

**CLASSIFICATION OF NUT TYPES BASED ON SHAPE AND TEXTURE  
USING K-MEANS CLUSTERING**

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**Abstract**

Nuts is component important in food man who gives nutrition and protein. Identification type peanut based on characteristic his physique can help in the sorting and processing process. In research this, we propose method For classify type nuts based on feature shape and texture use K-Means Clustering algorithm. Image data peanut collected and relevant features extracted. Through implementation of K-Means, we cluster nuts to in cluster based on similarity feature. Experimental results show that approach This own potency application practical in industry agriculture and processing food, as well capable identify pattern characteristics in characteristic physique nuts. This result open road for use analysis image and technique grouping in increase efficiency in production food and agriculture.

**Keywords:** Nuts , K-Means Clustering, Shape and Texture.

**1. Introduction**

As a country that has characteristic agrarian, Indonesia in general experience own relatively deep profits sector agriculture. If excess This utilized in a way maximum, will become supporting basis continuity independence food in this country . In line with increase amount residents all over the world, demand will food also continues increase. Deployment integration economics and market globalization wide has cause no competition unavoidable inside competition with agricultural countries other. Commodity Indonesian agriculture has potency For dominate the international marke. There is more of 12,000 types nuts in Indonesia, including peanut ground , almonds, cashews, and peanuts kinari. In an increasingly technological era advanced, digital introduction to technology that also becomes the more important .(Maria Lucia Refwallu & Dece Elisabeth Sahertian, 2020). For give help in work human , important approach automatic in classify peanut based on characteristic features his physique the more increase . The K-Means Clustering algorithm is One possible methods used For reach matter.

Preprocessing has very important roles and not can missed in data processing. Preprocessing aim main For delete data that is not relevant so that image can become similar with image other. The result , images the can extracted with good and can classified with accurate.

Texture is traits or characteristics possessed by one area ( in image ) is sufficient big so that experience traits earlier can repeated in area the . Understanding from texture in matter This not enough more is regularity patterns certain ones are formed from arrangement pixels in digital image .(Angelina Widians et al., 2019). Introduction pattern form is method that uses two combinations of parameters, namely eccentricity and metric of something objects in binary images. Eccentricity and matrix parameters are extraction techniques targeted features. For take or extracting eccentricity and metric values.

## 2. Research of Methodology

Acquisition image is stage beginning with objective get digital images as training data and where the test data is results acquisition image This is image peanut with pixel sizes vary .(Agustin & Atmaja, n.d.). At stage This done separation of Red, green and blue and this process works For transform color RGB image (3 layers) becomes grayscale (1 layer) with objective For reduce image three dimensions become One dimensions just with mark the same intensity so that can speed up the computing process .(Agustin & Atmaja, n.d.). Segmentation image is a processing process purposeful image separate areas (regions) of objects with the background region behind the order of the object easy analyzed in frame recognize lots of objects involve visual perception .(Kumaseh et al., n.d.).

K-means Clustering is most popular method used For get description from set of data with method disclose trend any other data . Trend grouping the based similarity characteristics existing data individuals . Basic idea of this technique is find center from every possible data groups There is For Then grouping each individual data into one from groups the based on the shape .(Premana et al., 2020). Texture is traits or characteristics possessed by one area ( in image ) is sufficient big so that experience traits earlier can repeated in area the . Understanding from texture in matter This not enough more is regularity patterns certain ones are formed from arrangement pixels in digital image .(Angelina Widians et al., 2019).

## 3. RESULT

Classification type nuts use K-Means clustering method based on texture and shape This need insert form picture . This system expected can help in identify type peanut.

Choose picture enter , first process in system This is choose image type nuts , nuts that will identified there are 4 types nuts that can seen in the picture under.



Figure 1. Been Sample

Preprocessing or initial data processing process in stage This done with method change image colored become  $l^*a^*b$  image. stages This used For makes the image process easier furthermore that is segmentation.

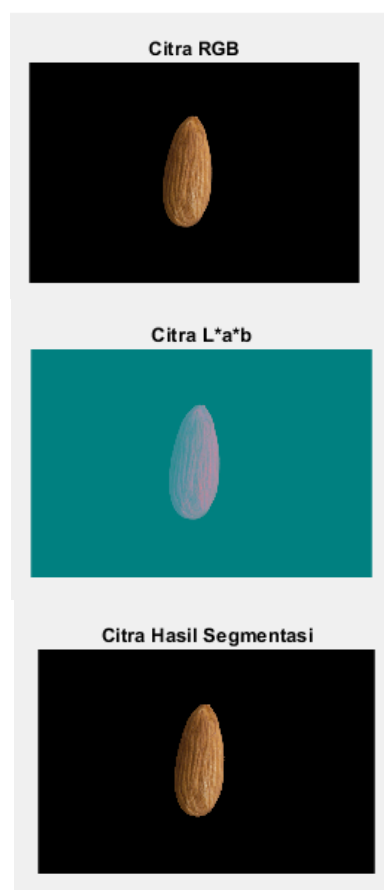


Figure 2. Segmentation Progress

In the introduction process pattern extraction feature shape and texture done parameter calculations are used for the classification process. Extraction parameters feature form namely metrics and eccentricity. In the extraction process feature form captured image that is image results segmentation in the form

of binary numbers , from This binary number will be used For calculation of metric and eccentricity parameters. Extraction parameters feature texture used are contrast, correlation, energy and homogeneity.

	1	2	3	4	5	6
1	0.7686	0.9028	0.0166	0.9843	0.8875	0.9939
2	0.8942	0.3605	0.0760	0.9524	0.8818	0.9813
3	0.5842	0.8281	0.0249	0.9836	0.9390	0.9957
4	0.6785	0.9048	0.0657	0.9866	0.7912	0.9891
5						
6						
7						
8						
9						
10						
11						
12						

Figure 3. Database Table

Based on picture above the metric parameters are A the quantity that shows level roundness something object or object. Metric results are obtained based on formula following.

$$M = \frac{4\pi \times A}{C^2}$$

The eccentricity parameters are obtained of Length between the distance of the minor ellipse foci and the major ellipse foci from A object . Following the formula

$$e = \sqrt{1 - \frac{b^2}{a^2}}$$

For get the contrast parameters from something object based on formula that has been used For look for mark of the contrast parameters.

$$\text{Contrast} = \sum_i \sum_j (i-j)^2 p(i,j)$$

$$\text{Correlation} = \sum_i \sum_j \frac{(i - \mu_i)(j - \mu_j)p(i,j)}{\sigma_i \sigma_j}$$

$$\text{Energy} = \sum_i \sum_j p(i,j)^2$$

$$\text{Homogeneity} = \sum_i \sum_j \frac{p(i,j)}{1 + |i - j|}$$

## 4. CONCLUSION

Research This give more views good about How the K-Means Clustering method can applied in context classification type nuts based on features shape and texture. This result give

donation significant in understand potency use analysis image and technique grouping in field agriculture and industry food.

## References

- Agustin, D., & Atmaja, RD (nd). *Digital Image Processing For Classifying Group Vehicle Using the Basic Geometric Parameter Method (Image Processing For Classifying Type Of Vehicles With Basic Geometric Parameters)* .
- Angelina Widians , J., Santoso Pakpahan , H., Budiman, E., & Soleha , M. (2019). Classification of Onion Types Using the K-Nearest Neighbor Based Method Shape and Texture Feature Extraction . *JURTI* , 3 (2).
- Berlian, O., Setia, H., Kurnia Bakti, V., & Nugroho, WE (nd). *System Implementation Image Improvement For Determine Dimensions Peanuts on Sorter Peanut Based \_ Nodemcu* .
- Kumaseh , MR, Latumakulita , L., & Nainggolan, N. (nd). *Fish Digital Image Segmentation Using Thresholding Method* .
- Lucia Refwallu , M., & Elisabeth Sahertian , D. (2020). Identification Plant Nuts ( Papilionaceae ) Grown on Larat Island , Regency Tanimbar Islands . In *Biophysiology Journal* (Vol. 1, Issue 2). On line.
- Ong, J. O. (2013). *Implementation K-Means Clustering Algorithm For Determining President University's Marketing Strategy* .
- Premana, A., Muhammad Herdian Bhakti, R., & Prayogi , D. (2020). *K-Means Clustering Segmentation in Images Using Extraction of Color and Texture Features* .
- Syarifuddin , F., Misdrum , M., & Aris Widodo, A. (2020). Classification of Corona Virus Data Sets Using the Naïve Bayes Classifier Method. In *November* (Vol. 12, Issue 2).