Identification of Tumors and other lesion through *ImageJ* Characteristic From Ultrasound Images

Hatim Sultan Imhimmed[1], Johan Noor[2], Indrastuti Normahayu[2]

1,2,2(Medical Physics, Faculty of sciences, Brawijaya University, Malang, East Java, Indonesia)

Abstract:- Ultrasound department in Dr. Saiful Anwar Hospital ,Malang, Indonesia, we collected our data from it. Our data were Ultrasound Images from several patients who were gotten difference diseases such as solid tumor, cystic mass and hydronephrosis the patients suffering from tumors disease of various kinds, and they do not have the ability to determine this tumors through the use of devices available and cheap price, for instance a ultrasound. According to this we worked with ultrasound images and installed in *imageJ* software which has ability to focus on the shape and size of the cells, therefore and as we have noted the gray values of profile number between 0 and 255, 0 mean dark and 255 mean light, so more less until 0 mean more darkness, and more bigger until 255 mean more lightness, so we observed by standard average of result and random samples results got not much different for instance, the difference between standard average of result and *imageJ* for liver mass is 35 level, hydronephrosis is 8 level and so on. For all the different result we can say that the different between standard average of result and *imageJ* were not much different, so the result from *imageJ* can be used to represent the result from another cases.

Keywords: *Imaging processing ,ImageJ Software ,Tumors , Ultrasound Images.*

I. INTRODUCTION

Many patients suffering from tumors disease of various kinds, and they do not have the ability to determine this tumors through the use of devices available and cheap price, for instance a ultrasound, so we must find some way to get a detection of the disease using the characteristic of *ImageJ* Software, which has the possibility to determine the shape and size of the cells. This is the first study of its kind in the detection of the tumor in a way characteristic used *imageJ* software with ultrasound images.

The word *tumour* means literally an abnormal swelling. *A tumour (neoplasm) is defined as a lesion resulting from the autonomous or relatively autonomous abnormal growth of cells which persists after the initiating stimulus has been removed*. Benign tumors are not cancer. Malignant ones are. Benign tumors grow only in one place. They cannot spread or invade other parts of your body. Even so, they can be dangerous if they press on vital organs, such as your brain [1]. The advantages of ultrasound imaging include bedside availability and the relative ease of performing repeated examinations. Imaging is real-time and free of harmful radiation. There are no documented side effects and discomfort is minimal. Despite the absence of randomized, controlled trials, ultrasonographic guidance for interventional procedures in the thorax is likely to improve diagnostic yield and reduce complications by providing visual guidance [2]. Bedside ultrasonography enables clinicians who understand the clinical context of patients to perform the most appropriate scans directed to address clinically relevant question and available to get it and cheap price.

ImageJ is a public domain, Java-based image processing program developed at the National Institutes of Health [3]. *ImageJ* was designed with an open architecture that provides extensibility via Java plugins and recordable macros [4]. Custom acquisition, analysis and processing plugins can be developed using *ImageJ's* built-in editor and a Java compiler. User-written plugins make it possible to solve many image processing and analysis problems, from three-dimensional live-cell imaging [5] to radiological image processing [6] multiple imaging system data comparisons [7] to automated hematology systems [8] *imageJ's* plugin architecture and built in development environment has made it a popular platform for teaching image processing.[9][10]

Ultrasound Technique

In medical ultrasound diagnostics are used short pulses of ultrasound, which contain a whole range of frequencies. Human tissues are not homogeneous in terms of the ultrasonic waves, and the passage of waves through the tissue leads to refraction, reflection, scattering and absorption of energy.

Fig 1. Major Parts of an Ultrasound Machine and Workflow

Reflection depends on the characteristic acoustic impedance of the funds on whose border is reflected ultrasound. The absorption and refraction of ultrasound increases with frequency, i.e., lower frequencies are pervasive. Therefore, for abdominal examinations (liver, kidneys, pancreas) using a frequency of about 3 MHz, for examination of children, neck, breast, and the similar–around 5 MHz, and sometimes even 7 MHz. The higher frequency allows better discernment of detail in the picture, and is being used by the highest frequencies that are sufficiently pervasive[11].

II.   MATERIALS AND METHODS

Type of Research

This research uses analysis image methods. Survey conducted for data collection patients, image where the data came from Ultrasound Department Dr. Saiful Anwar Hospital, Malang.

Place and Time of Research

The study was conducted in Dr. Saiful Anwar Hospital and biologist laboratory in Brawijaya University Malang, Indonesia from April to July 2013.

The study samples

The samples for the study were ultrasonographic images of patients with cell both normal and abnormal organs admitted to Dept. of Radiology, Dr. Saiful Anwar Hospital, Malang, for examinations.

Operational Definition

- Tumor is more commonly used term for a neoplasm. The word tumor simply refers to a mass. This is a general term that can refer to benign or malignant growths.
- Ultrasound scans use sound waves to produce images of the internal organs, vessels and tissues. The images are produced when the sound waves are directed into the body then reflected back to a scanner that measures them.
- *ImageJ* is a flexible program in that i can measures distances and angles and converts pixel values into user defined units. Its standard image-processing functions include contrast manipulation sharpening, smoothing, edge detection, and median filtering. Its applications in biological studies include quantifying and comparing cellular and subcellular components.

HOW TO WORK

A. Preliminary work.

We used five randomly selected patient data for examination (Liver , Kidney and Breast) because it more common tumor . The image analyses utilized *imageJ* software to obtain numerical values of the image related to the organs within the region of interest (ROI). The results compared with the reference to acquire accurate values.

B. Image Comparison

Upon the completion of the preliminary work, we conducted analyses to images of another ten patients bearing abnormal organs. The numerical values of the abnormal organs were compared with reference examination (the standard average result) output of the same patients regarding the suspected organs.

III.   RESULT AND DISCUSSIONS
Table 1 . Liver Mass With the Standard average of Result and ImageJ Profile.

Liver Mass			
No	The Standard average of Result	ImageJ Profile	Mean
1	90	106	125
2		144	

Table (1) shows that the measurement of the standard average of result for liver mass is 90 (out of gray level range between 0 to 255). This means that the average gray level of profile number observed by the standard average of result is 90. While the results of measurements on the average of profile numbers of the two data processed using *ImageJ* we obtained 106 and 144, respectively. Data obtained from both of them have a mean (average) of 125. So for the case of liver mass can be said that the image with the standard average of confirmation gave the number of 90 and *ImageJ* gave 125.
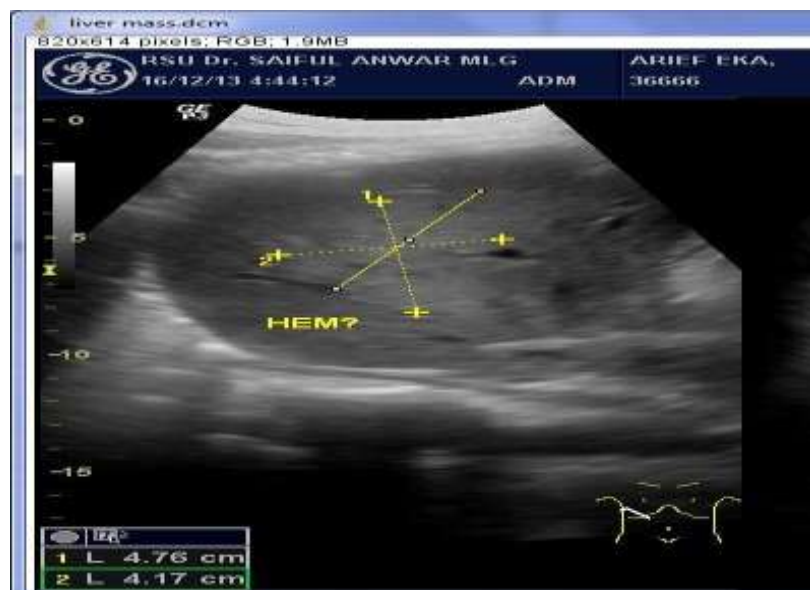

Fig. 2. Ultrasound Image for Liver Mass With ImageJ Profile

Fig. 2. in the above show us the way to determined the liver mass by *imageJ* profile .According to this as we observed it can see the line of the profile should be in the exactly and cover the area which has the faction, so we measured that area and we got the values.

Table 2 . Fatty Liver With the Standard average of Result and ImageJ Profile.

Fatty Liver			
No	**The Standard average of Result**	**ImageJ Profile**	**mean**
1	**125**	**74**	**118**
2		**162**	

Table (2) shows that the measurement with the standard average of result for the average gray level of profile number for fatty liver is 125. While the results of measurements on the average of profile number the two data processed by *ImageJ* obtained 74 and 162 respectively. Data obtained from both of them have mean (average) is 118. So for the case of fatty liver can be said that the results of the standard average of measurements showed the number of 125 and *ImageJ* measurement results showed the number of 118.

Fig. 3. Ultrasound Image for Fatty Liver With ImageJ Profile

Fig. 3. in the above show us how to determined the fatty liver by *imageJ* profile, so we observed it can see the line of the profile should be covered all of the area which has the faction, so we measured that area and we got the values.

Table 3. Kidney Mass With the Standard average of Result and ImageJ Profile.

Mass in the Kidney		
No	The Standard average of Result	ImageJ Profile	Mean
1	88	80	79
2		79	

Based on Table (3) the standard average of result measurements for the mass of the kidney case is 88. It shows that the value of the average gray level of profile number generated from the standard average of measurements is 88. In the table can also be seen that the mean value (average) of the two data measured using *ImageJ* was 79. The mean value obtained from the average of each profile number are 80 and 79. So in the case of mass in the kidney can be said that the results of the standard average of measurements showed the number of 88 and *ImageJ* measurement results showed the number of 79.
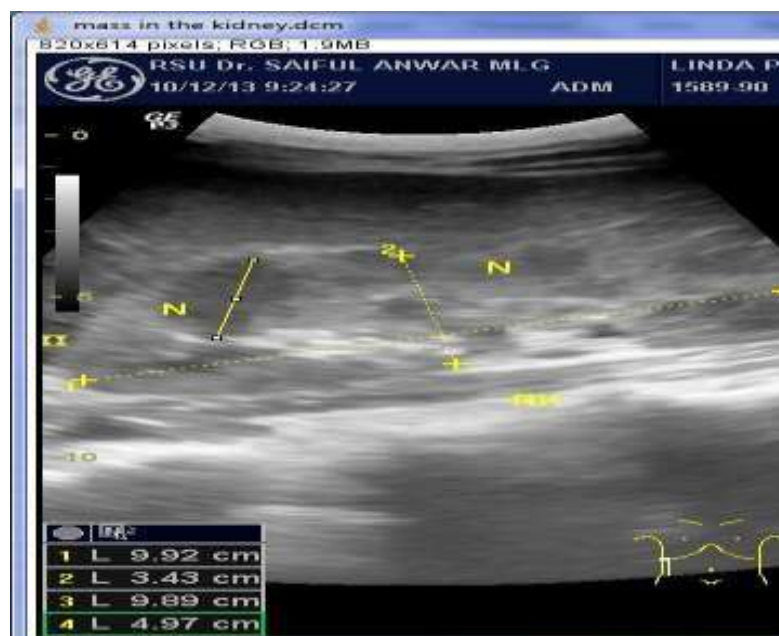

Fig. 4. Ultrasound Image for Mass in the Kidney With ImageJ Profile

Fig. 4. in the above show us the way to determined the liver mass by *imageJ* profile .on other hand we observed it can see the line of the profile which had it should in the exactly of the area which has the faction, so we measured that area and we got the values.

Table 4. Hydrophrosis With the Standard average of Result and ImageJ Profile

Hydrophrosis			
No	The Standard average of Result	ImageJ Profile	Mean
1	34	22	26
2		31	

Table (4) shows that the measurement of the standard average of result for hydronephrosis is 34. This means that the average gray level of profile number observed by the standard average of result is 34. While the results of measurements on the average of profile number the two data processed by *ImageJ* obtained 22 and 31 respectively. Data obtained from both of them have mean (average) is 26. So for the case of hydronephrosis can be said that the results of the standard average of measurements showed the number of 34 and *ImageJ* measurement results showed the number of 26.
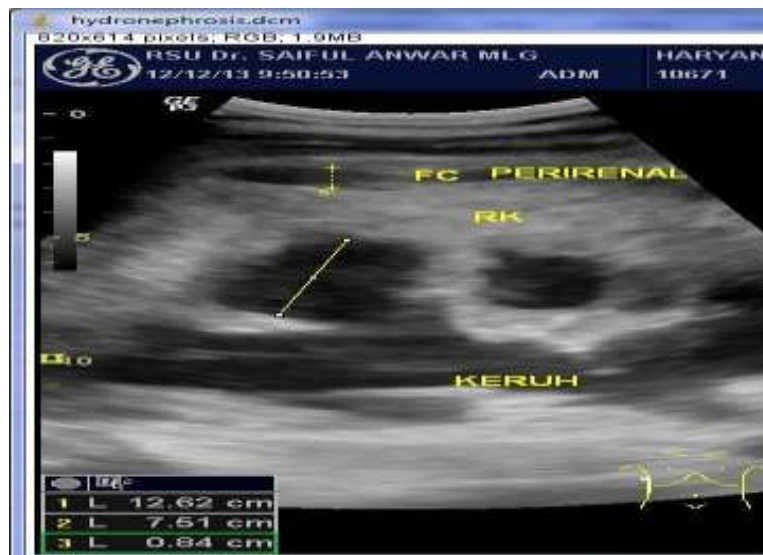

Fig. 5. Ultrasound Image for Hydronephrosis With ImageJ Profile

Fig. 5 in the above show us the way to determined the Hydronephrosis by *imageJ* profile .on other hand we observed it can see the line of the profile which had it should in the exactly of the area which has the faction, so we measured that area and we got the values.

Table 5 .Breast Cystic Mass With the Standard average of Result and ImageJ Profile.

Cystic Mass In the Breast			
No	The Standard average of Result	ImageJ Profile	Mean
1	60	55	50
2		46	

Table (5) shows the measurement of standard average of result for the average gray level of profile number for Breast Cystic Mass is 60. While the results of measurements on the average of profile number the two data processed by *ImageJ* obtained 55 and 46 respectively. Data obtained from both of them have mean (average) is 50. So for the case of fatty liver can be said that the results of the standard average of measurements showed the number of 60 and *ImageJ* measurement results showed the number of 50.

Fig. 6. Ultrasound Image for Breast Cystic Mass With ImageJ Profile .

Fig. 6. in the above show us how to determined the breast cystic mass by *imageJ* profile .so we observed it can see the line of the profile should be covered all of the area which has the faction, so we measured that area and we got the values.
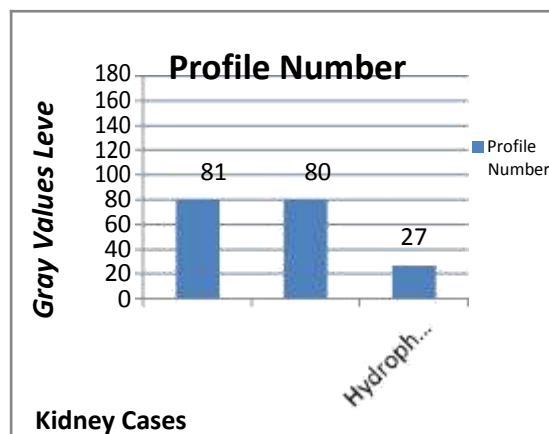

Fig. 7. Kidney Cases with Profile Number

Profile number in the cases of kidneys between normal and abnormal is not significantly different. It was shown in the graph above. Profile number of normal kidney is 81. While the profile number in the mass of the kidney is 80 and 27 for hydronephrosis. The difference between normal value and kidney mass is only 1 point, and 54 points for hydronephrosis. It can be concluded that the profile number between normal and abnormal is not much different.
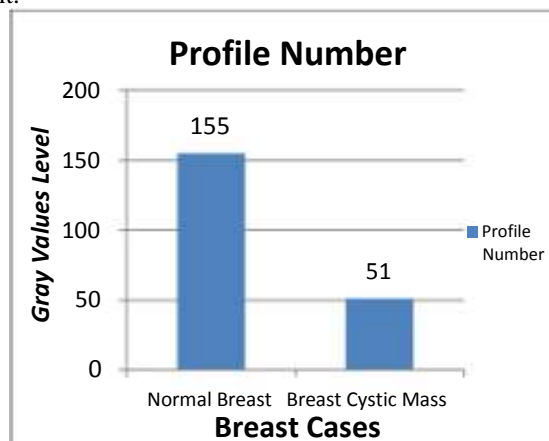

Fig. 8. Breast Cases With Profile Number

Profile number in the cases of breast between normal and abnormal is significantly different. It is shown in the graph above. Profile number of normal breast has a gray level value of 155. While the profile number of breast cystic mass is 51. The difference between the normal value and abnormal is 104 points. By the value of these differences, it can be concluded that the profile number between normal and abnormal is much different.
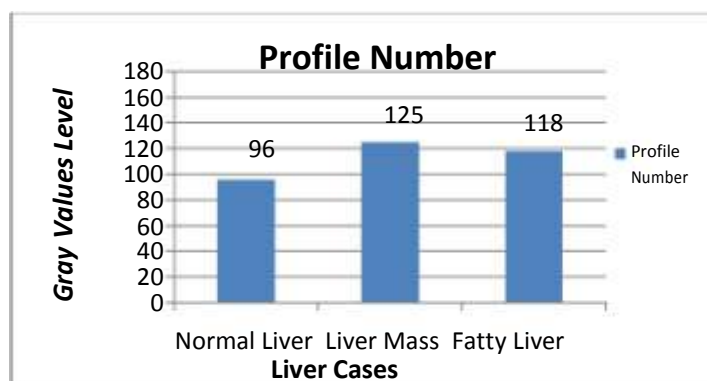

Fig. 9. Liver Cases With Profile Number.

The Liver cases are the same with cases of the kidneys. It was shown in the graph above, profile number in liver cases between normal and abnormal are not significantly different. Profile number for normal liver gray level value is 96. While the profile number in the liver mass is 125 and 118 for the fatty liver. The difference between the normal value and liver mass are 29 points, and in the fatty liver is 22 points. The value of these differences, it can be concluded that the profile number between normal and abnormal is not much different.

IV. CONCLUSIONS

- The difference between the standard average of result and *imageJ* for liver mass is 35 level, hydronephrosis is 8 level, fatty liver is 7 level, mass kidney is 9 level, mass breast is 10 level, so The maximum different result get it from liver mass and the minimum one is get from fatty liver.

- For all the different result can be said the different between the standard average of result and *imageJ* are not much different, so the result from *imageJ* can be used to represent the result from the result of standard average.

- We got different numbers between standard average and profile number of *imageJ* because the sizes of the lesion not the same so we had different.

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