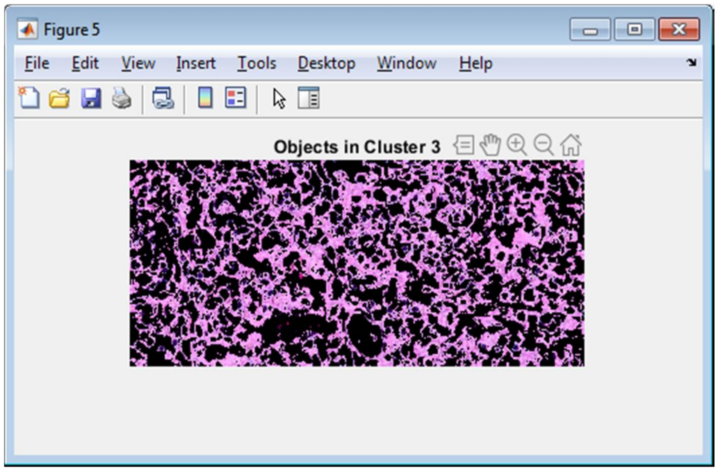

Fig 5: objects in cluster 3(BLUE)of image 1.

The presenceof nuclei in blood cell is shown by blue colour in fig 6.

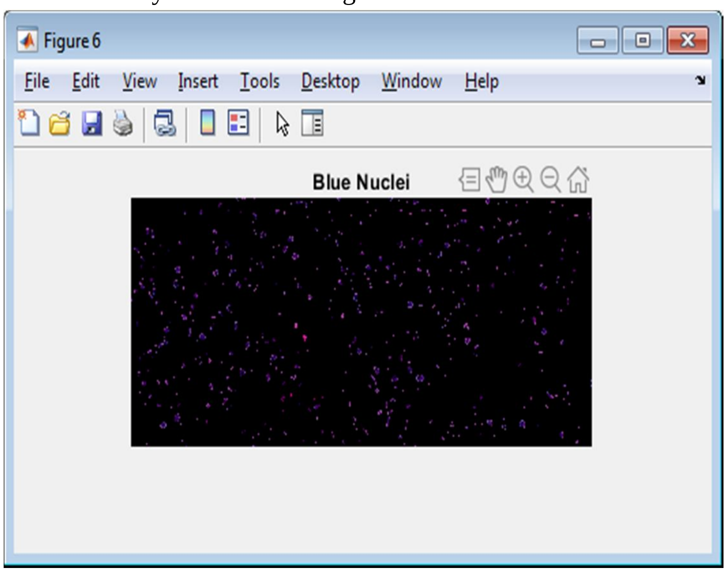

Fig 6: nuclei detectionof image 1

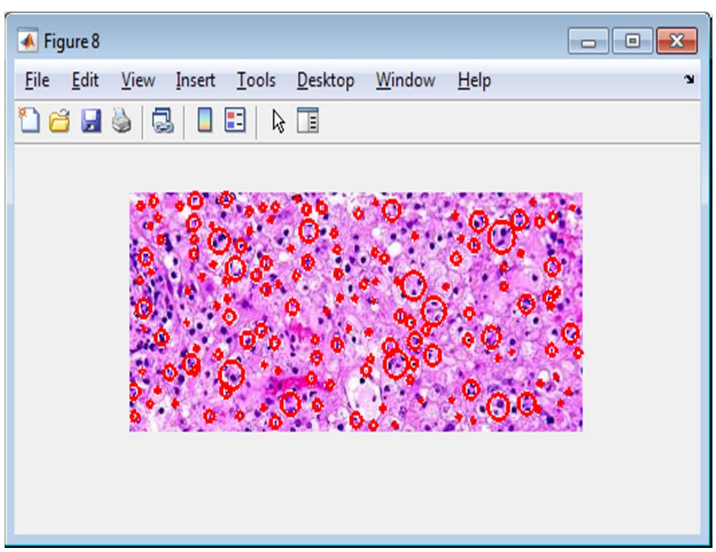

Fig 7: identify radiusof image 1

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After detecting the nuclei, we in circle (fig 7) then by using nuclei position and estimating the radius of each cell as shown by table 1.

Table 1 : nuclei radius and centers.

centers	radii
198.4516 145.4647	1.6793
106.0000 17.6358	1.6130
102.3991 44.2935	3.7267
328.1539 124.7385	1.6783
189.5210 135.0000	1.8520
24.2979 90.8865	4.5864
318.6746 115.7261	1.4844
48.3736 39.0232	2.8225
102.1843 60.9910	3.2793
171.2879 13.9659	2.6401
202.3539 77.4901	3.6758
253.2595 92.4211	3.2126
100.1361 10.0000	2.0742
43.1658 81.5705	1.3890
176.7362 111.3656	3.1816
23.4783 30.0000	2.1734
260.9834 18.6944	6.0896
10.9788 72.6409	5.4343

Figure 8 shows the erodes of figure 7 meaning destroying the image into parts to detect the damaged cell.

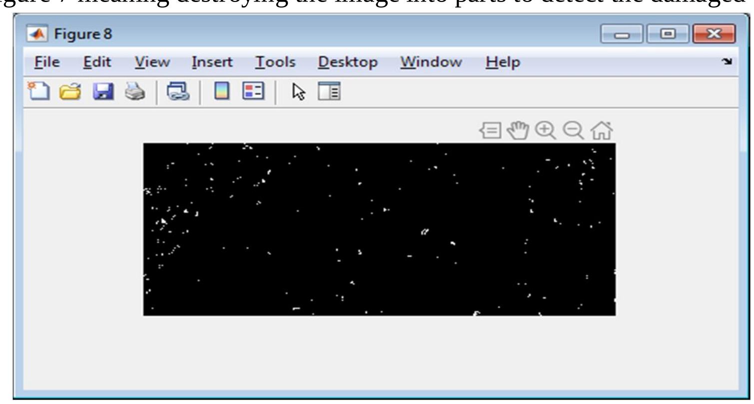

Fig 8: identify erodesof image 1

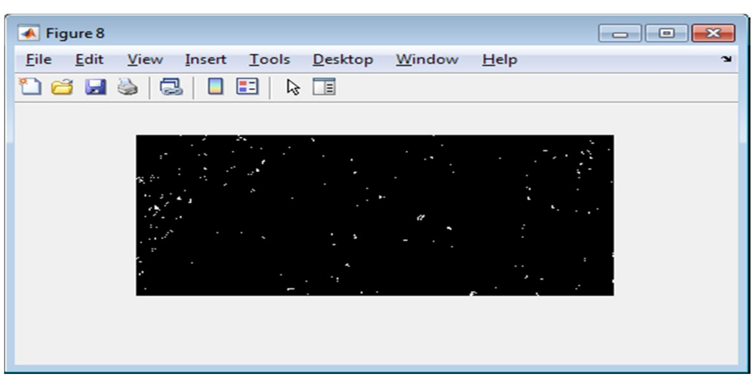

Fig 9: identify dilateof image 1

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The erode image is made wider by dilate (fig 9) to detect the damaged cell shown in figure 10 of image 1.

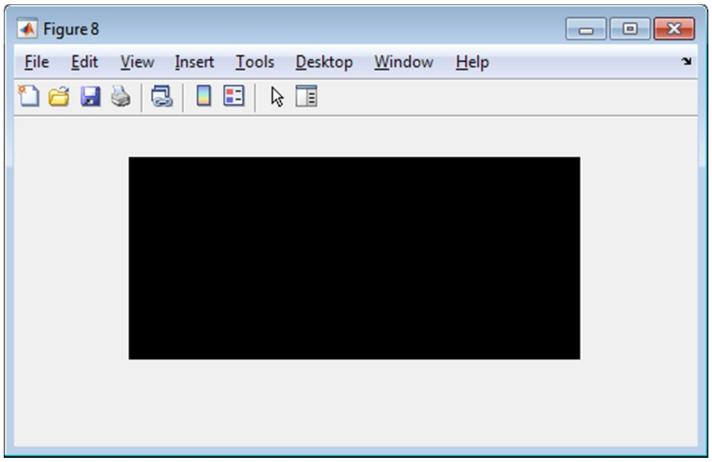

Fig 10: detect damage cellof image 1

There is no spot found in figure 10 of image 1 and the damage percentage found to be 0%.

Image 2
Fig11 shows the original hematoxylin-eosin (H&E) image no2.

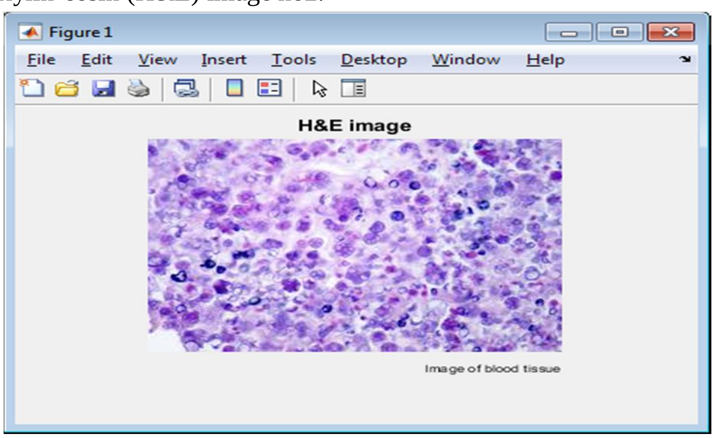

Fig 11: original image 2

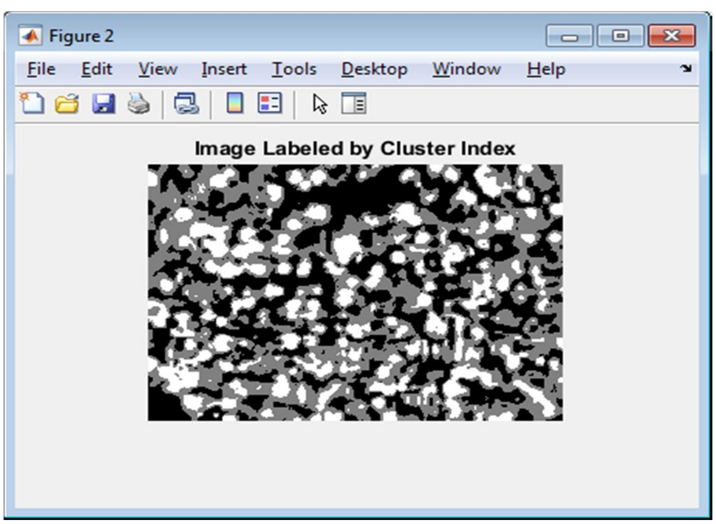

Fig 12: image 2labeled by cluster Index

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L*a*b color space image statistics for detecting the cluster index (shown in fig 12) that contains H&E images. The clustering is based on color feature as RGB for image 2 s also divided into three clusters according to colour RED, GREEN and BLUE. As shown in figures 13, 14 and 15 respectively.

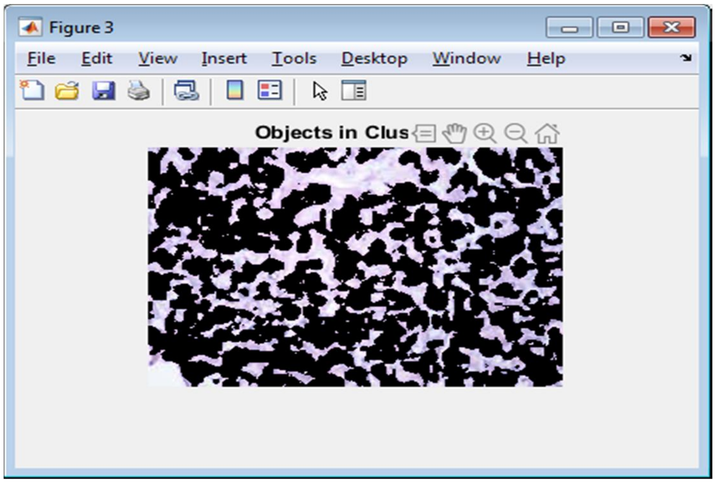

Fig 13: objects in cluster 1 (RED) of image 2

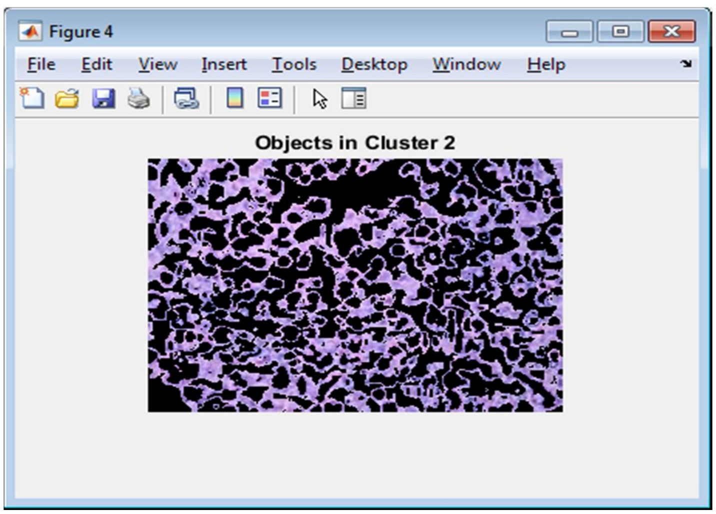

Fig 14: objects in cluster 2(GREEN) of image 2

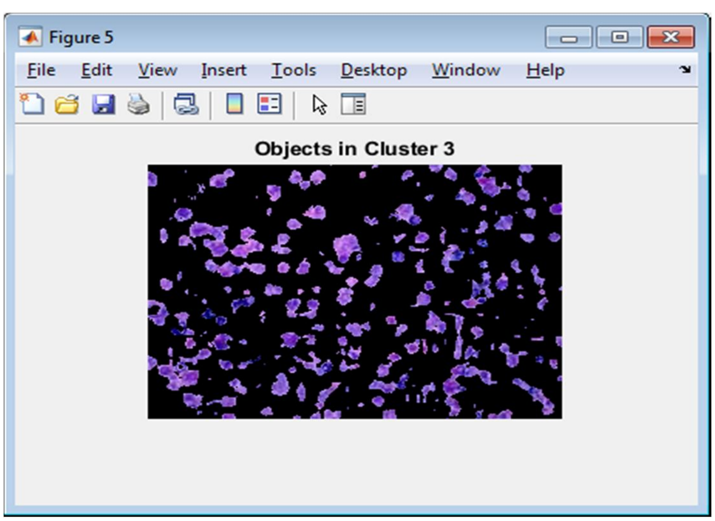

Fig 15: objects in cluster 3(BLUE) of image 2.

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The presence of nuclei in blood cell is shown by blue colour in fig 16.

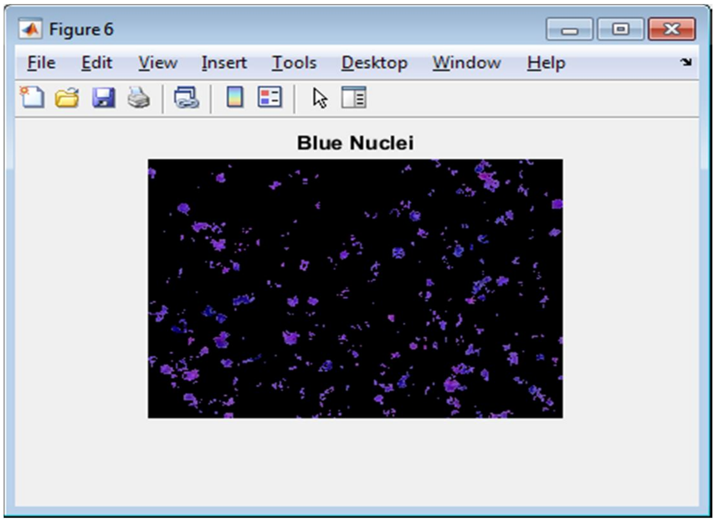

Fig 16: nuclei detection of image 2

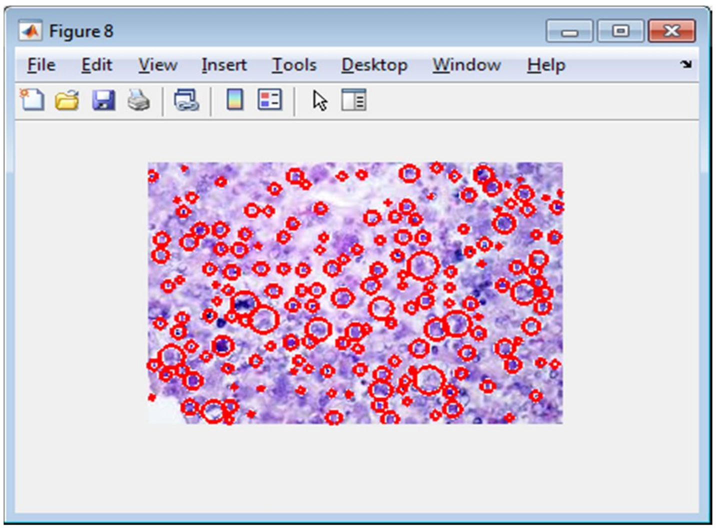

Fig 17: identify radius of image 2

After detecting the nucleiin circle (fig 17) then by using nuclei position and estimating the radius of each cell

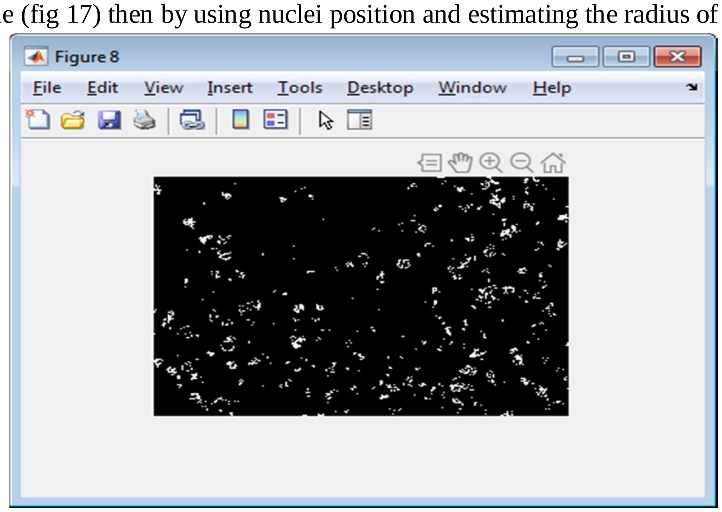

Fig 18: identify erodes of image 2

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Figure 18 shows the erodes of figure 17 meaning destroying the image into parts to detect the damaged cell.

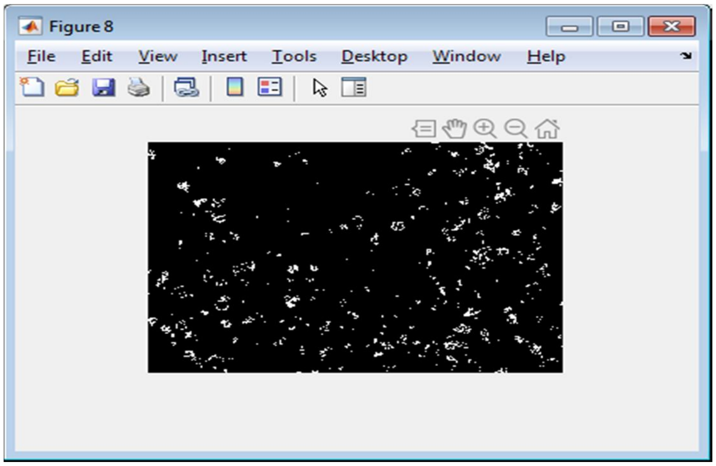

Fig 19: identify dilate of image 2

The erode image is made wider by dilate (fig 19) to detect the damaged cell shown in figure 20 of image 2.

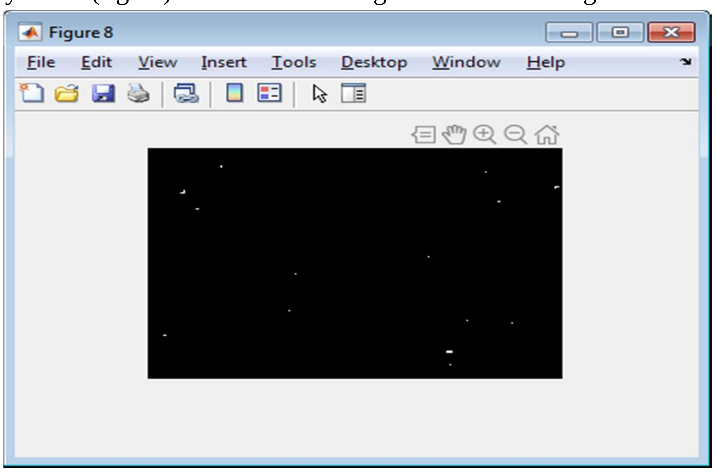

Fig 20: detect damage cell of image 2

There is few small spotof damaged cell is found in figure 20 of image 2which are made bigger by applying square shape on them shown by figure 21 and the damage percentage found to be 8.0925%.

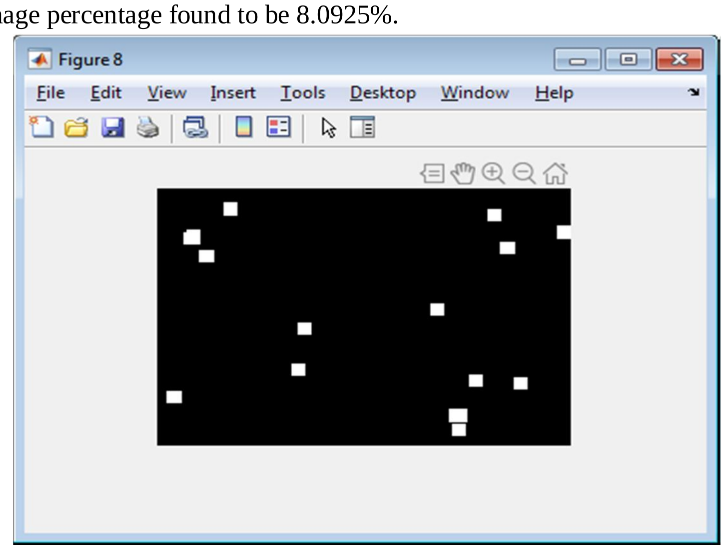

Fig 21: detected damage cell of image 2 in square.

Image 3

Fig22 shows the original hematoxylin-eosin (H&E) image no3.

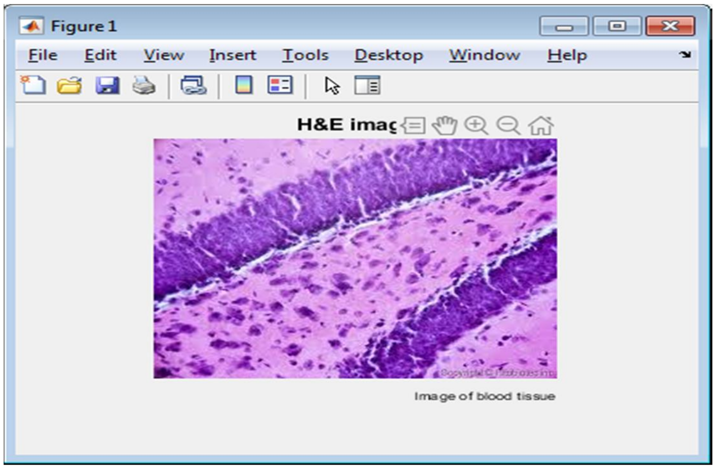

Fig 22: original image 3

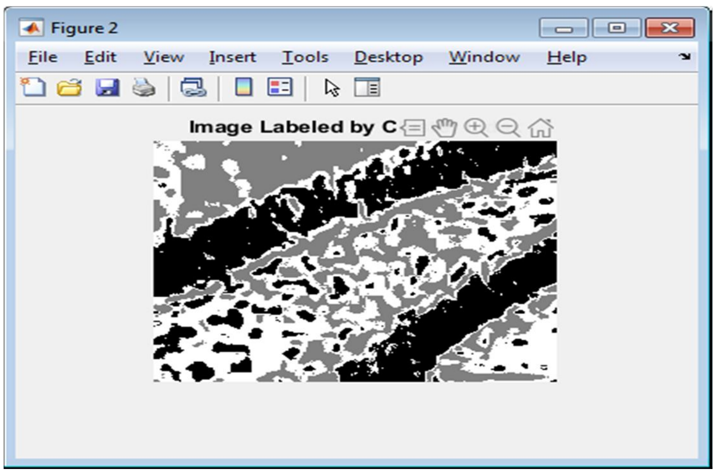

Fig 23: image 3labeled by cluster Index

L*a*b color space image statistics for detecting the cluster index (shown in fig 23) that contains H&E images. The clustering is based on color feature as RGB for image 2 s also divided into three clusters according to colour RED, GREEN and BLUE. As shown in figures 24, 25 and 26 respectively.

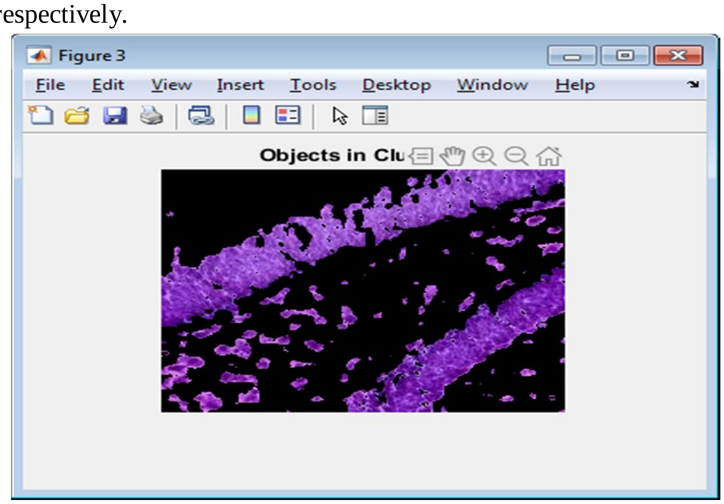

Fig 24: objects in cluster 1 (RED) of image 3

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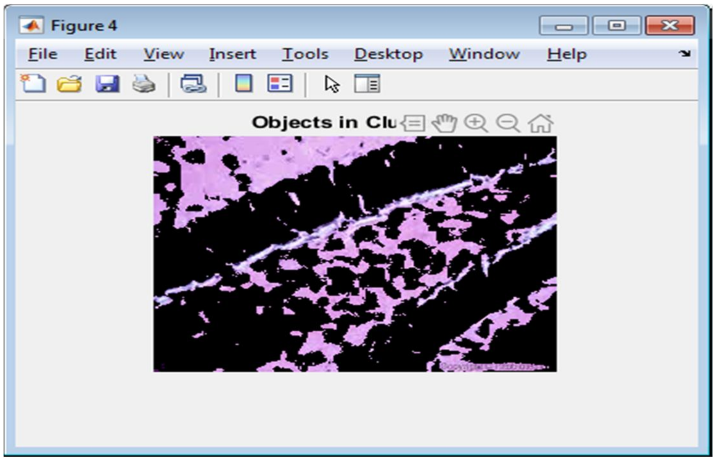

Fig 25: objects in cluster 2(GREEN) of image 3

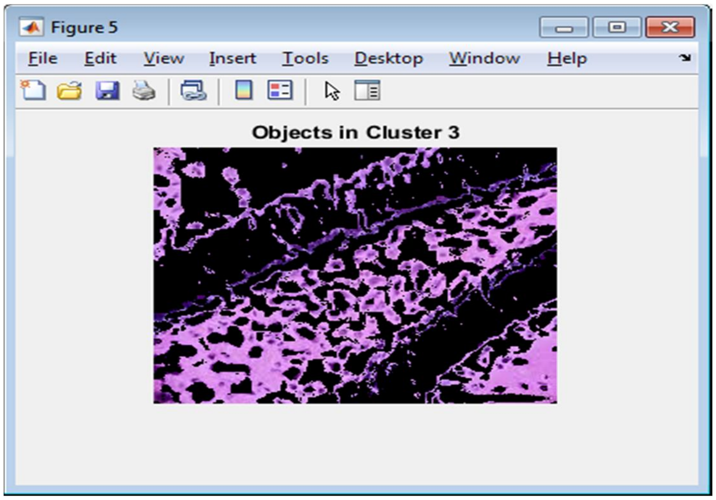

Fig 26: objects in cluster 3(BLUE) of image 3

The presence of nuclei in blood cell is shown by blue colour in fig 27.

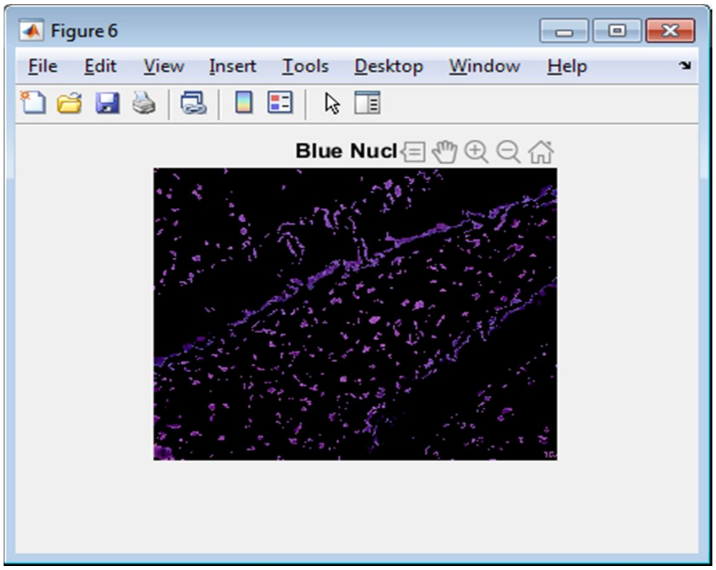

Fig 27: nuclei detection of image 3

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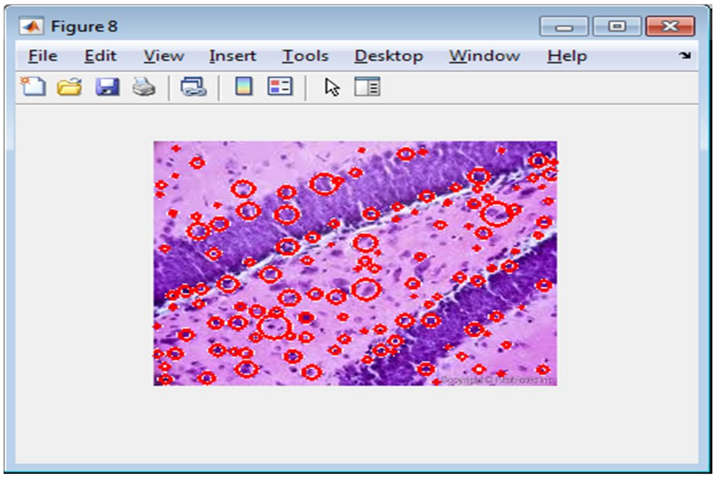

Fig 28: identify radius of image 3

After detecting the nuclei, we in circle (fig 28) then by using nuclei position and estimating the radius of each cell

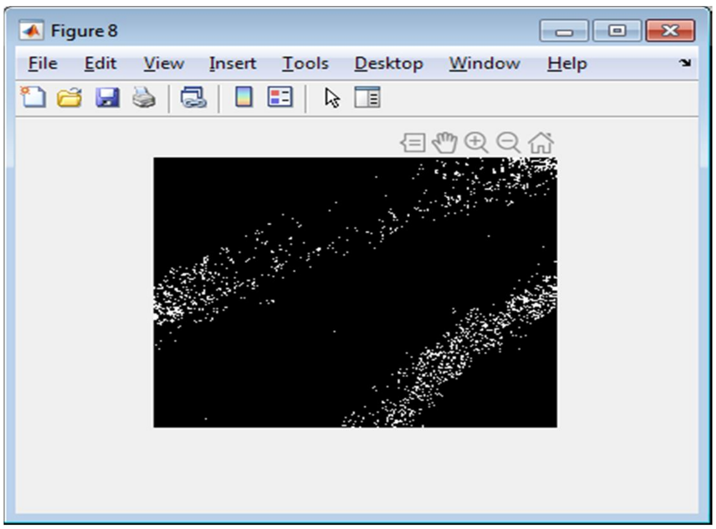

Fig 29: identify erodes of image 3

Figure 29 shows the erodes of figure 28 meaning destroying the image into parts to detect the damaged cell.

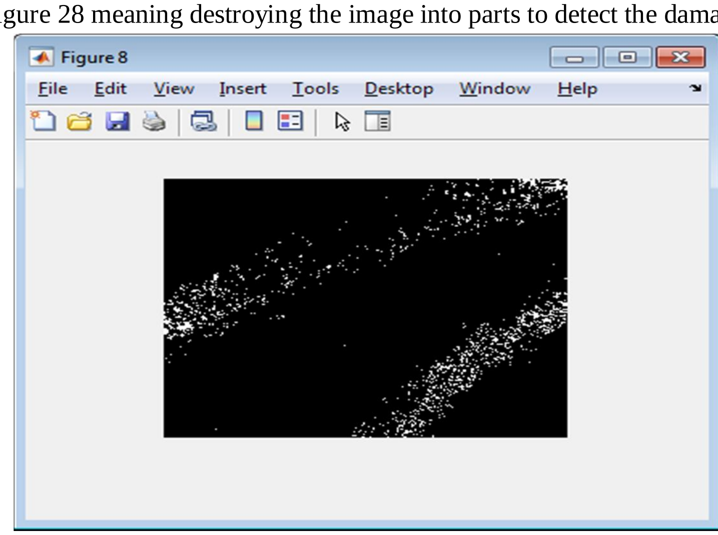

Fig 30: identify dilate of image 3

The erode image is made wider by dilate (fig 30) to detect the damaged cell shown in figure 31 of image 3.

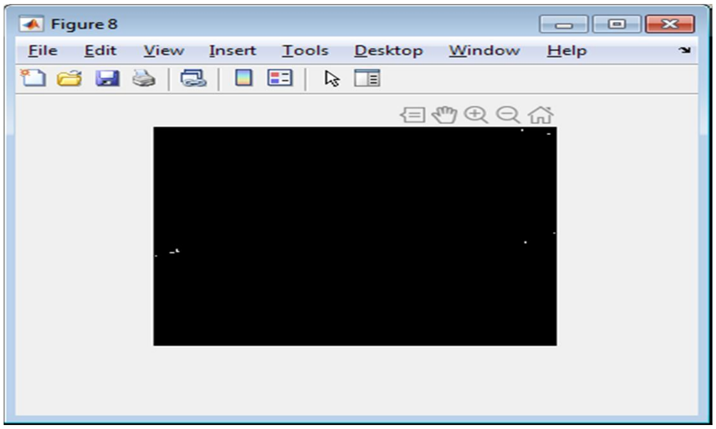

Fig 31: detect damage cell of image 3

There is few small spot of damaged cell is found in figure 31 of image 3 which are made bigger by applying square shape on them shown by figure 322 and the damage percentage found to be 3.9063%.

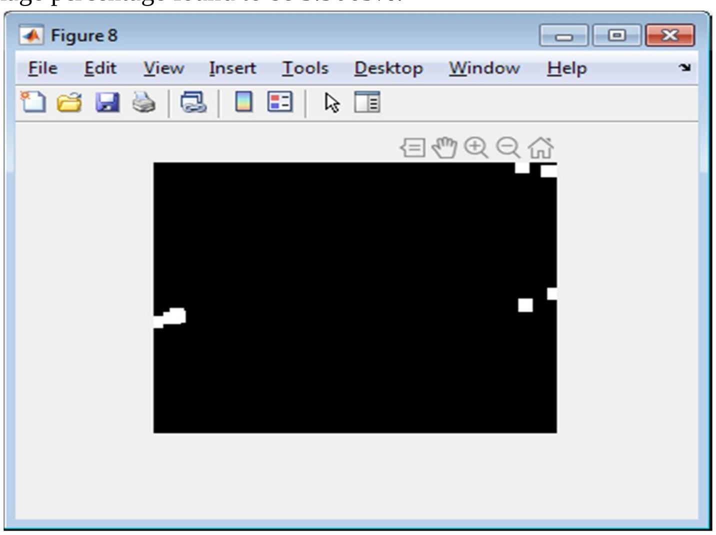

Fig 32: detected damage cell of image 3 in square.

III. CONCLUSION

Blood samples contains various information inside them. It's a big challenge how we get these information's. One of these challenges is detecting how much cells are damage. For this k-mean clustering is used to detect nuclei and a novel approach is used to identify radius and center of detected nuclei. Three H&E images are used to analyze the blood cell, the first image does not have any damaged cell, the second and third images gas 8% and 4% damaged cell respectively.

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