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Classification of breast cancer grades using physical parameters and K-nearest neighbor method

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Abstract

Breast cancer is a health problem in the world. To overcome this problem requires early detection of breast cancer. The purpose of this study is to classify early breast cancer grades. Combination of physical parameters with k-nearest neighbor Method is proposed to detect early breast cancer grades. The experiments were performed on 87 mammograms consisting of 12 mammograms of grade 1.41 mammograms of grade 2 and 34 mammogram of grade 3. The proposed method was effective to classify the grades of breast cancer by an accuracy of 64.36%, 50% sensitivity and 73.5% specifity. Physical parameters can be used to classify grades of breast cancer. The results of this study can be used to complement the diagnosis of breast mammography examination.

Keywords: breast cancer, grade, K-nearest neighbor

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1. Introduction

Breast cancer is a health problem in the world. To overcome this problem requires early detection of breast cancer. Discovered microcalsification is a sign of breast cancer. Many methods have successfully detected the presence of microcalsification [1-6]. However, the discovery of microcalsification is not enough to classify the breast cancer grades. Nezha H [7] classified breast cancer using the Quantum Clustering and Wavelet method. Shofwatul U [8] classified malignant and benign lesions using Feature Selection method. Seyyid A M [9] classified breast cancer using the K-Nearest Neighbor method with different distances. Mandeep R [10] classified malignant and benign breast cancer lesions using the Machine Learning Techniques method. Anggrek C N [11] classified normal and abnormal breast cancer using the K-Nearest Neighbor method above, none of them classifies breast cancer grade

To classify the grades of breast cancer typically used the methods of Tumor Node Metastase [12] and Scarff Bloom Richardson [13] are used. In this study, we proposed a new method for classifying breast cancer grades using a combination of physical parameters using the K-nearest neighbor method. The updated feature of our study is to use the physical parameters contained in the mammogram as input to the K-nearest neighbor method.

This research needs to be done to improve the prognosis of breast Cancer patient. The uniqueness of the research is by converting from a mammogram image to a numeric to determine the grades of breast cancer without a fine needle biopsy. The results of this study are used as a complement to mammography examination.

2. Materials and Methods

The steps to classify breast cancer grades are as follows: the breast is photographed using a digital mammography device, then it cuts suspicious mass and is stored using 256 heat bmp format. Then the image quality is improved to make it brighter. After that, the calculation of physical parameters using (1) to (13), then statistical tests using anova test to determine the significant physical parameters to distinguish breast cancer grades, a significant parameter and then used as an input variable from the K-Nearest Neighbor method using (14), the closest distance shows the results of grades classification of breast cancer as shown in Figure 1.



Figure 1. Research design

To classify breast cancer levels, 10 physical parameters are needed as follows:

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)

Inverse Difference Moment (MD) =
$$\sum_{yq=yi}^{yt} \sum_{yr=yi}^{yt} \left[\frac{H(yq, yr, d)}{1 + (yq - yr)^2} \right]$$
(4)

for $y_r \neq y_q$

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

AngularMoment of
$$H_{diff}$$
 (MAH) = $\sum_{i=i_1}^{i_t} [H_{diff}(i, d)]^2$ (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 [14]. K-Nearest Neighbor is a method to classify using the distance of the nearest neighbor [15-20], expressed in (14). Many researchers use the KNN method to classify breast cancer as has it done by [21-25].

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

with D, T and U respectively are the closest neighbors distance, training data, data to be tested. The study was conducted at the Sanglah central public hospital of Bali, Prima Medika

Bali hospital, and Doctor Soetomo Hospital Surabaya. This research has been approved by the research ethics committee of medical faculty of Udayana University and Sanglah central public hospital Denpasar, with approval number: 1204/UN.14.2/KEP/2017. Mammography images taken from Kodak brand mammography type dry view 6800 laser imager with setting KV=30, MAS=25, brightness=7, latitude=11, contrast=-4, movie size=18x24 cm. Total trial data of 87 mammograms consisting of 12 mammograms of grade 1,41 mammogram grade 2 and 34 mammogram grade 3. Experimental design that we use is cross section. Annova was used to find significant physical parameters in differentiating grade 1, 2 and 3. Significant variables were incorporated into KNN method to classify grading of breast cancer. Physical parameters are parameters contained in the mammographic image converted into entropy, contrast, angular second moment, inverse differential moment, mean, deviation, entropy of difference second order histogram and mean of difference second order histogram expressed in (1) through (13).

3. Results and Discussion

3.1. Results

Suspicious mass is shown by arrows such as Figures 2 (a), 3 (a), 4 (a), then it cropped and stored by the 256 heat bmp format. Graph of the results of the reduction of the background image with the original image as shown in Figures 2 (b), 3 (b), and 4 (b), it turns out that there are significant differences in grades 1, 2, and 3. We took grade 1 images from the radiology installation room database and grade 1 status we got from the medical record of Doctor Soetomo Hospital Surabaya. In Figure 2 (a) there is a microcalsification.





We took the grade 2 image from the radiology installation room database and the grade 2 status we got from the medical record of Doctor Soetomo Hospital Surabaya. In Figure 3 (a) there is shrinking of the skin around the nipples. We took the grade 3 image from the radiology installation room database and the grade 3 status we got from the medical record of Doctor Soetomo Hospital Surabaya. In Figure 4 (a) there is a very large density.

To classify grades of breast cancer using 10 physical parameters, not all physical parameters are significant for classifying grades of breast cancer. Annova statistical test is done to find a significant variable by looking at significant values smaller than 0.05. From the results of the study, only contrast variables that have significant values smaller than 0.5, as shown in Table 1 (see in Appendix). By: d is the distance between pixels; grade 1 (n=12) was taken 12 patients with level one malignancy; garde 2 (n=41) was taken 41 patients with level two malignancy; grade 3 (n=34) was taken 34 patients with level three malignancy.



Figure 3. (a) Grade 2 (b) subtract the background image form the original image grade 2 [14]



Figure 4. (a) Grade 3 and (b) subtract the background image form the original image grade 3 [14]

To determine the value of accuracy, sensitivity and specificity in this study required TP value means that if the actual grade 1 data turns out to be true grade 1, FNa means that if the actual grade 1 data turns out to be incorrect grade 1 but grade 2, FNb means the actual data Grade 1 turns out to be a non-grade 1 class, but grade 3, FP1 means that if the actual grade 2 data turns out to be incorrect grade 2, grade 1. TN1 means that if the actual grade 2 data is true the grade results actually state grade 2. FN1 means if the data actual grade 2 turns out that the result of the incorrect classification is not grade 2 but grade 3. FP2 means that if the actual grade 3 data turns out to be incorrect grade 3 but grade 1, FN2 means that the actual grade 3 data turns out to be incorrect grade 3 but grade 1, FN2 means that the actual grade 3 data turns out to be incorrect grade 3 but grade 1, FN2 means that the actual grade 3 data turns out to be true grade 3 classification. The formula for determining accuracy, sensitivity and specificity is as follows:

Accuracy =
$$\frac{TP + TN1 + TN2}{TP + FP1 + FP2 + FNa + TN1 + FN2 + FNb + FN1 + TN2}$$

Sensitivity =
$$\frac{TP}{TP + FNa + FNb}$$

Specifity =
$$\frac{TN2}{TN2 + FP2 + FN2}$$

from the results of the study obtained the results of TP, FNa, FNb, FP1, TN1, FN1, FP2, TN2 as in Table 2.

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		Actual Data					
		Grade 1 (12 mammogram)	Grade 2 (41 mammogram)	Grade 3 (34 mammogram)			
Classification	Grade 1	TP = 6	FP1 = 4	FP2 = 2			
Results	Grade 2	FNa = 3	TN1 = 25	FN2 = 7			
	Grade 3	FNb = 3	FN1 = 12	TN2 = 25			

Table 2. Results of K-Nearest Neighbor

The accuracy, sensitivity and specificity values are as follows: accuracy = 64.36%,

sensitivity = 50%,

specifity = 73.5%.

Graph Relation of grade 1, 2 and 3 to the value of contrast as Figure 5.



Figure 5. Contrast value of grade 1, 2, and 3

3.2. Discussion

In this paper we presented a new method for breast cancer grades classification based on a combination of physical parameters using the K-nearest neighbor method. The main motivation of this research is to develop the concept of early detection of breast cancer grades with emphasis on physical parameters with K-Nearest Neighbor. The method we propose gives good results. Evaluation was done by taking new data as many as 87 pictures from Doctor Soetomo Hospital Surabaya obtained accuracy, sensitivity and specificity are 64.36, 50 and 73.5% respectively. Our method is very stable and reliable. During our classification testing we have achieved good results regardless of the K factor value in the K-nearest neighbor algorithm. The test has successfully determined the ac`curacy, sensitivity and specificity of the method we propose. Tests have shown that the method we propose is sensitive to the type of breast cancer grades. Analysis Nine physical parameters show that not all physical parameters have a significant impact on classifying breast cancer grades. Because of this, significant parameters are needed to improve preprocessing and achieve better results. The combination of physical parameters and the K-nearest neighbor method has been shown to be a good choice for classifying breast cancer grades. The method we propose provides the ability to improve the classification of breast cancer grades.

4. Conclusion

The combination of physical parameters with K-nearest neighbor method is expected to detect early breast cancer grades. From the experimental results turned out contrast parameters as input method K-nearest neighbor able to classify the grades of breast cancer well. Future research prospects were developed using a combination of physical parameters with adaptive neuro fuzzy method, gynecological algorithm, fuzzy logic, c-mean clustering,

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neural network and support vector machine. The best results of these methods can be applied to digital mammography tools. So that digital mammography tool is able to detect early and predict the type of breast cancer before the biopsy.

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Appendix

Table 1. Average Physical Parameter Values of Grades 1, 2 and 3 with Varying Distances between Pixels from Doctor Soetomo Surabaya Hospital in 2018 [21]

d Average Average Standard deviation Standard Average Standard deviation Standard deviation 1 3.6868417 0.0881638 3.6310412 0.1573514 3.6220818 0.1526622 0.633 3 3.7517792 0.0887285 3.694687 0.159768 3.667972 0.156363 0.433 5 3.7758472 0.0886522 3.71076 0.1552709 3.699073 0.1532091 0.334 6 3.7758675 0.0824338 3.71474 0.1503973 3.704098 0.1520991 0.34 7 3.775875 0.07721717 3.711474 0.142265 3.69645 0.1482490 0.301 1 265.49121 62.24458 353306 166.645 1.486494 0.312 1 265.49121 62.24458 303306 166.645 1.486494 0.312 2 483.93363 174.75601 53.89106 23.44921 30.70024 14.84325 3.60645 1.486494 0.312 2 483.93363 174.7560			Grade 1 (n=12)		Grade 2 (n=41)		Grade 3 (n=34)		
Average deviation Average deviation Average deviation Average 1 3.6686417 0.0881638 6.319412 0.157541 3.208618 0.156853 0.436 2 3.7247925 0.0887836 3.672610 0.1579018 3.68521 0.1541853 0.363 4 3.761792 0.0836622 3.713076 0.1552709 3.699073 0.1582215 0.328 6 3.7758075 0.0824338 3.716717 0.1532973 3.701095 0.1500396 0.303 7.37757117 0.0752703 3.711746 0.1475737 3.699680 0.1500394 0.304 1 265.49121 62.20458 350.3300 196.50348 199.0247 174.32289 0.001 264.833333 174.75801 53.894056 23.71125 0.1481444 0.332 70.16664 318.23153 655.89709 30.71914 423.7046 41.83207 0.005 2 0.16645 1138.2315 655.89709 30.71914 423.7704 41.87455 <td></td> <td>d</td> <td>A</td> <td>Standard</td> <td>A</td> <td>Standartd</td> <td>A</td> <td>Standard</td> <td>Significant</td>		d	A	Standard	A	Standartd	A	Standard	Significant
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Entropy 6 3.7758717 0.0824338 3.716717 0.1533973 3.70695 0.1520901 0.334 7 3.7757117 0.0771117 3.71747 0.1542061 0.1500894 0.303 8 3.7719675 0.0771117 3.71747 0.1475737 3.699568 0.1500894 0.303 10 3.7638056 0.0735703 3.711726 0.142265 3.699272 0.1468494 0.312 2 433.93363 71475801 538.94056 233.14921 10.7802 239.99607 0.003 3 701.66646 318.23153 695.89709 330.71914 423.77046 411.87455 0.004 4 914.4501 474.53675 846.3778 823.3455 528.4305 527.19874 0.005 6 1304.2279 763.96169 1133.732 523.17237 632.24398 0.004 8 1607.5044 981.86602 1403.0164 695.40234 857.9327 89.080103 0.0052 9 1746.3309 1077.6348	- .	Ę	3.7728242	0.0836522	3.713076	0.1552709	3.699073	0.1532215	0.328
7 3.7757147 0.0729274 3.71747 0.1502636 3.019168 0.1508396 0.307 8 3.7719675 0.0771117 3.71147 0.1475737 3.699568 0.1508394 0.317 9 3.7692092 0.0742768 3.713742 0.142265 3.8996645 0.1483907 0.304 1 256.48121 622.0458 530.33306 196.50348 199.02477 1.47832289 0.001 2 443.39363 174.75801 538.94056 233.14921 310.7909 293.39607 0.003 3 701.66646 548.2315 666.83708 302.7914 423.77046 411.87455 0.004 4 914.4501 474.53675 846.3778 382.35455 528.4305 527.18974 0.005 5 1116.8115 652.24631 964.79304 464.09323 623.12277 632.24398 0.000 10 1075.7532 91.8602 1403.0164 695.40234 857.93327 890.8013 0.005 0.008131 723.9107 <td< td=""><td>Entropy</td><td>e</td><td>3.7758875</td><td>0.0824338</td><td>3.716717</td><td>0.1533973</td><td>3,704095</td><td>0.1529091</td><td>0.34</td></td<>	Entropy	e	3.7758875	0.0824338	3.716717	0.1533973	3,704095	0.1529091	0.34
8 3.7762092 0.0771117 3.711472 0.1475737 3.699645 0.150084 0.314 10 3.7638056 0.0735703 3.71172 0.142855 3.696645 0.1488397 0.304 1 265.48121 62.20458 350.3306 196.50348 189.0247 174.32289 0.001 2 433.93363 714.75801 538.94056 233.14921 130.7802 239.9807 0.003 3 701.66646 318.23153 695.89709 330.71914 423.77046 411.87455 0.004 4 914.4501 474.53675 846.3778 382.35455 528.4305 527.18974 0.008 5 1116.8115 652.94631 964.73304 440.40332 63.12277 63.24398 0.004 8 1607.5044 981.86602 1403.0164 695.40234 857.9327 890.80103 0.005 10 177.79529 113.6373 1647.1759 877.54774 995.00783 1051.5562 0.009 1 0.000227 5.1385-		-	3.7757117	0.0782974	3.71747	0.1502065	3.701108	0.1508396	0.303
9 3 7692002 0.0732788 3.713742 0.148325 3.696245 0.148307 0.332 1 256.48121 62.20458 350.38306 196.50348 199.0247 174.32289 0.001 2 483.39363 174.75801 538.94056 293.14921 310.7009 293.39607 0.003 3 701.66646 558.9709 303.71114 423.77046 411.87455 0.004 4 914.4501 474.53675 846.3778 382.35455 528.4055 527.18974 0.005 5 1116.8115 652.24631 984.7304 464.09323 623.12277 632.24398 0.008 6 1304.2279 763.96169 1133.7382 527.0389 707.48815 723.9107 0.005 7 1469.4238 884.45666 1271.2085 606.08567 784.85087 807.73848 0.002 10 10775.9529 1133.6373 1547.179 995.00783 1051.5562 0.002 1 0.000224 5.388E-05		8	3.7719675	0.0771117	3.717147	0.1475737	3.699568	0.1500894	0.317
10 3.7638058 0.0735703 3.711725 0.142265 3.692972 0.14684944 0.312 1 265.48121 62.20458 350.38306 196.50348 189.0247 174.32289 0.001 2 483.93353 174.75801 538.94056 293.14921 310.7809 293.39607 0.003 3 701.66646 318.23153 695.89709 30.71914 423.77746 411.87455 0.004 4 914.4501 747.5806 846.4566 1271.2085 600.0867 784.85087 807.73644 0.0005 7 1469.4238 884.45666 1271.2085 600.0867 784.85087 807.73644 0.005 9 1746.3309 1077.6346 1528.2417 783.1147 928.13054 927.83746 0.0005 10 0.002245 5.368E-05 0.00236 0.011491 0.000745 0.0031795 0.615 2 0.000205 4.532E-05 0.002203 0.011653 0.00062 0.001843 0.579 4		ç	3.7692092	0.0742788	3.713742	0.1448325	3.696645	0.1483907	0.304
Anguler 1 265.48121 62.20458 350.38306 196.50348 189.0247 174.32289 0.001 2 483.93363 174.75801 558.9406 293.14921 310.7699 293.39607 0.003 3 701.66646 318.2315.8 568.8970 330.71914 423.77046 411.87455 0.005 6 1304.2279 763.96169 1133.7382 523.70389 707.48815 723.9107 0.005 7 1469.4238 884.4666 1271.2085 606.08867 784.85087 807.73644 0.004 8 1607.5084 981.38602 1403.0164 695.40234 857.93327 890.80103 0.005 10 1757.9529 1133.6373 1647.1759 875.5474 995.00783 1051.5552 0.0002 10 0.0002742 6.331E-05 0.00238 0.0121617 0.00096 0.0031795 0.615 2 0.000205 4.532E-05 0.00240 0.011441 0.000741 0.0023146 0.577 8 <td></td> <td>1(</td> <td>3.7638058</td> <td>0.0735703</td> <td>3.711725</td> <td>0.142265</td> <td>3.692972</td> <td>0.1468494</td> <td>0.312</td>		1(3.7638058	0.0735703	3.711725	0.142265	3.692972	0.1468494	0.312
Anguler 2 483 33363 174,75801 538,94056 293.14921 310.70809 293.39607 0.003 Contrast 3 701.66646 318.23153 695.89709 330.71914 423.77046 411.87455 0.004 5 1116.8115 625.24631 964.79304 464.09323 623.12277 632.24388 0.008 7 1469.4238 884.46666 121.2085 606.08567 784.86307 807.73648 0.004 8 1607.5084 981.8602 1403.0164 695.40234 857.93327 890.80103 0.005 9 1746.3309 1077.6346 1528.2417 786.31147 928.13054 972.8874 0.005 10 1757.9529 1133.6373 1647.1758 877.54774 995.00731 1051.5562 0.009 11 0.000225 5.385E-05 0.002140 0.011451 0.000241 0.002146 0.578 second 6 0.000205 4.512-05 0.00174 0.00829 0.000421 0.00093179			265.48121	62.20458	350.38306	196.50348	189.0247	174.32289	0.001
Anguler second moment 3 701 66666 318.23153 695.89709 330.71914 423.77046 411.87455 0.004 4 914.4501 474.53675 846.3778 382.35455 528.4305 527.18974 0.005 6 1304.2279 763.96169 1133.7382 523.70389 707.48815 723.9107 0.005 7 1469.4238 884.4568 1271.2085 606.0587 784.85087 807.73648 0.004 8 1607.5084 981.88602 1403.0164 695.40234 857.93327 890.80103 0.005 9 1746.3309 1077.6346 1528.2417 786.31147 925.00783 1051.5562 0.009 1 0.000225 5.388705 0.002268 0.0121617 0.000241 0.002345 0.5158 3 0.000225 4.5184-05 0.001754 0.008279 0.001465 0.577 4 0.0002024 4.7184-05 0.001754 0.008279 0.000427 0.001465 5 0.0002024		2	483.93363	174,75801	538,94056	293,14921	310,7809	293.39607	0.003
A 914.4501 474.53675 846.3778 382.35455 528.4305 527.18974 0.005 Contrast 5 1116.8115 625.24631 964.79304 464.09323 623.12277 632.2438 0.008 7 1469.4238 884.45686 1271.2085 606.08567 784.85087 807.73648 0.004 8 1607.5084 981.88602 1403.0164 695.40234 857.93327 890.80103 0.005 9 1746.3309 1077.6346 1528.2417 786.31147 928.13054 972.88746 0.005 10 0.000274 6.331E-05 0.00236 0.0114911 0.000741 0.0023154 0.588 3 0.000202 4.814E-05 0.00240 0.011715 0.000497 0.001430 0.577 second 6 0.000202 4.814E-05 0.001747 0.000457 0.001465 0.577 8 0.0002024 4.318E-05 0.001747 0.002476 0.587 8 0.0002024 4.318E-05		3	3 701.66646	318.23153	695.89709	330.71914	423.77046	411.87455	0.004
Contrast 5 1116.8115 625.24631 964.79304 464.09323 623.12277 632.24398 0.008 7 1469.42279 763.96169 1133.7382 523.70389 707.4815 723.9107 0.005 8 1607.5084 981.88602 1403.0164 695.40234 857.93327 890.80103 0.005 9 1746.3309 1077.6364 1528.2417 786.81147 928.13054 972.88746 0.005 10 1757.9529 1133.6373 1647.1759 877.54774 995.00783 1051.5562 0.009 1 0.000225 5.368E-05 0.002369 0.0114941 0.000741 0.0023154 0.588 3 0.000205 4.523E-05 0.0014979 0.000491 0.0014655 0.577 second 6 0.0002026 4.615E-05 0.001477 0.000291 0.588 9 0.0002042 4.231E-05 0.001477 0.000429 0.000941 0.578 second 6 0.0002042 4.231E-05		4	914,4501	474.53675	846.3778	382.35455	528,4305	527,18974	0.005
Contrast 6 1304.2279 763.96169 1133.7382 523.70389 707.48815 723.9107 0.005 7 1469.4238 884.45686 1271.2085 606.08567 784.85087 807.73648 0.004 8 1607.5084 981.86081 1807.73648 0.005 1746.3309 1077.6346 1528.2417 786.31147 995.00783 1051.5562 0.009 1 0.0002742 6.331E-05 0.00258 0.0121617 0.000296 0.001843 0.579 2 0.000229 4.814E-05 0.002203 0.010853 0.00062 0.001843 0.579 Anguler 4 0.0002092 4.814E-05 0.001754 0.008829 0.000457 0.001843 0.583 second 6 0.0002022 4.615E-05 0.001754 0.0088739 0.000429 0.009476 0.587 8 0.0002042 4.231E-05 0.001754 0.0088739 0.000456 0.00386 0.603 10 0.0002042 4.231E-05 0.00127		Ę	5 1116.8115	625.24631	964.79304	464.09323	623.12277	632.24398	0.008
Anguler 7 1469.4238 884.45686 1271.2085 606.08567 784.85087 807.73648 0.004 8 1607.5084 981.86802 1403.0164 695.40234 857.93327 890.80103 0.005 9 1746.3309 1077.6548 1647.1759 877.54774 995.00783 1051.5562 0.009 1 0.0002742 6.331E-05 0.002369 0.0114941 0.000741 0.0023154 0.588 3 0.000225 5.368E-05 0.002309 0.0114941 0.000741 0.0023154 0.588 3 0.000225 4.615E-05 0.00204 0.0111915 0.000457 0.0014655 0.577 8 0.000203 4.41E-05 0.001754 0.0084979 0.000491 0.012406 0.587 8 0.000203 4.41E-05 0.001766 0.0062613 0.000457 0.000838 0.0007989 0.607 10 0.0050017 0.0080398 0.0075266 0.001497 0.007566 0.001226 0.038452 0	Contrast	é	3 1304.2279	763.96169	1133.7382	523.70389	707.48815	723.9107	0.005
Anguler 8 1607.5084 981.88602 1403.0164 695.40234 857.93327 890.80103 0.005 9 1746.3309 1077.6346 1528.2417 786.31147 928.13054 972.88746 0.005 10 0.757.9529 1133.6373 1647.1759 877.54774 995.00783 1051.5562 0.0002 2 0.000225 5.358E-05 0.002268 0.0121617 0.000996 0.0031795 0.615 2 0.000202 4.814E-05 0.002203 0.010853 0.000645 0.0577 second 6 0.000205 4.615E-05 0.001754 0.000457 0.001465 0.577 8 0.000208 4.441E-05 0.001754 0.000457 0.000829 0.000457 0.00829 0.000457 0.0588 9 0.0002042 4.231E-05 0.00177 0.0068739 0.000465 0.607 10 0.0002042 4.231E-05 0.001276 0.0068739 0.000464 0.798 0.000465 0.607		-	1469.4238	884.45686	1271.2085	606.08567	784.85087	807.73648	0.004
Anguler second 9 1746.3309 1077.6346 1528.2417 786.31147 928.13054 972.88746 0.005 10 1757.5529 1133.6373 1647.1759 877.54774 995.00783 1051.5562 0.009 2 0.000235 5.368E-05 0.002369 0.0114941 0.000741 0.0023154 0.588 3 0.000205 4.518E-05 0.002049 0.0104715 0.000240 0.0014655 0.577 second 6 0.000205 4.523E-05 0.0014715 0.000249 0.001465 0.001460 0.578 second 6 0.000208 4.441E-05 0.001623 0.0081787 0.000249 0.009476 0.583 9 0.0002042 4.231E-05 0.001497 0.0075266 0.000421 0.000386 0.603 10 0.0020042 4.231E-05 0.001276 0.0062613 0.000386 0.603 10 0.002042 4.231E-05 0.001276 0.0062613 0.000386 0.0028625 0.388		8	3 1607.5084	981.88602	1403.0164	695.40234	857.93327	890.80103	0.005
Anguler second moment 10 1757.9529 1133.6373 1647.1759 877.54774 995.00783 1051.5562 0.0099 Anguler second moment 0.000224 6.331E-05 0.002268 0.0114941 0.000741 0.00231795 0.615 Anguler second moment 4 0.000202 4.814E-05 0.002204 0.0114941 0.000454 0.001843 0.579 9 0.000205 4.523E-05 0.001843 0.0014655 0.577 8 0.000205 4.615E-05 0.001754 0.008499 0.000429 0.001410 0.558 8 0.000203 4.441E-05 0.001754 0.008479 0.000429 0.0099476 0.587 9 0.0002042 4.231E-05 0.001497 0.0068739 0.000429 0.009219 0.598 9 0.0002042 4.078E-05 0.001276 0.0068739 0.000405 0.000283 0.066873 0.036863 0.036837 0.8733 10 0.055017 0.0086583 0.003635 0.0112195 0.056863 <td></td> <td>ç</td> <td>1746.3309</td> <td>1077.6346</td> <td>1528.2417</td> <td>786.31147</td> <td>928.13054</td> <td>972.88746</td> <td>0.005</td>		ç	1746.3309	1077.6346	1528.2417	786.31147	928.13054	972.88746	0.005
Anguler second moment 1 0.0002742 6.331E-05 0.00258 0.0121617 0.000996 0.0031795 0.615 Anguler moment 3 0.00022 5.136E-05 0.002369 0.0114941 0.000741 0.0023154 0.588 Anguler second moment 5 0.0002092 4.814E-05 0.00203 0.0101715 0.000491 0.0014655 0.577 9 0.000208 4.441E-05 0.001754 0.0004979 0.000491 0.0012406 0.588 9 0.000208 4.441E-05 0.001754 0.000429 0.0009219 0.598 9 0.0002042 4.231E-05 0.001379 0.0062613 0.0003836 0.0009219 0.598 9 0.0002042 4.231E-05 0.001379 0.0062613 0.0008366 0.000988 0.0009989 0.607 1 0.0550017 0.0080398 0.0079358 0.003683 0.0086837 0.873 10 0.0236642 0.0056254 0.0081525 0.008152 0.03753 0.0086837 <		1() 1757.9529	1133.6373	1647.1759	877.54774	995.00783	1051.5562	0.009
Anguler second moment 2 0.000235 5.368E-05 0.002369 0.0114941 0.000741 0.0023154 0.588 Anguler second moment 4 0.000202 5.135E-05 0.002203 0.0110853 0.00062 0.0014655 0.577 Anguler second moment 0.0002005 4.523E-05 0.001754 0.008829 0.000427 0.0014655 0.578 7 0.0002003 4.418E-05 0.001623 0.008829 0.000427 0.001814 0.583 9 0.0002033 4.418E-05 0.001479 0.008829 0.000425 0.0008366 0.603 10 0.0002042 4.231E-05 0.001379 0.0068739 0.000425 0.0008366 0.603 10 0.005017 0.0080388 0.000383 0.0112165 0.000383 0.0102625 0.388 2 0.0435583 0.0052641 0.033432 0.007977 0.0088039 0.607 3 0.0366325 0.028067 0.0088032 0.0411208 0.0088829 0.607			0.0002742	6.331E-05	0.00258	0.0121617	0.000996	0.0031795	0.615
Anguler second moment 3 0.00022 5.135E-05 0.002203 0.010553 0.00062 0.001443 0.579 Anguler second moment 5 0.000205 4.615E-05 0.00244 0.011715 0.000491 0.0012406 0.578 7 0.0002025 4.615E-05 0.001744 0.008829 0.000497 0.000491 0.001240 0.583 8 0.0002024 4.231E-05 0.001726 0.008829 0.000491 0.0009219 0.588 9 0.0002042 4.231E-05 0.001726 0.0068739 0.000491 0.000262 0.663 10 0.0002042 4.231E-05 0.001276 0.0068739 0.0012625 0.388 2 0.0435583 0.006599 0.041152 0.0083152 0.007353 0.0086837 0.873 3 0.0366325 0.0056583 0.007717 0.034597 0.0091464 0.79 3 0.0366422 0.0056254 0.028048 0.0077564 0.031019 0.0088625 0.479		2	2 0.000235	5.368E-05	0.002369	0.0114941	0.000741	0.0023154	0.588
Anguler second moment 4 0.0002092 4.814E-05 0.00204 0.011715 0.00054 0.0014655 0.577 second moment 5 0.000205 4.523E-05 0.001894 0.0094979 0.000491 0.0012406 0.578 7 0.0002025 4.615E-05 0.001754 0.008829 0.000491 0.0009476 0.583 7 0.0002042 4.231E-05 0.001477 0.0008739 0.000457 0.0009366 0.603 10 0.002042 4.078E-05 0.001276 0.0068739 0.000456 0.0102625 0.388 1 0.0550017 0.0080398 0.000350 0.0112195 0.050863 0.0102625 0.388 2 0.0435583 0.006599 0.041152 0.0080322 0.041908 0.0088899 0.691 3 0.0366325 0.005241 0.033432 0.00777 0.034597 0.0091317 0.525 6 0.028042 0.005241 0.023342 0.0091317 0.525 10fferensial moment		3	3 0.00022	5.135E-05	0.002203	0.010853	0.00062	0.001843	0.579
Angular second moment 5 0.000205 4.523E-05 0.001894 0.0094979 0.000491 0.0012406 0.578 moment 7 0.0002025 4.615E-05 0.001754 0.008829 0.000457 0.001081 0.583 7 0.0002033 4.41E-05 0.001623 0.0081787 0.000421 0.0009219 0.588 9 0.0002042 4.231E-05 0.001379 0.0068739 0.000405 0.000989 0.607 1 0.0550017 0.0080398 0.050305 0.0112195 0.008638 0.002625 0.388 2 0.0435583 0.006599 0.001776 0.008632 0.041908 0.0088899 0.601 3 0.0366325 0.0055241 0.033432 0.0079717 0.032842 0.0091464 0.79 differensial moment 5 0.030695 0.005241 0.033432 0.0079172 0.028692 0.008825 0.479 9 0.028067 0.0051124 0.028124 0.0026792 0.027285 0.0088625		4	0.0002092	4.814E-05	0.00204	0.0101715	0.00054	0.0014655	0.577
Second moment 6 0.0002025 4.615E-05 0.001754 0.008829 0.000457 0.00181 0.583 moment 7 0.0002003 4.441E-05 0.001623 0.0081787 0.000429 0.0009476 0.587 9 0.0002023 4.418E-05 0.001497 0.0075266 0.000421 0.009219 0.598 9 0.0002042 4.231E-05 0.00179 0.0068739 0.000455 0.000398 0.603 10 0.002042 4.231E-05 0.001276 0.0062613 0.000398 0.0007989 0.607 1 0.0550017 0.0080398 0.050305 0.0112195 0.050863 0.012625 0.388 2 0.043583 0.006599 0.041152 0.008312 0.007353 0.0086837 0.873 3 0.036325 0.002844 0.033432 0.0079717 0.034597 0.0091464 0.79 6 0.028604 0.0055241 0.033432 0.007564 0.023429 0.0088027 0.313	Anguler	Ę	5 0.000205	4.523E-05	0.001894	0.0094979	0.000491	0.0012406	0.578
moment 7 0.0002008 4.441E-05 0.001623 0.0081787 0.000429 0.0009476 0.587 8 0.0002033 4.418E-05 0.001497 0.0075266 0.000421 0.0009219 0.588 9 0.0002042 4.231E-05 0.001379 0.0062613 0.000386 0.6073 10 0.00550017 0.008398 0.050305 0.0112195 0.050863 0.0102625 0.388 2 0.0435583 0.006599 0.041152 0.0088032 0.041088 0.003489 0.0088899 0.6617 3 0.0366325 0.0052641 0.033432 0.0079717 0.034597 0.0091464 0.79 6 0.0286042 0.0051924 0.029318 0.0077564 0.031019 0.0088928 0.548 moment 7 0.0265842 0.0056255 0.028042 0.0075964 0.027285 0.0086237 0.317 9 0.023467 0.0050711 0.025359 0.0068792 0.028502 0.0086237 0.313	second	e	0.0002025	4.615E-05	0.001754	0.008829	0.000457	0.001081	0.583
Invers 8 0.0002033 4.418E-05 0.001497 0.0075266 0.000421 0.0009219 0.598 10 0.0002042 4.231E-05 0.001379 0.0068739 0.000405 0.0008366 0.603 10 0.0050017 0.0080398 0.050305 0.0112195 0.050863 0.0102625 0.388 2 0.0435583 0.0052641 0.038432 0.004152 0.0038637 0.8733 3 0.0366325 0.0052641 0.033432 0.0079717 0.034297 0.0091464 0.79 5 0.030095 0.0052241 0.031148 0.0079568 0.028422 0.0091464 0.79 6 0.0246042 0.005124 0.029188 0.0077564 0.031019 0.008828 0.449 7 0.0265842 0.0051824 0.026452 0.0073192 0.028509 0.0088071 0.317 9 0.0234067 0.0050711 0.028359 0.0068792 0.027285 0.0086237 0.317 9 0.0234283	moment	-	0.0002008	4.441E-05	0.001623	0.0081787	0.000429	0.0009476	0.587
Invers 9 0.0002042 4.231E-05 0.001379 0.0068739 0.000405 0.0008366 0.603 10 0.0002042 4.078E-05 0.001276 0.0062613 0.000398 0.0007989 0.607 1 0.0550017 0.0080398 0.050305 0.0112195 0.050863 0.0102625 0.388 2 0.0435583 0.006599 0.041152 0.0088032 0.041908 0.0088899 0.691 3 0.0366325 0.0056583 0.036585 0.007717 0.034597 0.0091464 0.79 5 0.030095 0.0052241 0.031184 0.0079358 0.032842 0.0091464 0.79 6 0.0286042 0.0056255 0.028046 0.007564 0.031019 0.0088928 0.548 moment 9 0.0238067 0.0051824 0.026452 0.0075968 0.029592 0.00880237 0.317 9 0.0238067 0.0051824 0.026452 0.0077192 0.028509 0.00886237 0.317		8	0.0002033	4.418E-05	0.001497	0.0075266	0.000421	0.0009219	0.598
Invers 10 0.0002042 4.078E-05 0.001276 0.0062613 0.000398 0.0007989 0.607 1 0.0550017 0.0080398 0.050305 0.0112195 0.050863 0.0102625 0.388 2 0.0435583 0.005699 0.041152 0.0088032 0.041908 0.0088899 0.691 3 0.0366325 0.0055643 0.033432 0.0079717 0.034597 0.0091464 0.79 4 0.030095 0.0052641 0.033432 0.0077564 0.031019 0.0088928 0.548 6 0.0286042 0.0051824 0.029318 0.0075968 0.029592 0.0088027 0.313 9 0.0238067 0.0051824 0.026452 0.0075968 0.029592 0.0088027 0.313 10 0.0234283 0.0048346 0.024380 0.0068792 0.027285 0.0086237 0.313 10 0.0234283 0.0048346 0.024380 0.0026728 0.0085537 0.272 1 131.62967		ç	0.0002042	4.231E-05	0.001379	0.0068739	0.000405	0.0008366	0.603
Invers 1 0.0550017 0.0080398 0.050305 0.0112195 0.050863 0.0102625 0.388 2 0.0435583 0.006599 0.041152 0.0088032 0.041908 0.0088899 0.691 3 0.0366325 0.0056583 0.036685 0.008152 0.03753 0.0086837 0.873 differensial moment 4 0.03318 0.0052241 0.03143 0.0079756 0.031019 0.0088928 0.548 7 0.026642 0.0051824 0.029318 0.007568 0.029592 0.0088027 0.313 9 0.0224842 0.0056255 0.0286452 0.0075968 0.029592 0.0088027 0.313 10 0.0234283 0.0048346 0.024368 0.0068792 0.027285 0.0086237 0.313 10 0.0234283 0.0048346 0.024368 0.0068794 0.026728 0.0085537 0.272 1 131.62967 28.959467 145.02607 27.714486 148.54017 30.619168 0.2223 </td <td></td> <td>10</td> <td>0.0002042</td> <td>4.078E-05</td> <td>0.001276</td> <td>0.0062613</td> <td>0.000398</td> <td>0.0007989</td> <td>0.607</td>		10	0.0002042	4.078E-05	0.001276	0.0062613	0.000398	0.0007989	0.607
Invers 2 0.0435583 0.006599 0.041152 0.0088032 0.041908 0.0088899 0.691 3 0.0366325 0.0056583 0.036585 0.0079717 0.034597 0.0091464 0.79 differensial moment 4 0.03095 0.0052241 0.03184 0.0079717 0.034597 0.0091464 0.79 5 0.0286042 0.0051244 0.029318 0.0077564 0.031019 0.0088928 0.548 7 0.0268042 0.0051824 0.029318 0.0075968 0.029592 0.0088027 0.317 9 0.0238067 0.0050711 0.025359 0.0068792 0.027285 0.0086237 0.313 10 0.0234283 0.0048346 0.024368 0.0069794 0.026728 0.0085537 0.272 1 131.62967 28.959467 145.02607 27.714486 148.54017 30.619119 0.2226 2 132.11067 29.12184 145.7463 27.759487 149.69002 30.676374 0.222 </td <td></td> <td></td> <td>0.0550017</td> <td>0.0080398</td> <td>0.050305</td> <td>0.0112195</td> <td>0.050863</td> <td>0.0102625</td> <td>0.388</td>			0.0550017	0.0080398	0.050305	0.0112195	0.050863	0.0102625	0.388
Invers differensial moment 3 0.0366325 0.0056583 0.036585 0.0083152 0.03753 0.0086837 0.873 4 0.03318 0.0052641 0.033432 0.0079717 0.034597 0.0091464 0.79 5 0.030095 0.0052241 0.031184 0.0079358 0.032842 0.0091317 0.525 6 0.026642 0.0051924 0.029318 0.007564 0.031019 0.0088928 0.548 7 0.0265842 0.0056255 0.028046 0.0075968 0.029592 0.0088071 0.317 9 0.0238067 0.0050711 0.026452 0.0073192 0.028509 0.0088071 0.317 10 0.0234283 0.0048346 0.026452 0.0075184 0.026728 0.0085537 0.272 1 131.62967 28.959467 145.02607 27.714486 148.54017 30.619119 0.222 2 132.11067 29.12184 145.40824 27.759487 149.69002 30.676374 0.222		2	0.0435583	0.006599	0.041152	0.0088032	0.041908	0.0088899	0.691
Invers differensial moment 4 0.03318 0.0052641 0.033432 0.0079717 0.034597 0.0091464 0.79 bifferensial moment 5 0.030095 0.0052241 0.031184 0.0079358 0.032842 0.0091317 0.525 6 0.0286042 0.0051924 0.029318 0.0077564 0.031019 0.0088928 0.548 7 0.0265842 0.0056255 0.028046 0.0075968 0.029592 0.0088021 0.317 9 0.0238067 0.0050711 0.026525 0.0068792 0.027285 0.0086237 0.313 10 0.0234283 0.0048346 0.024368 0.0069794 0.026728 0.0085537 0.272 1 131.62967 28.959467 145.02607 27.714486 148.54017 30.691868 0.223 3 132.5816 29.273948 145.74163 27.759487 149.69002 30.676374 0.222 4 133.0409 29.415246 146.047 27.759487 149.69002 30.674152		3	0.0366325	0.0056583	0.036585	0.0083152	0.03753	0.0086837	0.873
Invers differensial moment 5 0.030095 0.0052241 0.031184 0.0079358 0.032842 0.0091317 0.525 differensial moment 6 0.0286042 0.0051924 0.029318 0.0077564 0.031019 0.0088928 0.548 7 0.0265842 0.0056255 0.028046 0.0075968 0.029592 0.0088625 0.479 8 0.02498 0.0051824 0.026452 0.0073192 0.028509 0.0088071 0.317 9 0.0238067 0.0050711 0.025359 0.0068792 0.027285 0.0086237 0.313 10 0.0234283 0.0048346 0.024368 0.0069794 0.026728 0.0085537 0.272 1 131.62967 28.959467 145.02607 27.714486 148.54017 30.619119 0.226 2 132.11067 29.12184 145.74163 27.759487 149.69002 30.676374 0.222 4 133.00409 29.415246 146.047 27.757742 150.13301 30.664421		4	0.03318	0.0052641	0.033432	0.0079717	0.034597	0.0091464	0.79
differensial moment60.02860420.00519240.0293180.00775640.0310190.00889280.54870.02658420.00562550.0280460.00759680.0295920.00886250.47980.024980.00518240.0264520.00731920.0285090.00880710.31790.02380670.00507110.0253590.00687920.0272850.00862370.313100.02342830.00483460.0243680.00697940.0267280.00855370.2721131.6296728.959467145.0260727.714486148.5401730.6191190.2262132.1106729.12184145.4082427.738119149.1738130.6918680.2233132.581629.273948145.7416327.759487149.6900230.6763740.2224133.0040929.415246146.04727.757742150.1330130.6644210.222Hm(y,d)6133.7532229.674278146.3514527.646034150.8647930.6741520.2237134.0808429.820181146.7608527.663767151.144830.666990.2258134.3495629.978102146.9566127.593481151.3704430.6625810.2269134.5675330.137103147.1265527.523106151.5675530.6522910.22710134.7314230.286683147.2631627.449828151.713430.6387890.227	Invers	Ę	0.030095	0.0052241	0.031184	0.0079358	0.032842	0.0091317	0.525
moment70.02658420.00562550.0280460.00759680.0295920.00886250.47980.024980.00518240.0264520.00731920.0285090.00880710.31790.02380670.00507110.0253590.00687920.0272850.00862370.313100.02342830.00483460.0243680.00697940.0267280.00855370.2721131.6296728.959467145.0260727.714486148.5401730.6191190.2262132.1106729.12184145.4082427.738119149.1738130.6918680.2233132.581629.273948145.7416327.759487149.6900230.6763740.2224133.0040929.415246146.04727.757742150.1330130.6644210.222Hm(y,d)6133.7532229.674278146.3514527.646034150.8647930.6741520.2237134.0808429.820181146.7608527.663767151.144830.666990.2258134.3495629.978102146.9566127.593481151.3704430.6625810.2269134.5675330.137103147.1265527.523106151.5675530.6522910.22710134.7314230.286683147.2631627.449828151.713430.6387890.227	differensial	6	0.0286042	0.0051924	0.029318	0.0077564	0.031019	0.0088928	0.548
8 0.02498 0.0051824 0.026452 0.0073192 0.028509 0.0088071 0.317 9 0.0238067 0.0050711 0.025359 0.0068792 0.027285 0.0086237 0.313 10 0.0234283 0.0048346 0.024368 0.0069794 0.026728 0.0085537 0.272 1 131.62967 28.959467 145.02607 27.714486 148.54017 30.619119 0.226 2 132.11067 29.12184 145.40824 27.738119 149.17381 30.691868 0.223 3 132.5816 29.273948 145.74163 27.759487 149.69002 30.676374 0.222 4 133.00409 29.415246 146.047 27.757742 150.13301 30.664421 0.222 Mean of 5 133.39093 29.545445 146.31024 27.740678 150.52887 30.66877 0.222 Hm(y,d) 6 133.75322 29.674278 146.35145 27.663767 151.1448 30.66699 0.225 <td< td=""><td>moment</td><td>7</td><td>0.0265842</td><td>0.0056255</td><td>0.028046</td><td>0.0075968</td><td>0.029592</td><td>0.0088625</td><td>0.479</td></td<>	moment	7	0.0265842	0.0056255	0.028046	0.0075968	0.029592	0.0088625	0.479
9 0.0238067 0.0050711 0.025359 0.0068792 0.027285 0.0086237 0.313 10 0.0234283 0.0048346 0.024368 0.0069794 0.026728 0.0085537 0.272 1 131.62967 28.959467 145.02607 27.714486 148.54017 30.619119 0.226 2 132.11067 29.12184 145.40824 27.738119 149.17381 30.691868 0.222 3 132.5816 29.273948 145.74163 27.759487 149.69002 30.676374 0.222 4 133.00409 29.415246 146.047 27.757742 150.13301 30.664421 0.222 Mean of 5 133.39093 29.545445 146.31024 27.740678 150.52887 30.66877 0.222 Hm(y,d) 6 133.75322 29.674278 146.35145 27.646034 150.86479 30.674152 0.223 7 134.08084 29.820181 146.76085 27.663767 151.1448 30.66699 0.225 <td></td> <td>8</td> <td>0.02498</td> <td>0.0051824</td> <td>0.026452</td> <td>0.0073192</td> <td>0.028509</td> <td>0.0088071</td> <td>0.317</td>		8	0.02498	0.0051824	0.026452	0.0073192	0.028509	0.0088071	0.317
10 0.0234283 0.0048346 0.024368 0.0069794 0.026728 0.0085537 0.272 1 131.62967 28.959467 145.02607 27.714486 148.54017 30.619119 0.226 2 132.11067 29.12184 145.40824 27.738119 149.17381 30.691868 0.222 3 132.5816 29.273948 145.74163 27.759487 149.69002 30.676374 0.222 4 133.00409 29.415246 146.047 27.757742 150.13301 30.668471 0.222 Mean of 5 133.39093 29.545445 146.31024 27.740678 150.52887 30.66877 0.222 Hm(y,d) 6 133.75322 29.674278 146.35145 27.666034 150.86479 30.674152 0.223 7 134.08084 29.820181 146.76085 27.663767 151.1448 30.66699 0.225 8 134.34956 29.978102 146.95661 27.593481 151.37044 30.662581 0.226 <		ç	0.0238067	0.0050711	0.025359	0.0068792	0.027285	0.0086237	0.313
1 131.62967 28.959467 145.02607 27.714486 148.54017 30.619119 0.226 2 132.11067 29.12184 145.40824 27.738119 149.17381 30.691868 0.223 3 132.5816 29.273948 145.74163 27.759487 149.69002 30.676374 0.222 4 133.00409 29.415246 146.047 27.757742 150.13301 30.664421 0.222 Mean of 5 133.39093 29.545445 146.31024 27.740678 150.52887 30.66877 0.222 Hm(y,d) 6 133.75322 29.674278 146.35145 27.666034 150.86479 30.674152 0.223 7 134.08084 29.820181 146.76085 27.663767 151.1448 30.66699 0.225 8 134.34956 29.978102 146.95661 27.593481 151.37044 30.662581 0.226 9 134.56753 30.137103 147.12655 27.523106 151.56755 30.652291 0.227		1(0.0234283	0.0048346	0.024368	0.0069794	0.026728	0.0085537	0.272
2 132.11067 29.12184 145.40824 27.738119 149.17381 30.691868 0.223 3 132.5816 29.273948 145.74163 27.759487 149.69002 30.676374 0.222 4 133.00409 29.415246 146.047 27.757742 150.13301 30.664421 0.222 Mean of 5 133.39093 29.545445 146.31024 27.740678 150.52887 30.66877 0.222 Hm(y,d) 6 133.75322 29.674278 146.35145 27.663767 151.1448 30.66699 0.225 8 134.08084 29.820181 146.95661 27.593481 151.37044 30.662581 0.226 9 134.56753 30.137103 147.12655 27.523106 151.56755 30.652291 0.227 10 134.73142 30.286683 147.26316 27.449828 151.7134 30.638789 0.227	Mean of Hm(y,d)		131.62967	28.959467	145.02607	27.714486	148.54017	30.619119	0.226
3 132.5816 29.273948 145.74163 27.759487 149.69002 30.676374 0.222 4 133.00409 29.415246 146.047 27.757742 150.13301 30.664421 0.222 Mean of 5 133.39093 29.545445 146.31024 27.740678 150.52887 30.664421 0.222 Hm(y,d) 6 133.75322 29.674278 146.35145 27.6646034 150.86479 30.674152 0.223 7 134.08084 29.820181 146.76085 27.663767 151.1448 30.666299 0.225 8 134.34956 29.978102 146.95661 27.593481 151.37044 30.662581 0.226 9 134.56753 30.137103 147.12655 27.523106 151.56755 30.652291 0.227 10 134.73142 30.286683 147.26316 27.449828 151.7134 30.638789 0.227		2	2 132,11067	29,12184	145,40824	27,738119	149,17381	30,691868	0.223
Mean of 5 133.00409 29.415246 146.047 27.757742 150.13301 30.664421 0.222 Mean of 5 133.39093 29.545445 146.31024 27.740678 150.52887 30.664421 0.222 Hm(y,d) 6 133.75322 29.674278 146.35145 27.646034 150.86479 30.674152 0.223 7 134.08084 29.820181 146.95661 27.593481 151.37044 30.662581 0.226 8 134.34956 29.978102 146.95661 27.523106 151.56755 30.652291 0.227 10 134.73142 30.286683 147.26316 27.449828 151.7134 30.638789 0.227		-	132 5816	29 273948	145 74163	27 759487	149 69002	30 676374	0.222
Mean of 5 133.39093 29.545445 146.31024 27.740678 150.52887 30.66877 0.222 Hm(y,d) 6 133.75322 29.674278 146.35145 27.646034 150.86479 30.674152 0.223 7 134.08084 29.820181 146.95661 27.593481 151.37044 30.66699 0.225 8 134.34956 29.978102 146.95661 27.593481 151.37044 30.662581 0.226 9 134.56753 30.137103 147.12655 27.523106 151.56755 30.652291 0.227 10 134.73142 30.286683 147.26316 27.449828 151.7134 30.638789 0.227			122.0010	20.210040	146 047	27.767742	150 12201	20 664421	0.222
Image: Display bit in the image with the image withe image with the image with the image with the image			100.00409	23.413240	140.047	21.101142	150.15501	20 66977	0.222
Finit(y,d) 6 133.75322 29.6/4278 146.35145 27.646034 150.86479 30.674152 0.223 7 134.08084 29.820181 146.76085 27.663767 151.1448 30.66699 0.225 8 134.34956 29.978102 146.95661 27.593481 151.37044 30.662581 0.226 9 134.56753 30.137103 147.12655 27.523106 151.56755 30.652291 0.227 10 134.73142 30.286683 147.26316 27.449828 151.7134 30.638789 0.227			133.39093	29.545445	140.31024	21.140018	150.5288/	11800.06	0.222
7 134.08084 29.820181 146.76085 27.663767 151.1448 30.66699 0.225 8 134.34956 29.978102 146.95661 27.593481 151.37044 30.662581 0.226 9 134.56753 30.137103 147.12655 27.523106 151.56755 30.652291 0.227 10 134.73142 30.286683 147.26316 27.449828 151.7134 30.638789 0.227		6	133.75322	29.6/42/8	146.35145	27.646034	150.86479	30.674152	0.223
8 134.34956 29.978102 146.95661 27.593481 151.37044 30.662581 0.226 9 134.56753 30.137103 147.12655 27.523106 151.56755 30.652291 0.227 10 134.73142 30.286683 147.26316 27.449828 151.7134 30.638789 0.227		7	134.08084	29.820181	146.76085	27.663767	151.1448	30.66699	0.225
9 134.56753 30.137103 147.12655 27.523106 151.56755 30.652291 0.227 10 134.73142 30.286683 147.26316 27.449828 151.7134 30.638789 0.227		8	3 134.34956	29.978102	146.95661	27.593481	151.37044	30.662581	0.226
10 134.73142 30.286683 147.26316 27.449828 151.7134 30.638789 0.227		ę	134.56753	30.137103	147.12655	27.523106	151.56755	30.652291	0.227
		1() 134.73142	30.286683	147.26316	27.449828	151.713 <u>4</u>	30.638789	0.227

Classification of breast cancer grades using physical... (Anak Agung Ngurah Gunawan)

		Grade	1 (n=12)	Grade 2 (n=	41)	Gr	ade 3 (n=34)	
d		Olddo	Standard	Standard Average	Standartd	U.	Standard	Significant
		Average	deviation		deviation	Average	deviation	Olgrinount
	1	34 260554	9 7619133	34 312329	11 739118	34 201961	10 784648	0 999
Deviation	2	34 063222	9 6913602	34 101007	11 747045	34 178546	10.407243	0.000
	2	33 87281	9.6183372	34 104492	11 766145	34 037906	10.401743	0.000
	1	33 718320	0.5646835	34 020315	11 702871	33 0/0052	10.525177	0.006
	5	33 50001	9.5040055	33 086836	11 803124	33 773723	10.525177	0.003
	5	22 /0072	9.3004270	22 072127	11 8002/1	22 7171	10.005755	0.333
	7	22 276675	9.4020397	33.972137	11.009241	22 776022	10.70313	0.99
	0	22 244600	9.2914793	22 067265	11.019327	22 754651	10.055759	0.907
	0	22 122057	9.1040079	33.907303	11.031127	33.734031	10.701700	0.90
	9	33.132037	9.1244331	33.970001	11.030007	33.743379	10.759450	0.973
	10	33.007077	9.1209369	33.99697	11.044002	33.731424	10.612569	0.968
	1	1.5207192	0.051969	1.544523	0.0937383	1.54/0//	0.0883259	0.651
	2	1.6403642	0.0628206	1.63932	0.0873686	1.643583	0.0996902	0.979
Entropy of	3	1./14141/	0.0744286	1.698631	0.0893982	1.702241	0.1102782	0.887
of	4	1.7665917	0.0828595	1.742473	0.0939141	1.742984	0.1194766	0.76
difference	5	1.8067333	0.0885038	1.//6/6/	0.0980366	1.//462/	0.1270087	0.66
second	6	1.8386942	0.0924841	1.805169	0.1032635	1.800483	0.1318185	0.596
order	7	1.8637192	0.0956349	1.828137	0.1076612	1.821602	0.1358604	0.563
histogram	8	1.8797392	0.0996391	1.849734	0.1119991	1.839526	0.1396573	0.62
	9	1.9006017	0.1008531	1.867021	0.115691	1.852449	0.1419445	0.519
	10	1.9146375	0.1021066	1.881975	0.1189006	1.868959	0.1445945	0.569
	1	0.03668	0.0051556	0.0341868	0.0085414	0.0353732	0.0076225	0.586
Anguler second moment of	2	0.0282383	0.0039959	0.0297332	0.0117903	0.0286021	0.0066021	0.821
	3	0.0239925	0.0037562	0.0261732	0.0110877	0.0251809	0.0065281	0.727
	4	0.021315	0.003611	0.0237566	0.010287	0.0230621	0.0065961	0.67
	5	0.0194033	0.0034894	0.0219956	0.0096175	0.0215512	0.0066765	0.61
unierence	6	0.0180183	0.0034022	0.0206161	0.0090624	0.0203379	0.0065739	0.573
order	7	0.0169567	0.003318	0.0194468	0.0083957	0.0193909	0.0065425	0.547
	8	0.0161233	0.0032688	0.0184744	0.0078957	0.0186097	0.0064878	0.532
nistogram	9	0.0154375	0.0032256	0.0176859	0.0074144	0.0179182	0.0063886	0.515
	10	0.0148642	0.0031297	0.016971	0.006786	0.01735	0.0063198	0.487
	1	12.471971	1.437844	13.61416	3.055367	13.57642	2.740966	0.429
Mean of difference second order histogram	2	16.497296	2.330525	16.91747	3.296786	17.10418	3.79908	0.868
	3	19.660166	3.426158	19.40229	3.708941	19.62252	4.608733	0.965
	4	22,319414	4 424387	21,49979	4,243049	21,63089	5.370358	0.869
	5	24.645164	5.302194	23.35188	4.84364	23.33268	6.035107	0.741
	6	26 637238	6 112734	25 03549	5 50095	24 83297	6 606327	0.66
	7	28 368256	6 793837	26 56531	6 134323	26 15693	7 135861	0.608
	7 8	29 839518	7 442675	28 00049	6 796493	27 37054	7.655554	0.000
	۵ ۵	21 144367	8 017003	20.00049	7 442864	28 40270	8 1150/7	0.500
	10	32 271235	8 5010159	30 47403	8 063936	29 53199	8 580728	0.616

Table 1. Average Physical Parameter Values of Grades 1, 2 and 3 with Varying Distances between Pixels from Doctor Soetomo Surabaya Hospital in 2018 [21] *(continue)*