Pork and Beef Features Extractions

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Pork and Beef Features Extractions

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Abstract*—Increased demand for meat in the market causes various problems, including misuse of sales by mixing beef with pork. The similarity between meat as making a layman is difficult to distinguish between meat. Ignorance makes consumers can not distinguish the type of meat that makes consumers just the origin of buying meat. Therefore, the introduction of meat is important to ensure that meat is certain. Color and texture is one of the characteristics of every meat. In this study we used the introduction of meat using images using histogram-based texture extraction and HSI color feature extraction. The result of feature extraction obtained then processed by using Neural Network, SVM, and KNN method to be grouped into two classes of meat, namely pork and beef. The determination of the success of this classification process is evaluated by using a confusion matrix which yields an accuracy of 93.75% using k-fold 20 with Neural Network method for the classification.

Keywords-component; Image Processing, Meat Classification, Neural Network, Feature Extractions

I. INTRODUCTION

The increasing demand for meat in the market to be evidence that meat is one of the foods that are often consumed. The high demand for meat affects the stability of the price of meat itself. In general, the meat is sold merchants according to type. However, not a few traders who do mix to get bigger profit [1]. Differences in the price of beef and pork, often used by traders to do mixing, when sending meat consumer orders. Fraud committed by traders like this, harm consumers to get meat that is not in accordance with the desired [8].

The color of the meat becomes one of the most important quality characteristics for buyers. Red meat is the name for meat that comes from mammals or reptiles that have several types, such as beef, mutton, pork, and other meats [2]. The similarity between meat and meat often makes traders mix meat consumption [3]. This is what makes a layman difficult to distinguish between meat.

There is a characteristic difference between beef and pork, this difference is the underlying study. One way to recognize beef and pork in the field of informatics is to use image processing.

Lestari Handayani, et al. In their study showed the difference between beef and pork based on color and texture. The Hue Saturation Value (HSV) model is used for color extraction and uses the Probabilistic Neural Network (PNN) method for feature classification and extraction. The study also compares three methods: Gabor, Principle Component Analysis (PCA) and Local Binary Pattern (LBP). The experiment was conducted using 100 images of beef and pork and mixed. The best spread value of the ratio of the three methods is 108 [4].

Sachin D Khirade and A.B Patil in their study mentioned that health monitoring and disease detection in plants is very important for sustainable agriculture.A large number of manual jobs require an excessive process of being difficult to monitor disease in plants.In the study discussed the method, some feature segmentation and extraction were used to detect the disease in plants[5].

In another research[6], explored to produce features that can be used and classification system.Different quantization models can produce different accuracy even when compared to more complex methods.In the study yielded superior results for color on feature extraction by using the MSB quantization method.The results in the study show that feature extraction with simplified quantization of images and dimensional reduction can provide more compact vector results.

In the studies [7] conducted experiments using self tuning MLP Classifier (AutoMLP) and SVM for the quality classification of coconut wood.n the study autoMLP resulted in an accuracy of 78.82%, which is slightly better than 77.06% SVM using the SVM classification of libSVM libraries.Research other by Gaurav Kumar and Pradeep Kumar Bhatia[9]. In the study discussed how important in image processing. The research explains that there are various preprocessing techniques of drawing prior to extracting features that will be useful in classifying and recognizing images. The techniques mentioned in the study are such as binarization, thresholding, resizing, normalization etc. Image processing technique applied before first extraction is done. The results of this study concluded feature extraction can be done and ascertain which feature extraction techniques produce the best features to perform extraction based on the type of image complecity.

Research by Mr. Hrishikesh P, et al. Presenting that characteristic of leaf disease is an important thing that will help in finding the right disease on the leaf itself. In that study disease detection with the proposed methodology using leaf features. Hue's image of HSI provides clear and more useful discrimination for size-sizing[10].

The study used a feature-based histogram texture extraction and color feature extraction of Hue Saturation Intensity (HSI).

The purpose of this research is to get the accuracy of classification of meat image classified in two classes, namely pork meat using Neural Network method with dataset which is the result of histogram extract based on feature texture combined with HSI color extraction result in meat figure

II. RESEARCH METHODS

A. Data Collection Method

Data collection is a stage that aims to obtain information relating to research. In this study, data were used is primary data with 40 images of beef and 40 images of pork taken directly from our laboratory. Images that taken using DSLR cameras are then did preprocessing using Adobe Photoshop to cropping each image has the same size that is 400x400 pixels [16]. For example shown at fig 1.

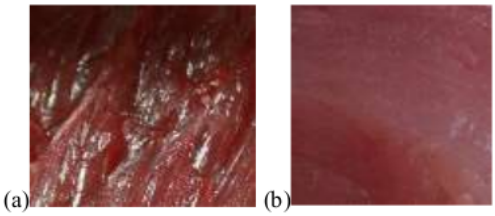

Figure 1. (a) beef (b) pork

B. Method

In this research, the image data that has been through preprocessing is RGB image which then extract color features on RGB images into HSI images so that there are 12 color features of each image and feature-based histogram texture extraction that produces 6 texture features of the beef and pork image This feature is used as data classification process Artificial Neural Network. So the value of accuracy obtained from the classification using the evaluation technique of confusion matrix.

C. Proposed Feature Extraction

a. Color Feature Extraction

Image processing has many methods to get the desired features, one of which is color-based extraction features. In this study the color feature extraction used is Hue Saturation Intensity[13].

b. Texture Feature Extraction

In this research, Image Processing used is histogram texture feature method[15], which search for 6 features in the picture, among others mean, standard deviation, entropy, energy, slope, and fluency. The extraction on the image is done by the calculation process as follows on equation 8-13:

1) Intensity Meaning Feature (Mean):

The average intensity or so-called mean is the first feature calculated by the following formula:

$$m = \sum_{i=0}^{L-1} i.p(i) \quad (8)$$

2) Skewness Feature

$$Skewness = \sum_{i=0}^{L-1} (i-m)^3 . p(i) \quad (9)$$

The skewness feature shows the negative value of the brightness distribution on the left leaning against the mean and the positive value indicates the brightness distribution is tilted to the right against the mean.

3) Standart Deviation Feature

The third feature is to calculate the standard deviation with the following formula:

$$\sigma = \sqrt{\sum_{i=0}^{L-1} (i-m)^2 . p(i)} \quad (10)$$

4) Energy Feature

$$Energi = \sum_{i=0}^{L-1} [p(i)]^2 \quad (11)$$

The energy value that is often called the uniformity value in the image has a maximum value of 1. An image that has many gray levels will have little energy value compared to the image that has a small gray level.

5) Entropy Feature

$$Entropi = \sum_{i=0}^{L-1} p(i) \log_2 (p(i)) \quad (12)$$

Entropy shows the complexity of an image so that the higher the image entropy value the more complex the image will be.

6) Smoothness Feature

$$Smothness\ (R) = 1 - \frac{1}{1+Deviasi^2} \quad (13)$$

The highest Smoothness (R) value indicates that the image has good value.

D. Classification

Support Vector Machine (SVM)

SVM is an algorithm that seeks to find a linear separator (hyperplane) between data points in a multidimensional space of two classes.The benefit of SVM is to create better accuracy than other classifiers. SVM is perfect for handling interactions between features and redundant features. The main problem with SVM is the correct selection of kernel functions. different kernel functions show different results on each data. SVM takes more time than other algorithms and is designed to solve binary class problems. Problems with SVM are not as many as other methods. Easily handle complex nonlinear data points[17].

KNN

The algorithm aims to classify new objects based on attributes and training samples. KNN is very easy to implement and requires relatively fast training time. But the KNN algorithm has its drawbacks as in slow and noise sensitive testing[17].

Neural Network

Neural network (neural network) is a non-linear statistical data modeling tool consisting of simple elements that operate in parallel. Networks are adjusted based on output and target comparisons. Artificial neural networks have the function of pattern recognition, identification, classification and difficult problem solving for conventional or human computers.In addition, neural networks have the advantage of solving complicated cases in spite of time that is not fast[17].

In this study, both features are combined for use in the Neural Network (NN) classification process, so there are 18 features on each image, consisting of 12 features resulting from color extraction, and 6 features extracted histogram features. Feature extraction is obtained by using MATLAB program while the NN classification process uses RapidMiner.

E. Features

X1 = MeanHue
X2 = MeanSaturation
X3 = MeanIntensity
X4 = StDevHue
X5 = StDevSaturation
X6 = StDevIntensity
X7 = SkewnessHue
X8 = SkewnessSatuation
X9 = SkewnessIntensity
X10 = CurHue
X11 = CurSaturation
X12 = CurIntensity
X13 = Mean
X14 = StDev
X15 = Skewness
X16 = Energi
X17 = Entropi
X18 = Smoothness

F. Evaluation

To evaluate the method in order to know whether this method has good results, one of them is by calculating the accuracy of the obtained classification results. In this research, applied confussion matrix method to get the result of its accuracy.

III. Result and Discussion

The method of extraction of HSI color features applied in this study, yielded 12 features. Judging from the extraction, the color features of the beef look slightly different from the pork. However, these extraction results are not directly classified, but are combined with feature histogram texture extraction resulting in 6 features of each image. So each image has 18 features to be used as a training set on the classification process.

18 features available are used for classification with two classes, namely pork and beef. In this research applied 3 classification method that is neural network, knn, and svm using tools RapidMiner. From the classification results, can be calculated the level of accuracy using confusion matrix, and obtained the following results:

TABLE I. Confussion Matrix of SVM

SVM	true beef	true pork	Precision
Predictionbeef	16	0	100.00%
Prediction pork	24	40	62.50%
Recall	40.00%	100.00%	
Accuracy = 70%			

TABLE II. Confussion Matrix of KNN

KNN	true beef	true pork	Precision
Predictionbeef	33	5	86.84%
Prediction pork	7	35	83.33%
Recall	82.50%	87.50%	
Accuracy = 85%			

TABLE III. Confussion Matrix of NN

NN	True beef	True pork	Precision
Predictionbeef	37	2	94.87%
Predictionpork	3	38	92.68%
Recall	92.50%	95.00%	
Accuracy = 93.75%			

IV. Conclusion

In this study, evaluation of each classification shows that SVM had 70% of its accuracy, KNN had 85%, and neural network results is the bestproduces an accuracy that is 93.75% with k-folds 20. So it can be concluded that combining features between HSI color features with histogram-based texture features can classify the image of meat with 2 labels, beef and pork well using Neural Network classification.

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