The Utilization of Physics Parameter to Classify Histopathology Types of Invasive Ductal Carcinoma (IDC) and Invasive Lobular Carcinoma (ILC) by using K-Nearest Neighbourhood (KNN) Method

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ABSTRACT

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Keyword:

Invasive ductal carcinoma Invasive lobular carcinoma Nearest neighbourhood Medical imaging process has evolved since 1996 until now. The forming of Computer Aided Diagnostic (CAD) is very helpful to the radiologists to diagnose breast cancer. KNN method is a method to do classification toward the object based on the learning data which the range is nearest to the object. We analysed two types of cancers IDC dan ILC. 10 parameters were observed in 1-10 pixels distance in 145 IDC dan 7 ILC. We found that the Mean of Hm(yd,d) at 1-5 pixels the only significant parameters that distingguish IDC and ILC. This parameter at 1-5 pixels should be applied in KNN method. This finding need to be tested in different areas before it will be applied in cancer diagnostic.

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1. INTRODUCTION

The diagnosing of early breast cancer is very important to reduce the mortality rate for women. The breast cancer is the health problem in the world, many women die because of it. Most of the patients who come to have treatment have had advanced stage. Therefore, the early detection of breast cancer and its treatment is the only way to survive longer and to improve the patients' life quality. CAD system that is evolved is very helpful in diagnosing breast cancer. Besides, CAD system can also be used as the comparison of diagnostic result of the radiologists and the pathology and anatomy specialist doctors. In this kind of CAD system, the accuracy of result is very important. A misguided detection can cause a misguided treatment too. Because the problem is sensitive, there are many researchers do the research in breast cancer speciality and compete each other to achieve the better result.

The technologies developed all this time to detect early breast cancer are Ultrasonography (USG) device [1], [2], Mammography, Magnetic Resonance Imaging (MRI) [4], [5], and Positron Emission Tomography (PET) Scan [6]. All early detection tools above are unable to classify IDC and ILC histopathology types. Therefore, we propose a new technique to classify IDC and ILC histopathology types by using physics parameter as the input variable by using KNN method. Software that we produced would be planted in Mammography tool so that it could improve its activity as an early detection of breast cancer.

The research that we proposed was focused on mammogram images from Dokter Soetomo (Surabaya, Indonesia) Hospital, Sanglah (Denpasar, Bali, Indonesia) Hospital, and from Prima Medika

(Denpasar, Bali, Indonesia) Hospital producing classification of IDC and ILC histopathology types. IDC was currently categorized into invasive carcinoma of no special type was terrace breast carcinoma, namely it was from 45% to 75% case, whereas ILC was only from 5 to 15% invasive breast carcinoma [7]. The disparity between these two types was clinicopathology characteristic and response regarding systemic therapy [8]. IDC Histopathology gave the growth image of invasive epithelium malignant cells which mostly form solid and sinsisial patterns, and part with glandular and tubules differentiation. ILC consists of epithelium malignant cells arranged in the spreading of individual cell or arranged in infiltrative linear pattern between fibrus connective tissue stroma and it was usually connected with lobular carcinoma in situ (LCIS) [7].

In our paper, we proposed a new method to classify histopathology types of ILC and IDC breast cancers. Because of the physics parameter value range of ILC and IDC was different [9]. So, physics parameter containing on the mammogram could be used as the input variable for KNN method to determine whether it belonged to ILC or IDC types.

The superiority of the method that we proposed was the output of our method was numerical form which its value was certainly to be very objective, it was different with the previous method that still used the visual reading which the result was very subjective and depending on the readers. Why did we do the research? We wanted to help decreasing the mortality rate of women who have had breast cancer.

The aim of the writing is to introduce a new method to detect the types of IDC and ILC histopathology. CAD system that we have developed is used as the comparison of FNAB result before doing the operation.

2. METHODS

2.1. Sample

The research was approved by ethics committee of Sanglah Hospital, Denpasar, Bali, Indonesia. Number: 1204/UN.14.2/KEP/2017. The samples were taken at random from the year 2013 to the year 2017 from the database of Dokter Soetomo Hospital (Surabaya, Indonesia), Prima Medika Hospital (Denpasar, Bali, Indonesia), Sanglah General and Central Hospital (Denpasar, Bali, Indonesia). The samples consisted of 7 images of ILC type and 145 images of IDC type.

2.2. Developed method

Gunawan [9] used physics parameter to determine histopathology types of breast cancer by using Special Pattern Cropping method. In this research, we developed the use of physics parameter as the input of KNN method to determine histopathology type of breast cancer.

It has been observed that the abnormality, especially the suspicious are with the higher density than the neighbor pixel like on the Figure 1 and Figure 2. We counted 9 physics parameters like entropy, contrast, angular second moment, inverse difference moment, mean of Hm(y,d), deviation, entropy of H_{diff} , angular second moment of Hdiff and mean of H_{diff} for every pixel with the range between pixels from 1 pixel to 10 pixels. By using Anova statistics to get significant parameter that was able to distinguish IDC and ILC histopathology types. Then, we used chosen physics parameter as input variable from KNN method to take the final decision. We applied the pre-processing steps at the early algorithm to fix the image quality. The aim of repairing application of image quality was to clarify the image on mammogram. The block diagram explaining the method used was showed on Figure 3.



Figure 1. (a) IDC, (b) Subtract the background image of the original image Image: From the data base of Radiology Department of RSUP. Dr. Soetomo Surabaya Hospital.



Figure 2. (a) ILC, (b) Subtract the background image of the original image Image: From the data base of Radiology Department of RSUP. Dr. Soetomo Surabaya Hospital.



Figure 3. The steps of proposed algorithm

2.3. Processing

The aim of Processing step is to group mammogram images of ILC and IDC taken from the anatomic Pathologic research as the standard goal. Cropping the suspicious area. Then, it is done the reparation of the image quality to clarify the mammogram image.

2.4. The calculation of physics parameter

After the processing step, our algorithm counts 9 physics parameters, namely entropy, contrast, angular second moment, inverse differential moment, mean, deviation, entropy of Hdiff, angular second moment of Hdiff and mean of Hdiff at the range from 1 pixel to 10 pixels by using the Equations (1)-(13). The counted entropy from the histogram of order two provides the measurement of irregularity and defined like Equation (1). Histogram of order 2 illustrates the distribution of possibilities from the event of the pair of gray-level.

Entropy
$$(E) = -\sum_{y_q=y_1}^{y_t} \sum_{y_r=y_1}^{y_t} [H(y_q, y_r, d)] \log[H(y_q, y_r, d)]$$
 (1)

$$Contrast (C) = \sum_{y_q=y_1}^{y_t} \sum_{y_r=y_1}^{y_t} (y_q - y_r)^2 H(y_t, y_r, d)$$
(2)

Angular Second Moment (MA) =
$$\sum_{y_q=y_1}^{y_t} \sum_{y_r=y_1}^{y_t} [H(y_q, y_r, d)]^2$$
 (3)

Momen Differensial Invers (MD) =
$$\sum_{y_q=y_1}^{y_t} \sum_{y_r=y_1}^{y_t} \left[\frac{H(y_q, y_r, d)}{1 + (y_q - y_r)^2} \right]$$
(4)

for $y_r \neq y_q$

$$Correlation (Corr) = \frac{\sum_{y_q=y_1}^{y_t} \sum_{y_r=y_1}^{y_t} y_q y_r H(y_q, y_r, d) - \mu H_m(y_q, d) \mu H_m(y_r, d)}{\sigma H_m(y_{qq}, d) \sigma H_m(y_r, d)}$$
(5)

with

$$H_m(y_q, d) = \sum_{y_r=y_1}^{y_t} H(y_q, y_r, d)$$
(6)

$$H_m(y_r, d) = \sum_{y_q=y_1}^{y_t} H(y_q, y_r, d)$$
(7)

$$Mean (MN) = \sum_{y_q=y_1}^{y_t} y_q H_m(y_q, d)$$
(8)

Deviation (D) =
$$\sqrt{\sum_{y_q=y_1}^{y_t} [y_q - \sum_{y_p=y_1}^{y_t} y_p H_m(y_p, d)]^2 H_m(y_q, d)}$$
 (9)

$$H_{diff}(i,d) = \sum_{y_q=|y_q-y_r|=i}^{y_t} \sum_{y_r=y_1}^{y_t} H(y_q, y_r, d)$$
(10)

Entropy of
$$H_{diff}(EH) = -\sum_{i=i_1}^{i_t} H_{diff}(i,d) \log H_{diff}(i,d)$$
 (11)

Angular Moment of
$$H_{diff}(MAH) = \sum_{i=i_1}^{l_t} [H_{diff}(i,d)]^2$$
 (12)

$$Mean of H_{diff} (MHD) = \sum_{i=i_1}^{i_t} i H_{diff}(i,d)$$
(13)

With $H(y_q, y_r, d)$, d, y each is the probability of a pair of gray-level, the distance between the pixel and gray level value, respectively [10], [11].

2.5. The selection of physics variable

Selection of significant physics variables as input KNN method that is able to distinguish type IDC and ILC using T test statistical analysis. The main reason why we used KNN method to determine invasive lobular carcinoma and invasive ductal carcinoma in breast cancer, because the categorization based on the nearest range between examined data with learning data used the Euclidean Distance formula like the Equation (14).

2.6. KNN method

KNN method is a method to do classification toward the object based on the learning data which the range is nearest to the object.

To calculate Euclidean Distance by using the Equation (14).

$$D = \sqrt{\sum_{i=1}^{i=n} (T_i - U_i)^2}$$
(14)

It consists of 2 input variables, namely mean 1 and mean 2 and 2 histopathology types, namely ILC and IDC. If there is a new data with mean 1 value 180.81088 and mean 2 = 181.11186, is like Table 1.

able 1. Meani	and Meanz and	i 2 misiopamology Type
Mean1	Mean2	Type of Histopathology
114.26825	113.97313	IDC
91.31764	91.71834	IDC
150.37279	151.51907	IDC
142.07158	142.72827	IDC
155.47071	156.30185	IDC
159.96244	161.16492	ILC
149.01149	148.98700	ILC
153.83340	153.93231	ILC
149.59902	149.84301	ILC
161.06060	161.83271	ILC

Table 1 Mean1 and Mean2 and 2 Histopathology Types

The Steps:

1. Determine k parameter= the nearest neighbor number. For instance k = 3.

2. Calculate the range between a new data and a learning data, is like Table 2.

	Table 2. Rang	e Between a New Data and a Learning Data
Mean1	Mean2	The range quadrate with the new data (180.81088, 181.11186)
114.26825	113.97313	$(114.26825 - 180.81088)^{2} + (113.97313 - 181.11186)^{2} = 8935.530673$
91.31764	91.71834	$(91.31764 - 180.81088)^2 + (91.71834 - 181.11186)^2 = 16000.24142$
150.37279	151.51907	$(150.37279 - 180.81088)^{2} + (151.51907 - 181.11186)^{2} = 1802.210543$
142.07158	142.72827	$(142.07158 - 180.81088)^2 + (142.72827 - 181.11186)^2 = 2974.033346$
155.47071	156.30185	$(155.47071 - 180.81088)^{2} + (156.30185 - 181.11186)^{2} = 1257.660812$
159.96244	161.16492	$(159.96244 - 180.81088)^{2} + (161.16492 - 181.11186)^{2} = 832.5378658$
149.01149	148.98700	$(149.01149 - 180.81088)^{2} + (148.98700 - 181.11186)^{2} = 2043.207834$

149.01149	148.98700	$(149.01149 - 180.81088)^2 + (148.98700 - 181.11186)^2 = 2043.207834$
153.83340	153.93231	$(153.83340 - 180.81088)^2 + (153.93231 - 181.11186)^2 = 1466.512365$
149.59902	149.84301	$(149.59902 - 180.81088)^2 + (149.84301 - 181.11186)^2 = 1951.921185$
161.06060	161.83271	$(161.06060 - 180.81088)^2 + (161.83271 - 181.11186)^2 = 761.7591848$

3. The range order and the determination of the nearest neighbor based on the k minimum, is like Table 3.

Mean1	Mean2	The range quadrate with the new data (180.81088,	Minimum	Including the
		181.11186)	range	nearest
			level	neighbor
114.26825	113.97313	$(114.26825 - 180.81088)^2 + (113.97313 - 181.11186)^2$ = 8935.530673	9	IDC
91.31764	91.71834	$(91.31764 - 180.81088)^2 + (91.71834 - 181.11186)^2$ = 16000.24142	10	IDC
150.37279	151.51907	$(150.37279 - 180.81088)^2 + (151.51907 - 181.11186)^2$ = 1802.210543	5	IDC
142.07158	142.72827	$(142.07158 - 180.81088)^2 + (142.72827 - 181.11186)^2$ = 2974.033346	8	IDC
155.47071	156.30185	$(155.47071 - 180.81088)^2 + (156.30185 - 181.11186)^2$ = 1257.660812	3	IDC
159.96244	161.16492	$(159.96244 - 180.81088)^2 + (161.16492 - 181.11186)^2$ = 832.5378658	2	ILC
149.01149	148.98700	$(149.01149 - 180.81088)^2 + (148.98700 - 181.11186)^2$ = 2043.207834	7	ILC
153.83340	153.93231	$(153.83340 - 180.81088)^2 + (153.93231 - 181.11186)^2$ = 1466.512365	4	ILC
149.59902	149.84301	$(149.59902 - 180.81088)^2 + (149.84301 - 181.11186)^2$ = 1951.921185	6	ILC
161.06060	161.83271	$(161.06060-180.81088)^2 + (161.83271-181.11186)^2$ = 761.7591848	1	ILC

Table 3. Determination of the Nearest Neighbor Based on the k Minimum

From the three levels, ILC histopathology type comes out two times, whereas IDC comes out one, it means mean1 value = 180.81088 and mean2 = 181.11186 including ILC group.

3. RESULTS AND DISCUSSION

Table 4 shows the average of physics parameter of idc and ilc at various distance (pixels) at Dr Sutomo Hospital Surabaya at 2017.

Table 4. Average of Physics Parameter of IDC and ILC at various distance (pixels) at Dr Sutomo
Hospital Surabaya at 2017

(n=148) (n=7) kansi Entropy 1 3.6104536 0.15085807 0.01252808 3.6171657 0.08066793 0.03048961 0.907 2 3.6568468 0.15332612 0.01273304 3.6617500 0.0308933 0.03008933 0.933 3 3.6777772 0.15452700 0.01283277 3.6813429 0.07883346 0.02975904 0.996 5 3.6947606 0.153560226 0.01291769 3.6982637 0.0793913 0.02975904 0.996 6 3.6944948 0.15554954 0.01291769 3.6998771 0.07765963 0.0293528 0.975 8 3.6965695 0.15078884 0.01252133 3.6977043 0.027717322 0.02818603 0.966 10 3.6940294 0.14930956 0.01240188 3.6966014 0.07753221 0.1818034 0.02771323 0.9241803 0.9966 10 3.6916357 0.0334534 0.027712132 3.97269071 2.51.49710240 95.5696977 0.726 2499.2650374 0.726		Pixel		IDC			ILC		Signifi
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8 3.6965695 0.15078884 .01252233 3.6977043 00.07783147 0.02941753 0.984 9 3.6901633 0.14933956 0.01240198 3.6966014 0.07475322 0.02818603 0.966 10 3.6909294 0.14800686 0.01229130 3.6916357 0.07334534 0.02771213 0.990 2 499.2650374 300.94027582 24.99172961 552.7721929 479.90755321 181.38800544 0.656 3 656.7864110 395.39781826 12.83600155 569.0755014 489.84205140 185.14289281 0.937 4 801.8035399 484.31155031 10.21988509 779.0552014 512.8899163 193.85417272 0.904 5 937.9186496 571.04196611 17.42245409 385.5693477 53.34877610 209.14617855 0.813 6 1063.7877057 633.23207514 34.24797114 288.7686614 599.9771773 22.677033749 0.766 7 1181.3326292 732.63307678 0.84186542 1085.7139914 549.32149292 <td></td> <td>7</td> <td>3.6982033</td> <td>0.15187368</td> <td>0.01261242</td> <td>3.7000300</td> <td>0.07765963</td> <td>0.02935258</td> <td>0.975</td>		7	3.6982033	0.15187368	0.01261242	3.7000300	0.07765963	0.02935258	0.975
9 3.6941683 0.14933956 0.01240198 3.6960014 0.07457322 0.02818603 0.996 Contras 1 315.1388486 177.70143713 14.75730112 339.7269071 251.49710240 95.05696977 0.726 2 499.2650374 300.94027582 24.99172961 552.7721929 479.9075321 181.38800544 0.656 3 656.7864110 395.39781826 32.8360155 569.0755014 489.84205140 185.14289281 0.937 4 801.8035399 484.31155031 10.21988509 779.0552014 512.8993163 193.85417272 0.904 5 937.9186496 571.04196611 17.42245409 385.5693447 553.34877610 209.14617855 0.813 6 1063.7877057 653.23207514 54.24797114 985.7693447 553.34877610 209.14617855 0.813 8 1291.0414610 809.84046662 7.2535916 1177.5454200 701.2389871 226.577033749 0.766 9 1396.3682258 889.44363204 73.86427323		8	3.6965695	0.15078884	.01252233	3.6977043	00.07783147	0.02941753	0.984
International 16 3.6909294 0.14800686 0.01229130 3.6916357 0.07334534 0.02772193 0.990 Contras 1 315.1388486 177.70143713 14.75730112 339.7269071 251.49710240 95.05696977 0.726 2 499.2650374 300.94027582 24.99172961 552.7721929 479.90755321 181.38800544 0.656 3 656.7864110 395.39781826 12.83600155 569.0755014 489.84205140 185.14289281 0.937 4 801.8035399 484.31155031 10.21988509 779.0552014 512.88993163 193.85417272 0.904 5 937.9186496 571.01496611 17.4245409 885.5693447 553.34877610 209.14617855 0.813 6 1063.7877057 653.23207514 34.24797114 988.7686614 599.97791773 226.77033749 0.766 7 1181.3326292 732.63307678 80.84186542 1085.7139914 649.32149292 245.4204588 0.735 8 1291.0414610 809.84046652		9	3.6941683	0.14933956	0.01240198	3.6966014	0.07457322	0.02818603	0.966
Contras 1 315.1388486 177.70143713 14.75730112 359.7269071 251.49710240 95.05696977 0.726 2 499.2650374 300.94027582 24.99172961 552.7721929 479.90755321 181.38800544 0.656 3 656.7864110 395.39781826 22.83600155 569.0755014 489.84205140 185.14289281 0.937 4 801.8035399 484.31155031 10.21988509 779.0552014 512.88993163 193.85417272 0.904 5 937.9186496 571.04196611 17.42245409 885.5693447 553.34877610 209.14617855 0.813 6 1063.7877057 653.23207514 44.24797114 988.7686614 599.9791773 226.7703749 0.766 7 1181.3326292 732.63307678 50.84186542 1085.7139914 549.32149292 245.42045588 0.735 8 1291.0414610 809.84046662 7.25359016 1177.5454200 701.23899871 265.04342860 0.716 9 1396.682258 889.44363204 73.86427323 <td>~</td> <td>10</td> <td>3.6909294</td> <td>0.14800686</td> <td>0.01229130</td> <td>3.6916357</td> <td>0.07334534</td> <td>0.02772193</td> <td>0.990</td>	~	10	3.6909294	0.14800686	0.01229130	3.6916357	0.07334534	0.02772193	0.990
2 499.2650374 300.9402782 24.99172961 552.7721929 479.90755321 181.38800544 0.0556 3 656.7864110 395.39781826 32.83600155 569.0755014 489.84205140 185.14289281 0.937 4 801.8035399 484.31155031 10.21988509 779.0552014 512.88993163 193.85417272 0.904 5 937.9186496 571.04196611 17.42245409 385.5693447 553.34877610 209.14617855 0.813 6 1063.7877057 653.23207514 54.24797114 988.7686614 599.97791773 226.77033749 0.766 7 1181.3326292 732.63307678 50.84186542 1085.7139914 649.32149292 245.42045588 0.735 8 1291.0414610 809.8404662 77.25359016 1177.5454200 701.23898871 265.04342860 0.716 9 1396.3682258 889.44363204 73.86427323 1264.6367414 758.53064057 286.69763383 0.701 second 2 0.000012514 0.00001039 0.00002575 <td>Contras</td> <td>1</td> <td>315.1388486</td> <td>177.70143713</td> <td>14.75730112</td> <td>339.7269071</td> <td>251.49710240</td> <td>95.05696977</td> <td>0.726</td>	Contras	1	315.1388486	177.70143713	14.75730112	339.7269071	251.49710240	95.05696977	0.726
3 556.7864110 395.39781826 52.85600155 569.0755014 489.84205140 185.14289281 0.937 4 801.8035399 484.31155031 40.21988509 779.0552014 512.88993163 193.85417272 0.904 5 937.9186496 571.04196611 17.42245409 385.5693447 553.34877610 209.14617855 0.813 6 1063.7877057 653.23207514 54.24797114 988.7686614 599.97791773 226.77033749 0.766 7 1181.3326292 732.6307678 50.84186542 1085.7139914 649.32149292 245.42045588 0.735 8 1291.0414610 809.84046662 57.25359016 1177.5454200 701.23899871 265.04342860 0.716 9 1366.3682258 889.44363204 73.86427323 1264.6367414 78.53064057 286.69763383 0.701 10 1494.5215899 966.88745656 0.29563279 1347.9700171 813.56216396 307.49759456 0.694 Anguler 1 0.0002846 0.000012200 0.0000139 <td></td> <td>2</td> <td>499.2650374</td> <td>300.9402/582</td> <td>24.991/2961</td> <td>552.7721929</td> <td>4/9.90/55321</td> <td>181.38800544</td> <td>0.656</td>		2	499.2650374	300.9402/582	24.991/2961	552.7721929	4/9.90/55321	181.38800544	0.656
4 801.8053599 484.3115031 40.21988309 7/9.052014 512.88993163 193.89417272 0.904 5 937.9186496 571.04196611 17.42245409 385.5693447 553.34877610 209.14617855 0.813 6 1063.7877057 653.23207514 54.24797114 988.7686614 599.97791773 226.77033749 0.766 7 1181.3326292 732.63307678 50.84186542 1085.7139914 549.32149292 245.42045588 0.735 8 1291.0414610 809.84046662 57.25359016 1177.5454200 701.23899871 265.04342860 0.716 9 1396.3682258 889.44363204 73.86427323 1264.6367414 758.53064057 286.69763383 0.701 10 1494.5215899 966.8874565 0.29563279 1347.9700171 813.56216396 307.49759456 0.694 Anguler 1 0.000244 0.000012514 0.00002714 0.00005593 0.00002114 0.823 moment 3 0.0002673 0.00011959 0.00002571		3	656./864110	395.39/81826	32.83600155	569.0755014	489.84205140	185.14289281	0.937
5 937.9186496 571.04196011 47.4224309 585.5093447 553.3487/610 209.14617855 0.813 6 1063.7877057 653.23207514 54.24797114 988.7686614 599.97791773 226.77033749 0.766 7 1181.3326292 732.63307678 50.84186542 1085.7139914 549.32149292 245.42045588 0.735 9 1396.3682258 889.44363204 73.86427323 1264.6367414 758.53064057 286.69763383 0.701 10 1494.5215899 966.88745656 30.29563279 1347.9700171 813.56216396 307.49759456 0.694 Anguler 1 0.0002806 0.00012514 0.00001303 0.0002714 0.00005593 0.00001945 0.883 moment 3 0.0002806 0.00011920 0.00002641 0.00005146 0.00001945 0.883 7 0.0002639 0.00011959 0.00002671 0.00004786 0.0000189 0.883 6 0.0002639 0.0001172 0.00002571 0.00004786 0.0000189		4	801.8035399	484.31155031	10.21988509	//9.0552014	512.88993163	193.85417272	0.904
6 1063.787/057 653.25207514 54.2479714 988.7680614 599.97791775 226.77035749 0.706 7 1181.3326292 732.63307678 50.8418652 1085.7139914 549.32149292 245.42045588 0.735 8 1291.0414610 809.8404662 57.25359016 1177.5454200 701.23899871 265.04342860 0.716 9 1396.3682258 889.44363204 73.86427323 1264.6367414 758.53064057 286.69763383 0.701 10 1494.5215899 966.88745656 30.29563279 1347.9700171 813.56216396 307.49759456 0.694 Anguler 1 0.0002864 0.000012514 0.00001303 0.0002857 0.000017102 0.00001145 0.883 accond 2 0.0002726 0.00012036 0.00002643 0.00005146 0.00001945 0.883 4 0.0002639 0.00011929 0.0002571 0.00004786 0.00001809 0.883 7 0.0002619 0.00011728 0.00002571 0.00004786 0.00001809		5	93/.9186496	5/1.04196611	17.42245409	585.5693447	553.34877610	209.1461/855	0.813
7 1181.320292 72.05307678 50.84180342 1085.7139914 549.32149292 243.42045388 0.735 8 1291.0414610 809.84046662 57.25359016 1177.5454200 701.23899871 265.04342860 0.716 9 1396.3682258 889.44363204 73.86427323 1264.6367414 758.53064057 286.69763383 0.701 10 1494.5215899 966.88745656 0.29563279 1347.9700171 813.56216396 307.49759456 0.694 Anguler 1 0.0003488 0.00015695 0.00001303 0.0003714 0.00017102 0.00006464 0.711 second 2 0.0002806 0.00012200 0.00001039 0.0002857 0.00005146 0.00001945 0.843 4 0.0002673 0.00011942 0.00000992 0.0002614 0.00001945 0.897 6 0.0002623 0.00011742 0.00000975 0.0002571 0.00001809 0.883 7 0.0002629 0.00011727 0.00000974 0.0002571 0.00001809 0.991 </td <td></td> <td>0</td> <td>1005.7877057</td> <td>055.25207514</td> <td>54.24/9/114</td> <td>988./080014</td> <td>599.97791775</td> <td>220.77033749</td> <td>0.700</td>		0	1005.7877057	055.25207514	54.24/9/114	988./080014	599.97791775	220.77033749	0.700
8 1291.0414010 809.84040602 7.2535016 1177.343200 701.2589871 205.04342800 0.716 9 1396.3682258 889.44363204 73.86427323 1264.6367414 758.53064057 286.69763383 0.701 10 1494.5215899 966.88745656 30.29563279 1347.9700171 813.56216396 307.49759456 0.694 Anguler 1 0.0002964 0.000112514 0.00001303 0.0002714 0.00005593 0.00002114 0.823 moment 3 0.000266 0.00012200 0.0000100 0.0002643 0.00005146 0.00001945 0.843 4 0.0002639 0.00011959 0.00002614 0.00005146 0.00001809 0.883 7 0.0002639 0.00011722 0.00002571 0.00004786 0.00001809 0.991 8 0.0002619 0.00011727 0.00002571 0.00004786 0.00001809 0.921 9 0.0002619 0.00011727 0.0000974 0.0002571 0.00004786 0.00001809 0.921		/	1181.3320292	/32.0330/0/8	00.84180542	1085./159914	049.32149292	245.42045588	0.735
9 1396.3682238 889.44303204 7.36427325 1204.0307414 7.36.35004057 2280.69705383 0.701 10 1494.5215899 966.88745656 30.29563279 1347.9700171 813.56216396 307.49759456 0.694 Anguler 1 0.0003488 0.00015695 0.00001303 0.0003714 0.00017102 0.00006464 0.711 second 2 0.0002806 0.00012514 0.0000139 0.0002857 0.00005593 0.00001945 0.843 moment 3 0.0002726 0.00012036 0.00001000 0.0002643 0.00005146 0.00001945 0.883 5 0.0002673 0.00011959 0.00000992 0.0002571 0.00004786 0.00001809 0.883 7 0.0002623 0.0001172 0.00000974 0.0002571 0.00004786 0.00001809 0.921 9 0.0002619 0.00011727 0.00000971 0.0002571 0.00004786 0.00001809 0.921 10 0.0002619 0.00011727 0.00000971 0.000		8	1291.0414010	809.84040002	17.25559010	11/7.5454200	701.23899871	205.04542800	0.710
10 1494.3213899 900.88743050 30.29305279 1347.97001717 \$15.30210396 307.49739430 0.0094 Anguler 1 0.0003488 0.00015695 0.00001303 0.0003714 0.00017102 0.00002644 0.711 second 2 0.0002964 0.000012514 0.00001039 0.0002857 0.00005593 0.00001945 0.843 moment 3 0.0002726 0.00012036 0.0000100 0.0002643 0.00005146 0.00001945 0.843 5 0.0002673 0.00011942 0.00000992 0.0002614 0.00001486 0.00001945 0.887 6 0.0002639 0.0001172 0.00000975 0.0002571 0.00004786 0.00001809 0.983 7 0.0002616 0.00011727 0.00002571 0.00004786 0.00001809 0.921 9 0.0002619 0.00011727 0.00002571 0.00004786 0.00001884 0.916 10 0.0002629 0.0011695 0.0000971 0.0002571 0.00004182 0.00001584		9	1390.3062236	066 99745656	13.60421323	1204.0507414	/ 36.3300403/ 212 56216206	200.09703303	0.701
Anglief 1 0.0003483 0.0001303 0.0001303 0.0001714 0.0001712 0.0000404 0.711 second 2 0.0002964 0.000012514 0.0000139 0.0002857 0.0000593 0.0000214 0.823 moment 3 0.0002806 0.00012200 0.0000100 0.0002714 0.00005462 0.00001913 0.823 4 0.0002726 0.000119203 0.0000100 0.0002643 0.00005146 0.00001915 0.883 5 0.0002639 0.00011959 0.00000992 0.0002571 0.00004786 0.00001809 0.883 7 0.0002616 0.0001172 0.0000975 0.0002571 0.00004786 0.00001809 0.999 8 0.0002619 0.00011727 0.00002571 0.00004786 0.00001809 0.921 9 0.0002619 0.00011727 0.00002571 0.00004786 0.00001584 0.916 10 0.0002629 0.0011695 0.0000971 0.0002571 0.00004192 0.00001584 0.897	Angular	10	0.0002488	900.88743030	0.00001202	0.0002714	0.00017102	0.00006464	0.094
second 2 0.0002804 0.000012314 0.00001039 0.0002837 0.00003933 0.00002114 0.823 moment 3 0.0002806 0.00012200 0.0000103 0.0002714 0.00005166 0.00001945 0.843 4 0.0002673 0.00011942 0.00000992 0.0002614 0.00005146 0.00001945 0.897 6 0.0002639 0.00011959 0.0000992 0.0002571 0.00004786 0.00001809 0.883 7 0.0002623 0.0001172 0.0000975 0.0002571 0.00004786 0.00001809 0.999 8 0.0002616 0.0001172 0.0000974 0.0002571 0.00004786 0.00001809 0.921 9 0.0002619 0.00011727 0.0000971 0.0002571 0.00004182 0.00001584 0.916 10 0.0002629 0.00011695 0.0002571 0.00004192 0.00001584 0.897 Invers 1 0.0547979 0.01312559 0.0010902 0.0520400 0.00878544 0.0032058 <td>Aliguiei</td> <td>2</td> <td>0.0003466</td> <td>0.00013093</td> <td>0.00001303</td> <td>0.0003714</td> <td>0.00017102</td> <td>0.00000404</td> <td>0.711</td>	Aliguiei	2	0.0003466	0.00013093	0.00001303	0.0003714	0.00017102	0.00000404	0.711
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	moment	2	0.0002904	0.000012314	0.00001039	0.0002837	0.00005595	0.00002114	0.823
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	moment	1	0.0002800	0.00012200	0.00001013	0.0002714	0.00005140	0.00001945	0.843
6 0.0002673 0.00011952 0.0000093 0.0002571 0.00004786 0.00001809 0.883 7 0.0002623 0.00011959 0.00000975 0.0002571 0.00004786 0.00001809 0.883 8 0.0002616 0.0001172 0.00000974 0.0002571 0.00004786 0.00001809 0.999 9 0.0002619 0.00011727 0.0000974 0.0002571 0.00004786 0.00001809 0.921 9 0.0002629 0.00011727 0.0000974 0.0002571 0.00004192 0.00001584 0.916 10 0.0002629 0.00011695 0.0000971 0.0002571 0.00004192 0.00001584 0.897 Invers 1 0.0547979 0.01312559 0.00109002 0.0520400 0.00878544 0.00332058 0.584 differensia 2 0.0473543 0.03097366 0.00257222 0.0437914 0.00605996 0.00229045 0.762 1 moment 3 0.0401514 0.0183754 0.00090001 0.0385729 0.00		5	0.0002720	0.00012030	0.00001000	0.0002643	0.00005002	0.00001915	0.897
1 0.0002629 0.00011742 0.0000974 0.0002571 0.00004786 0.00001809 0.909 8 0.0002616 0.00011742 0.0000974 0.0002571 0.00004786 0.00001809 0.909 9 0.0002619 0.00011728 0.0000974 0.0002571 0.00004786 0.00001809 0.921 9 0.0002619 0.00011727 0.0000974 0.0002571 0.00004786 0.00001584 0.916 10 0.0002629 0.00011695 0.0000971 0.0002571 0.00004192 0.00001584 0.897 Invers 1 0.0547979 0.01312559 0.00109002 0.0520400 0.00878544 0.00332058 0.584 differensia 2 0.0473543 0.03097366 0.00257222 0.0437914 0.00605996 0.00229045 0.762 1 moment 3 0.0401514 0.0183754 0.009001 0.0385729 0.00577497 0.00218273 0.703 4 0.0384927 0.02187408 0.00181654 0.0361086 0.0061		6	0.0002675	0.00011942	0.00000992	0.0002571	0.00003140	0.00001945	0.883
8 0.0002616 0.00011728 0.0000974 0.0002571 0.00004766 0.00001809 0.921 9 0.0002619 0.00011728 0.0000974 0.0002571 0.00004786 0.00001809 0.921 10 0.0002629 0.00011727 0.0000974 0.0002571 0.00004192 0.00001584 0.916 10 0.0002629 0.00011695 0.0000971 0.0002571 0.00004192 0.00001584 0.897 Invers 1 0.0547979 0.01312559 0.00109002 0.0520400 0.00878544 0.00332058 0.584 differensia 2 0.0473543 0.03097366 0.00257222 0.0437914 0.00605996 0.00229045 0.762 1 moment 3 0.0401514 0.01083754 0.0090001 0.0385729 0.00577497 0.00218273 0.703 4 0.0384927 0.02187408 0.00181654 0.0361086 0.00613606 0.00231921 0.775 5 0.0344490 0.01014603 0.00080736 0.0323700 0.		7	0.0002633	0.00011737	0.00000995	0.0002571	0.00004786	0.00001809	0.005
9 0.0002619 0.00011727 0.0000974 0.0002571 0.00004192 0.00001584 0.916 10 0.0002629 0.0011695 0.0000971 0.0002571 0.00004192 0.00001584 0.916 10 0.0002629 0.0011695 0.0000971 0.0002571 0.00004192 0.00001584 0.897 Invers 1 0.0547979 0.01312559 0.00109002 0.0520400 0.00878544 0.00332058 0.584 differensia 2 0.0473543 0.03097366 0.00257222 0.0437914 0.00605996 0.00229045 0.762 1 moment 3 0.0401514 0.0183754 0.0090001 0.0385729 0.00577497 0.00218273 0.703 4 0.0384927 0.02187408 0.00181654 0.0361086 0.00613606 0.00231921 0.775 5 0.0344490 0.01014603 0.00084258 0.0340371 0.00624037 0.00235864 0.916 6 0.0326346 0.00972193 0.00080736 0.0323700 0.00		8	0.0002625	0.00011742	0.00000975	0.0002571	0.00004786	0.00001809	0.921
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Invers 1 0.0547979 0.01312559 0.00109002 0.0520400 0.00878544 0.00332058 0.584 differensia 2 0.0473543 0.03097366 0.00257222 0.0437914 0.00605996 0.00229045 0.762 1 moment 3 0.0401514 0.01083754 0.0009001 0.0385729 0.00577497 0.00218273 0.703 4 0.0384927 0.02187408 0.00181654 0.0361086 0.00613606 0.00231921 0.775 5 0.0344490 0.01014603 0.00084258 0.0340371 0.00624037 0.00235864 0.916 6 0.0326346 0.00972193 0.00080736 0.0323700 0.00596515 0.00225461 0.943		10	0.0002629	0.00011695	0.00000971	0.0002571	0.00004192	0.00001584	0.897
differensia 2 0.0473543 0.03097366 0.00257222 0.0437914 0.00605996 0.00229045 0.762 1 moment 3 0.0401514 0.01083754 0.0009001 0.0385729 0.00577497 0.00229045 0.762 4 0.0384927 0.02187408 0.00181654 0.0361086 0.00613606 0.00231921 0.775 5 0.0344490 0.01014603 0.00084258 0.0340371 0.00624037 0.00235864 0.916 6 0.0326346 0.00972193 0.00080736 0.0323700 0.00596515 0.00225461 0.943	Invers	1	0.0547979	0.01312559	0.00109002	0.0520400	0.00878544	0.00332058	0.584
I moment 3 0.0401514 0.01083754 0.0009001 0.0385729 0.00577497 0.00218273 0.703 4 0.0384927 0.02187408 0.00181654 0.0361086 0.00613606 0.00231921 0.775 5 0.0344490 0.01014603 0.00084258 0.0340371 0.00624037 0.00235864 0.916 6 0.0326346 0.00972193 0.00080736 0.0323700 0.00596515 0.00225461 0.943	differensia	2	0.0473543	0.03097366	0.00257222	0.0437914	0.00605996	0.00229045	0.762
4 0.0384927 0.02187408 0.00181654 0.0361086 0.00613606 0.00231921 0.775 5 0.0344490 0.01014603 0.00084258 0.0340371 0.00624037 0.00235864 0.916 6 0.0326346 0.00972193 0.00080736 0.0323700 0.00596515 0.00225461 0.943	1 moment	3	0.0401514	0.01083754	0.00090001	0.0385729	0.00577497	0.00218273	0.703
50.03444900.010146030.000842580.03403710.006240370.002358640.91660.03263460.009721930.000807360.03237000.005965150.002254610.943		4	0.0384927	0.02187408	0.00181654	0.0361086	0.00613606	0.00231921	0.775
6 0.0326346 0.00972193 0.00080736 0.0323700 0.00596515 0.00225461 0.943		5	0.0344490	0.01014603	0.00084258	0.0340371	0.00624037	0.00235864	0.916
		6	0.0326346	0.00972193	0.00080736	0.0323700	0.00596515	0.00225461	0.943
7 0.0310297 0.00974142 0.00080898 0.0312786 0.00615010 0.00232452 0.947		7	0.0310297	0.00974142	0.00080898	0.0312786	0.00615010	0.00232452	0.947
8 0.0296746 0.00940930 0.00078140 0.0299643 0.00546359 0.00206504 0.936		8	0.0296746	0.00940930	0.00078140	0.0299643	0.00546359	0.00206504	0.936
9 0.0285969 0.00945333 0.00078506 0.0285969 0.00945333 0.00078506 0.930		9	0.0285969	0.00945333	0.00078506	0.0285969	0.00945333	0.00078506	0.930
10 0.0276533 0.00925452 0.00076855 0.0279657 0.00546788 0.00206666 0.930		10	0.0276533	0.00925452	0.00076855	0.0279657	0.00546788	0.00206666	0.930
Mean of 1 133.5669281 27.19744514 2.25862488 154.4756100 16.19232902 6.12012510 0.046	Mean of	1	133.5669281	27.19744514	2.25862488	154.4756100	16.19232902	6.12012510	0.046
Hm(y,d) 2 133.9853676 27.26778725 2.26446648 154.9300529 16.22254719 6.13154650 0.046	Hm(y,d)	2	133.9853676	27.26778725	2.26446648	154.9300529	16.22254719	6.13154650	0.046
3 134.3513773 27.32300711 2.26905224 155.2295157 16.21027822 6.12690927 0.047		3	134.3513773	27.32300711	2.26905224	155.2295157	16.21027822	6.12690927	0.047
4 134.6905923 27.37766341 2.27359120 155.4813714 16.17205405 6.11246189 0.049		4	134.6905923	27.37766341	2.27359120	155.4813714	16.17205405	6.11246189	0.049
5 135.0195647 27.41287327 2.27651522 155.6828743 16.11552700 6.09109667 0.050		5	135.0195647	27.41287327	2.27651522	155.6828743	16.11552700	6.09109667	0.050
6 135.3111239 27.45034260 2.27962687 155.8540200 16.07657784 6.07637527 0.052		6	135.3111239	27.45034260	2.27962687	155.8540200	16.07657784	6.07637527	0.052
7 135.5660110 27.48385842 2.28241021 156.0133371 16.08660616 6.08016562 0.053		7	135.5660110	27.48385842	2.28241021	156.0133371	16.08660616	6.08016562	0.053
8 135.8055795 27.49340697 2.28320317 156.1406957 16.10091118 6.08557241 0.055		8	135.8055795	27.49340697	2.28320317	156.1406957	16.10091118	6.08557241	0.055
9 136.0024805 27.52114376 2.28550659 156.2764029 16.13230995 6.09744003 0.056		9	136.0024805	27.52114376	2.28550659	156.2764029	16.13230995	6.09744003	0.056
10 136.1667878 27.54103176 2.28715820 156.4100486 16.18074467 6.11574663 0.056		10	136.166/8/8	27.54103176	2.28/15820	156.4100486	16.180/446/	6.115/4663	0.056
Deviation 1 31.0089927 $10.37/31414$ $0.801/8903$ 31.2089386 $8.17/71068$ 3.09088638 0.920	Deviation	1	31.6089927	10.3//31414	0.861/8903	31.2089386	8.1///1668	3.09088638	0.920
2 = 51.4320036 = 10.52891015 = 0.53770980 = 30.8505845 = 8.00177986 = 3.02435652 = 0.877		2	31.4520058	10.32891015	0.85770980	30.8303843	8.001//988	3.02438852	0.877
5 51.1534020 10.27361794 0.85485522 30.0475200 8.17395880 5.08946003 0.898 A 31.2711453 10.34187188 0.85884571 20.4715120 8.20040564 2.12251282 0.841		5	31.1334020 31.2711452	10.29381994	0.000400022	30.04/3200	0.1/39388U 8 20040564	3.08940003	0.898
4 31.2711433 10.3416/160 0.63604371 30.4713127 6.29049304 3.13331262 0.641 5 21 307409 10.24407031 0.9501020 30.2044042 9.50950500 2.31509105 0.920		4 5	21 2027408	10.3410/100	0.85010202	20 2044042	8.29049304	2 21508105	0.841
5 $51.202/1470$ $10.3447/0.31$ 0.65710302 30.3944045 6.3000007 3.21598105 0.859		5	31.2027498	10.34497031	0.85750772	30.3944043	8 66131050	3.21398103	0.039
0 31.1003330 10.32370034 0.03730772 30.3103037 0.00131333 3.27307109 0.844 7 31.5810366 11.55083013 0.05000320 30.3518372 0.70703270 2.23170510 0.725		7	31.1003330	10.32370034	0.05/50/72	30.3103037	0.00131333 8 78787270	3.27307109	0.044
7 51.5012500 11.52502715 0.5257252 30.2510245 0.70702576 3.52140516 0.705 8 31 033299 10 3696025 0 86114276 30 1001443 8 01417430 3 36054199 0.925		8	31.3019300	10 36960/25	0.95999259	30.2310243	8 91417/30	3 3692/122	0.705
9 30 9988406 10 36905312 0 86110290 30 1733120 0 0.1785132 3 A08A27A2 0.833		9	30 9988/06	10 36905312	0.86110200	30 1733120	9 01785132	3 40842742	0.836
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		10	31.0513794	10 40834147	0.86436571	30.1827486	9.11795614	3 44626349	0.829
Entropy of 1 1.5257865 0.10911401 0.00906143 1.5202071 0.07754101 0.02930775 0.894	Entropy of	1	1.5257865	0.10911401	0.00906143	1.5202071	0.07754101	0.02930775	0.894
Hdiff	Hdiff								

The Utilization of Physics Parameter to Classify Histopathology... (Anak Agung Ngurah Gunawan)

	Pixel		IDC			ILC		Signifi
			(n=148)			(n=7)		kansi
		Average	Standart	Standart error	Average	Standart	Standart error	
			deviation			deviation		
	2	1.6213262	0.11459042	0.00951622	1.6125686	0.07693016	0.02907687	0.842
	3	1.6791019	0.12226794	0.01015380	1.6695557	0.07801198	0.02948576	0.838
	4	1.7207762	0.12816197	0.01064327	1.7120586	0.08066301	0.03048775	0.859
	5	1.7530858	0.13349584	0.01108623	1.7447471	0.08343252	0.03153453	0.870
	6	1.7790535	0.13767171	0.01143301	1.7715600	0.08655722	0.03271555	0.887
	7	1.7974672	0.14557475	0.01208932	1.7942429	0.09061765	0.03425025	0.954
	8	1.8190492	0.14463779	0.01201151	1.8133386	0.09409468	0.03556445	0.918
	9	1.8348149	0.14744603	0.01224473	1.8293657	0.09614239	0.03633841	0.923
	10	1.8486772	0.15050684	0.01249891	1.8435843	0.09751869	0.03685860	0.930
Anguler	1	0.0373317	0.00945719	0.00078538	0.0362171	0.00625452	0.00236399	0.758
second	2	0.0301529	0.00819906	0.00068090	0.0297257	0.00492143	0.00186012	0.892
moment of	3	0.0264829	0.00760508	0.00063157	0.0262943	0.00447068	0.00168976	0.948
Hdiff	4	0.0241821	0.00738957	0.00061367	0.0239829	0.00421100	0.00159161	0.944
	5	0.0225104	0.00723454	0.00060080	0.0223143	0.00406143	0.00153508	0.943
	6	0.0212292	0.00709542	0.00058924	0.0210329	0.00390195	0.00147480	0.942
	7	0.0202617	0.00701517	0.00058258	0.0200086	0.00394125	0.00148965	0.925
	8	0.0194140	0.00691035	0.00057387	0.0190671	0.00394584	0.00149139	0.896
	9	0.0187663	0.00687225	0.00057071	0.0184157	0.00376733	0.00142392	0.894
	10	0.0181572	0.00679038	0.00056391	0.0178014	0.00369565	0.00139682	0.891
Mean of	1	13.0044315	3.28830418	0.27307880	12.8764514	2.58576160	0.97732602	0.919
Hdiff	2	16.3007437	4.35912747	0.36200583	16.0138443	3.47013242	1.31158677	0.864
	3	18.7080357	5.24950020	0.43594726	18.1383900	3.75149392	1.41793142	0.777
	4	20.6860886	5.98356049	0.49690765	19.8918086	4.10911592	1.55309983	0.729
	5	22.3636332	6.65117494	0.55235001	21.4161543	4.52950474	1.71199187	0.710
	6	23.8832428	7.25739935	0.60269421	22.7707043	4.91520935	1.85777451	0.689
	7	25.2233172	7.82210544	0.64959050	23.9815157	5.38847605	2.03665251	0.679
	8	26.4331844	8.35874188	0.69415573	25.0965229	5.79428972	2.19003566	0.677
	9	27.5453989	8.89030016	0.73829924	26.0930457	6.16308459	2.32942702	0.670
	10	28.5556697	9.39921379	0.78056222	27.0679543	6.53656128	2.47058794	0.680

Anova was conducted using IBM SPSS 20 software. The mean parameter is the only parameter that significantly distinguish IDC and ILC. At the mean analyis, the distance of 1-5 pixels are significantly distinguish IDC and ILC, while the higher distances are not significantly different.

The decision system of CAD that we developed can fall into one of the four categories. The image area can be called ILC and IDC and a decision can be true or false. The CAD system that we developed can produce two false output types, namely False Positive (FP) and False Negative (FN). True Positive (TP) and True Negative (TN) is the true decision. Two working measurements of classification system which are related with identified decision above are 'Sensitivity and Specificity'. Sensitivity (Recall) is TP/(TP+FN) whereas Specificity is TN/(TN+FP). The high values of sensitivity and specificity are very expected. 'Accuracy' and 'Precision' are also used to evaluate the performance of KNN system. Accuracy is (TN + TP)/(TP+FN+TN+FP) and Precision is TP/(TP+FP). Error Rate is (FP + FN)/(TP+FN+TN+TP).

To assess our algorithm, we examined 152 images from the data base of Dokter Soetomo Hospital, Surabaya, Indonesia. 145 (95%) images have IDC character and 7 (5%) images have ILC character. The results of our analysis are shown at Table 5.

Table 5 The Result of Analysis							
Performance measure	IDC o	cases	ILC cases				
	145 (95%)		7 (5%)				
	TP	FN	TN	FP			
	102 (70%)	43(30%)	5 (71%)	2 (29%)			
Sensitivity (Recall)			70 %				
Specificity			71 %				
Accuracy	70 %						
Precision	98 %						
Error Rate			30 %				

Evaluating of the performance of the CAD system that we developed to classify histopathology types of IDC and ILC needed the definite criteria to determine cluster detection of TP and FP. To evaluate our result, true classification cluster was identified by a radiologist and an expert of Pathology Anatomy. The criteria we used to calculate the number of TP detection, assuming that a detection cluster was true if the

examination result from the radiologists and the experts of Pathology Anatomy (PA) was the same with the system decision of CAD that we developed. If the decision was assumed to be different, so it was assumed FP.

It was like shown at table 5, our algorithm, the sensitivity was 70%, the specificity was 71%, the accuracy was 70%, the precision was 98%, and error rate was 30%. Two radiologists and experts of pathology and anatomy found our result was quite satisfying and could be reliable.

4. CONCLUSION

The CAD system that we developed by using physics parameter was very helpful in classifying histopathology type of breast cancer. Mammogram image was very difficult to detect histopathology types. Even, the Radiology experts were not able to identify it for 100%.

The utilization of physics parameter to classify histopathology types of breast cancer helped the experts of Radiology to get the second opinion. The final aim of the CAD system that we developed for mammography was to detect untouchable lesion which its size was often neglected on mammography. Detection of histopathology type increased the opportunity for women to be successful in the treatment of breast cancer.

Our research was especially focused on histopathology types of IDC and ILC. We used physics parameter to classify histopathology types of breast cancer, after getting significant variable to distinguish histopathology types of IDC and ILC. Then, we used the parameter as the input variable of KNN method to take decision whether it included IDC or ILC histopathology types.

According to the experts of radiology, the result produced by the CAD system that we developed was quite satisfying and could be reliable, and could assist the expert of radiology in diagnosing breast cancer.

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