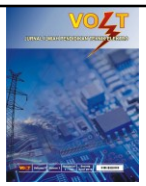
P-ISSN: 2528-5688
E-ISSN: 2528-5696

VOLT
Jurnal Ilmiah Pendidikan Teknik Elektro
Journal homepage: jurnal.untirta.ac.id/index.php/VOLT
Vol. 2, No. 2, October 2017, 149–156



THE IDENTIFICATION OF PARASITE BABESIA FORM ON COW BLOOD BY USING ACTIVE CONTOUR MODEL

Eka Dwi Nurcahya[1]✉, Andy Trianto Pujo Raharjo[2]

[1]Electrical Engineering, Faculty of Engineering
Universitas Muhammadiyah Ponorogo, Ponorogo 36471, Indonesia
✉Corresponding author e-mail: ekadwi_te@umpo.ac.id

[2]Informatic Enginering , Faculty of Engineering
Universitas Muhammadiyah Ponorogo, Ponorogo 36471, Indonesia

Received: 14 September 2017. *Received in revised form*: 23 October 2017. *Accepted*: 23 October 2017

Abstract

Babesia parasite is one of the parasites that infect the cow blood and it can cause death. Observation of blood data sample in the laboratory used a microscope equipped by optilab cameras. The form of microscopic observation of a blood must be supported by the skill of the observer to determine whether the blood is parasitic or not. This study aims to find the method of automatic search of parasite Babesia sp form by using the method of active contour model (ACM). Parasite in the blood is very likely to be detected by utilizing the science of image processing. One of the science image processing is Active Contour Model. Initial data in the form of image file was the result from the shoot using camera optilab and it had RGB color. The first data processing was done by doing the color conversion to be homogeneous and facilitated the Active Contour Model works. The preprocessing process invented the RGB-HSV-grayscale-binary/ BW conversion method. HSV was used to remove colors considered as noise. To reinforce the parasite object, the background was converted to grayscale, then the removed image of the noise color and the grayscale background were converted to binary imagery. This research finds the method of Active Contour Model which can do maximum cropping on binary image. In the grayscale image there were still constraints with the edges of the contrast blood form with the back-ground. The result of the implementation of Active Contour Model had accuracy 0.997, Sensitivity 0.99, Spesifity 74%.

Keywords: ACM, babesia, HSV, Parasite, RGB

INTRODUCTION

One of the death causes of livestock because the blood was infected by blood para-

site. One of the parasites infecting cows and goats was Babesia sp. Babesia is also a para-site that can cause infection in humans through the bite of sengkenit (Setiyani, 2009). Babesia is like apple-seed (apple-seedlike) that can cause babesiosis (Anggraini 2013). The examinations done by the veterinary still used manual methods, ie by taking blood samples that was likely to explain the source of pain from the cattle was being examined.

The collection of blood specimens was done when the animal was slaughtered. From the blood came out taken a drop of blood, then placed at the end of the object glass and immediately made preparations review. Howen asserted that after the blood was dried by airing it, the caustic preparation was then fixed using an absolute methanol solu-tion for five minutes colored by the dyeing method (Utama, Kendran, Widyastuti, Virgania, Sene, Kusuma, & Arisandi, 2013). After the dry preparation is then stored and observed in the laboratory using a micro-scope (Olympus CX-51, Japan) with 1000 times by cross sectional method (Weiss & Wardrop, 2010). The time taken by the farmers to know the results of the laboratory can be for days even in a matter of weeks.

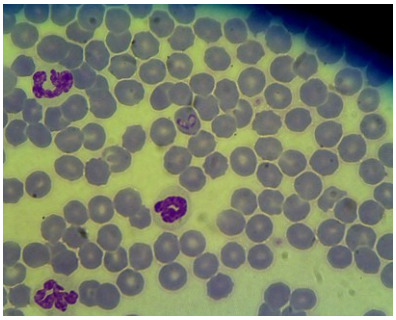
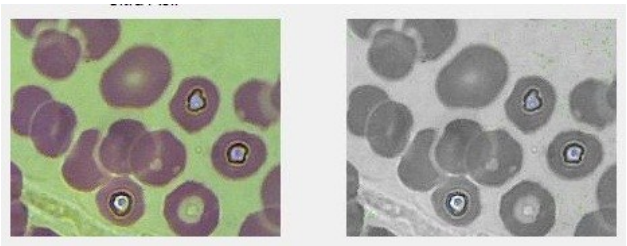


Figure 1. Blood samples from microscope imag-es.

From some literatures of blood parasite image can be analyzed more quickly by utilizing the science of image processing. The purpose of this study is to recognize the shape of parasite babesia sp. If in a microscope there was only trained expert who could recognize while the availability of expert was very little, then by the implementation of image processing could help more easily recognize parasite.

In the initial study as in figure 1, the shape and color of the parasite can be different from the blood cells. But the color difference was very thin and the shape was sometimes almost the same. By using digital image pro-cessing we can minimize disturbance by filter-ing annoying colors and eliminating noise on the image. The goal is to facilitate segmentation due to less number of disturbing colors or in other words it is more homogeny as in figure 2.



(a) (b)

Figure 2. The result of color homogeny; (a) original, (b) filter result

One of the ways to reduce color is by converting original colors of RGB-type to HSV or grayscale. HSV can be used to adjust the brightness and the number of colors appears, while the grayscale we can use it to adjust the contours on an image because grayscale has a range of white to black and can be called gray not other colors.

Many image processing studies have been done to segment; among them is the Ac-tive Contour Model (ACM) which is one of the most successful methods. Previous studies of Active contour models are used to search for malaria parasites in human blood cells

(Permata, 2015). Another active contour model study is also applied to the object of cancer (Basyid & Adi, 2014). Other researches still use active contour on medical image and on image of bone CT scan (Nurpadmi & Purnama, 2017). Region based ACM is less sensitive to the initial contour location and then efficiently detects the exterior and interior limits simultaneously (Zhang, Zhang, Song, & Zhou, 2010). Active contour is a segmentation method using closed curves that can move wide or narrow (Basyid & Adi, 2014). The basic idea of Active Contour Model (ACM) is to develop curves by limiting constraints to extract the desired object. Active contour wide or narrow is influenced by internal and external energy. Internal Energy is formulated as follows:

$$E_{\text{int}} = \left(\alpha(s)\left|\vec{\gamma}_s(s)\right|^2 + \beta(s)\left|\vec{\gamma}_{ss}(s)\right|^2 \right)/2 \qquad (1)$$

Where the value α (s) and β (s) determines the pervasive and horizontal movements of the intended object. External energy that limits movement is defined as follows:

$$E_{eks} = \left|\nabla G\left(\vec{\gamma}(s)\right)\right|^2 \qquad (2)$$

G is the object to be segmentation. From external and internal energy is included in the ACM formula as follows:

$$E = \int_0^1 E_{\text{int}}\left(\vec{\gamma}(s)\right)ds + \int_0^1 E_{eks}\left(\vec{\gamma}(s)\right)ds \qquad (3)$$

There are two factors move the active contour of E_{int} which determines the shape of object and E_{eks} draws curves, like figure 3

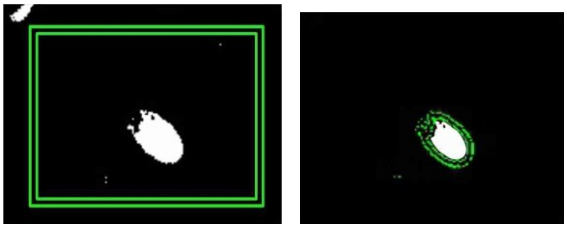


Figure 3. ACM selecting objects

Figure 3 tells how the green line is the ACM curve that moves closer to the object. Lines will continue to approach the object until the iteration runs out.

METHOD

The identification research of babesia parasite form in cow blood has several stages as in figure 4.

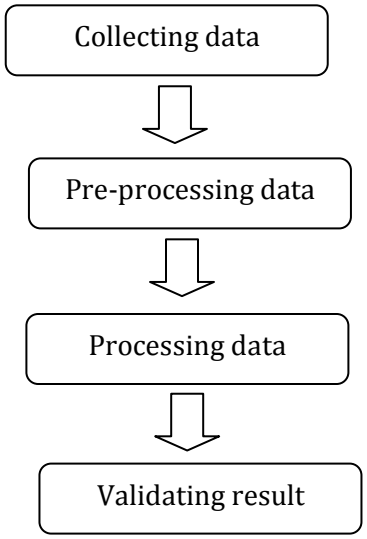


Figure 4. The research steps

Methods of collection used a microscope equipped optilab camera, so that the image of parasite on glass preparations can be pictured. From the data had been obtained was being done the data selection that fulfilled the requirements to be processed using d image processing methods.

The next step was to process the image to be prepared in order to use the ACM method well. The result as shown in Figure 2, the final step was the validation of results to determine the accuracy of the parasite form.

For image processing techniques was pictured on the flowchart image5.

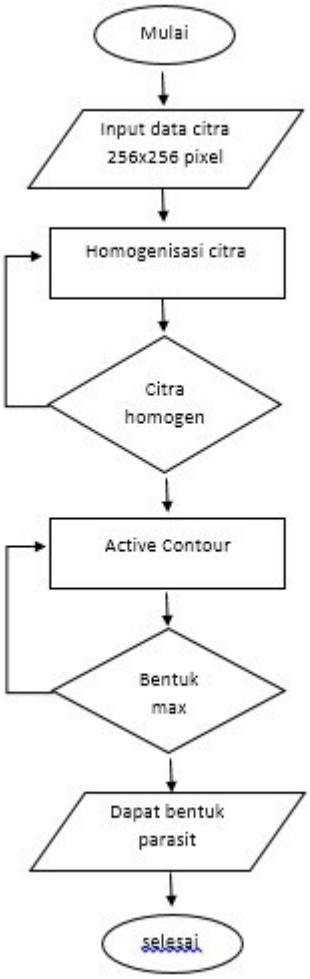


Figure 5 Flowchart image processing.

The image of the result in figure 2 is one of the image processing results with the image as in the flowchart in figure 5.

To measure the success rate used the Receiver Operating Characteristics (ROC) method by comparing the True Positive (TP), True Negative (TN), False Positive (FP), and False Negative (FN) (Nurcahya, 2017). Davis and Goadric describe performance measurements presented in the form of performance metrics (Syarif, 2016).

		Predicted Label	
		Positive	Negative
Actual Label	Positive	True Positif	False negative
	Negative	False negative	True negative

Figure 3 Confusion Matrix

ACM precision determines the shape of the parasite can be measured by the formula in table 1.

Table 1 Measurement of classification reliability

Ukur	Rumus	
Acuration	$\frac{TP}{TP+FP}$	(4)
Sensitifity	$\frac{TP}{TP+FN}$	(5)
Acuration	$\frac{TP}{TP+FP+TN+FN} x100\%$ or $\frac{data\ benar}{data\ benar+data\ salah}$	(6)

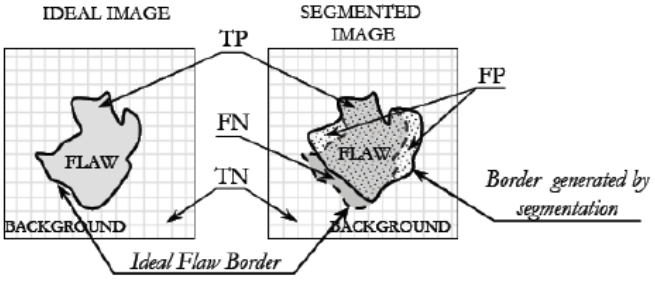


Figure 7. The different of Reference and Result (Nurpadmi & Purnama, 2017)

TP = is the corresponding pixel between the reference and the ACM result
TN = white Background
FP = the reference area is not the same as ACM result
FN = the ACM result is not the same as Reference

RESULT AND DISCUSSION

The data obtained had a Red Green Blue (RGB) color structure. RGB colors were still very heterogeneous to be applied to active contour. To get closer and facilitate the working of active contour then try by reducing heterogeneous color of image. The way used by researchers was to convert RGB color to HSV. By HSV it can be easier to remove the colors that are not related to the object of the parasite cell and adjust the brightness level to a certain color. After removing the color considered disturbing and converted to the next step then the next step changed to the form of binary image or black and white as in figure 8.

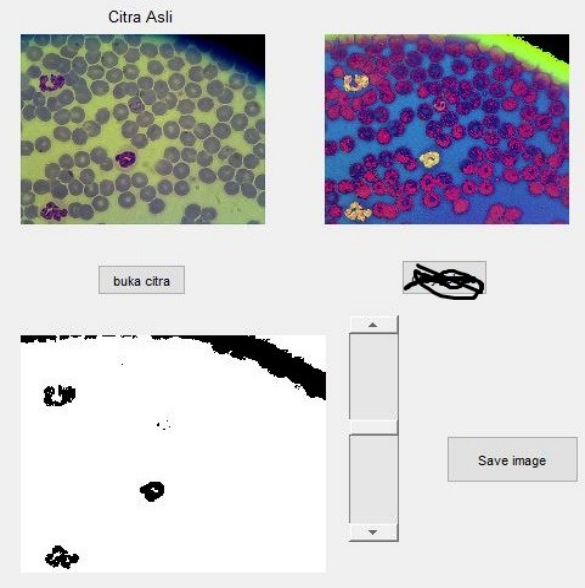


Figure 8. The result of image processing

From figure 8 the original image that has been converted to clarify the object is converted into a binary image so that it can be subject to the ACM method. The results of the ACM process can affect the parasitic object but it is still disturbed the edge of the camera that appears on the object.

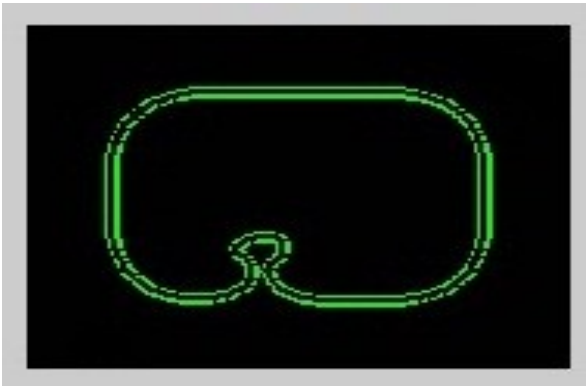


Figure 9. ACM starts to look for parasit form

ACM will move until it finds the shape of the parasitic form and iteration is exhausted.

Figure 10 ACM has found parasitic form

ACM can find parasitic objects using 2500 iterations. From this research, it is still constrained data that is not ideal like the edge of the camera and noise. The result of preprocessing is very good, ie only applying ACM

on grayscale image or image that has long-er color range.

The result of identification of parasitic form with active contour model is converted to binary image with parasitic form to black or 1 and the background becomes white or zero. Results from cropping with ACM as in figure 11.

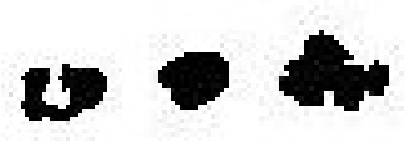


Figure 11. The result of segmentasion with ACM

The level of acuration from Active Contour Model including:

Tabel 2. Acurasion score, sensitifity, dan spesifity.

Data	TP	FP	TN	FN	Acu-ration	Sensi-fifity	Spesi-fity
aa	526	1	185	1	0,998	0,998	73%
ab	558	0	145	8	1	0,98	78%
-	-	-	-	-	-	-	-
jj	513	3	185	12	0,994	0,97	71%
avr	532,3	1,3	171,6	7	0,997	0,99	74%

CONCLUSIONS

The result of preprocessing processing is very satisfied but when it uses ACM method it can go on binary picture well. The identification research of parasite Babesia form has reached good result. With coversion color from RGB to HSV for reducing noise to homogeneous image and conversion to binary image (Black and Withe), ACM have maximaly to identification the babesia parasite. The research of identification parasite babesia with ACM model have result acuration 0.997, Sensitifity 0,99, and Spesifity 74%.

ACKNOWLEDGEMENT

The gratitude is aimed to DRPM-DIKTI which has been funded this research by the contract letter (120/iv.1/PN/2017). Universitas Muhammadiyah Ponorogo as facilitator and Laboratory of Parasitological, FKH, Unair Surabaya is as a place of collecting data.

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