International Journal Of Health, Engineering And Technology (IJHET) *E-ISSN 2829 - 8683*
Volume 1, Number 2, July 2022, *Page. 89 - 96*
Email : editorijhess@gmail.com

Coconut Wood Density Image Processing Techniques Based On Texture Image With Comparison Of Sobel Edge Detection Algorithm And Canny Edge Detection Algorithm

Aulia Annisa Br Bangun [1*)], Achmad Fauzi [2)], Husnul Khair [3)]
[1,2,3)] STMIK Kaputama Binjai, Indonesia

*Coresponding Author
Email : auliaannisa570@gmail.com

Abstract

Indonesia is the second largest country that has Cocos nucifera coconut trees, coconut wood has a strength that is not inferior to existing forest wood, other building elements and for mabel and building construction materials. Coconut wood also has unique fibers, so it has a high aesthetic value. The quality of coconut wood, namely strength and durability, is determined by many factors, one of which is the pattern of fiber density in coconut wood. How to find out the density of coconut wood digitally by detecting the outer patch of coconut wood using a computer so that it can make it easier and help determine the image of quality coconut wood. To determine the quality of coconut wood by looking at the fiber density by reducing noise before calculating the edge detection so that more edges are produced. By checking the numbers if the value of the number >= 128 then the binary value given is 1, if the value of the number < 128 then the binary value given is 0, then the binary value given for the numbers 12,12,10 is 0,0,0. And By checking the numbers if the value of the number >= 128 then the binary value given is 1, if the value of the number < 128 then the binary value given is 0, then the binary value given for the numbers 12,29,-28 is ,0,0, 0.

Keywords: Image, Coconut Wood, Sobel Algorithm, Canny Algorithm

INTRODUCTION

The development of information technology occurs quite rapidly in various fields. One of the technologies that has developed is the Sobel Edge Detection and Canny edge detection techniques on images. In the field of remote sensing, distinguishing the edges of an object is very necessary because if you only use color characteristics, the object classification process in the image will not be optimal. Another benefit of edge detection can also reduce the amount of data when processing (A. H. Hasibuan *et.al, 2020*).

How to find out the density of coconut wood digitally by detecting the outer patch of coconut wood using a computer so that it can make it easier and help determine the image of quality coconut wood. To determine the quality of coconut wood by looking at the fiber density by reducing noise before calculating the edge detection so that more edges are produced.

Edge Detection Sobel algorithm serves to determine the object edge detection image from a digital image. The resulting image is an image that shows the shape of the outline of a digital image. To produce the resulting image, it is necessary to carry out several steps written in the Sobel algorithm (Cahyo *et.al*, 2017).

This research is strengthened by a research journal conducted by (I Gusti, 2018) with the title "Implementation of Edge Detection to Detect Bone Fractures in Elderly People (Olders) on X-Ray Images with Sobel and Prewitt Operators". From this research, create an image processing application using Sobel and Prewitt filters. Sobel and Prewitt filters to produce edges in the image. Edge detection in images can be implemented in the medical field, such as fracture analysis in bones. Cracks in the bone create edges, the fractured parts are reinforced with Sobel and Prewitt filters.

RESEARCH METHODS

Previous research aims to obtain comparison and reference materials. In addition, to avoid the assumption of similarity with this study. So in this study the researchers found the results of previous studies as follows:The first study entitled "Comparison of the Normalized Difference Water Index (NDWI) method and the Sobel filter on Landsat 8 Imagery for Coastline Extraction". The study was conducted to compare the Normalized Difference Water Index (NDWI) method with the Sobel filter for coastline extraction in Pesisir Selatan Sampang, Madura using Landsat 8 imagery. The best method was then applied to the image to determine shoreline changes from 2015 to 2020.

From the research From this it can be ascertained that visually the NDWI method produces something better than the Sobel filter because the resulting lines are close to the original conditions in Landsat 8 or Basemap World Imagery images. Sobel filter, the resulting accuracy is not very good and does not approach field conditions, but this filter has the advantage of a relatively fast closest time because it can use a single band. Then the NDWI value generated in this study has a range of -0.497121 to 0.377046. The first class which is non-water body objects have a value of -0.497121 to 0. Then the second class which is a water body object has a value of 0 to 0.377046. The results of the calculation of shoreline changes for five years show that there is a shift in the coastline with a range of 0.62 to 2.75 meters. Landsat 8 pixel size is a displacement of 30 meters only reaches < 3 meters. So from this experiment it did not show any significant shoreline changes. Suggestions for further research, it is necessary to conduct a study using high-resolution imagery so that shoreline changes can be confirmed accurately. (A. H. Hasibuan *et.al, 2020*).

The second study entitled Implementation of Edge Detection to Detect Bone Fractures in Elderly People on X-Ray Images with Sobel and Prewitt Operators. This study aims to create an image processing application using Sobel and Prewitt filters. Sobel and Prewitt filters to produce edges in the image. Edge detection in images can be implemented in the medical field, such as fracture analysis in bones. Cracks in the bone create edges, parts that are reclaimed with Sobel and Prewitt filters. What was carried out in this research were: literature study, application of Sobel and Prewitt filters. Next, analyze and design image processing applications with Sobel and Prewitt filters. In this study, Sobel and Prewitt filters were used to strengthen the edges of the input image. By using these two filters, it is possible to display edges in the image for analysis by the user. (I Gusti, 2018)

The Sobel method is one of Robert's development methods by using a High Pass Filter (HPF) which is given one zero as a buffer. This algorithm includes an algorithm that functions as an image filter. The Sobel edge detection method is an operator that uses a 3 x 3 neighbor matrix with the point being examined as the midpoint matrix. The Canny edge detection method is an edge detection method that will produce an image display that is different from all methods because it displays a relief effect in it. The advantage of the Canny method is the ability to reduce noise before performing edge calculations so that the resulting edge will be more. Canny edge detection can detect true edges with minimum error rate and produce optimal edges.

.

RESULTS AND DISCUSSION

Algorithm Analysis

Based on the observations that have been made, edge detection is used to measure the thickness of the coconut fiber to determine the quality of the wood. Looking at the cutting of coconut wood blocks, there are thicker fibers of very good quality, the picture below is as follows:

Figure 1 Image of Coconut Wood

Matrix Convolution

Matrix convolution is the process of converting the image into a number matrix to get the image into a number. Simplify the calculation of blocks with pixel sizes in the Sobel algorithm. Here is an image that has an RGB Image on coconut wood.

160	**160**	**160**	**160**	**160**	160	160	160	160	160	160	160	158	156	154	152
150	**150**	**147**	**147**	**147**	147	147	147	147	147	148	148	148	147	147	147
146	**163**	**163**	**163**	**163**	163	163	163	163	163	163	165	164	163	161	158
156	**155**	**154**	**150**	**150**	150	150	150	150	150	150	150	150	149	148	148
147	**146**	**166**	**166**	**167**	167	167	167	167	167	167	167	169	168	167	165
163	161	160	159	155	155	155	155	155	155	155	155	155	154	153	151

Calculation of the Sobel Method

1. Divide the Image into 5 x 5 Pixel Sizes to adjust to Sobel, then the size of the image to be processed is divided by blocks with a size of 5 x 5 pixels per block.

   Separating the RGB image into each form of R, G and B before carrying out the process of detecting the gemstone image object, first the RGB image of the gemstone image is converted into the respective shapes of R, G and B images. The image display is converted into their respective shapes -respectively R, G and B images are displayed.

2. Determine the gradient value of the gray image that has been operated with the mask matrix via the Sobel operator.

Table 1 Image Pixel Neighbors

160	160	160	160	160
150	150	147	147	147
146	163	163	163	163
156	155	154	150	150
147	146	166	166	167

160	**160**	**160**
150	**150**	**147**
146	**163**	**163**

Gx = (160)(-1) + (150)(-2) + (146) (-1) + (160) (0) + (150) (0) + (163) (0) + (160) (1) + (147) (2) + (163) (1) = 11

Gy = (160)(1) + (160)(2) + (160) (1) + + (150) (0) + (150) (0) + (147) (0) + (146)(-1) + (163)(-2) + (163) (-1) = 5

G[f(x,y)] = $\sqrt{11^2 + 5^2}$ = 12

The pixel value obtained from the pixel calculation operated by the Sobel method at the point Row 1, Column 1 is 12.

160	**160**	**160**
150	**147**	**147**
163	**163**	**163**

Gx = (160)(-1) + (150)(-2) + (163) (-1) + (150) (0) + (147) (0) + (163) (0) + (163) (1) + (147) (2) + (163) (1) = -3

Gy = (160)(1) + (160)(2) + (160) (1) + (150) (0) + (147) (0) + (147) (0) + (163)(-1) + (163)(-2) + (163) (-1) =-12

G[f(x,y)] = $\sqrt{-3^2 + -12^2}$ = 12

The pixel value obtained from the pixel calculation operated by the Sobel method at the point Row 1, Column 2 is 12.

160	**160**	**160**
147	**147**	**147**
163	**163**	**163**

Gx = (160)(-1) + (147)(-2) + (147) (-1) + (160) (0) + (147) (0) + (163) (0) + (160) (1) + (147) (2) + (163) (1) = 16

Gy = (160)(1) + (160)(2) + (160) (1) + (147) (0) + (147) (0) + (147) (0) + (163)(-1) + (163)(-2) + (163) (-1) = -12

G[f(x,y)] = $\sqrt{16^2 + -12^2}$ = 10

The pixel value obtained from the pixel calculation operated by the Sobel method at the point Row 1, Column 3 is 10.

3. Determine the Thresholding Value

$$g(x,y) = \begin{matrix} 1, Jika\ f\ (x,y) \geq 128 \\ 0, Jika\ f\ (x,y) < 128 \end{matrix}$$

By checking the numbers if the value of the number >= 128 then the binary value given is 1, if the value of the number < 128 then the binary value given is 0, then the binary value given for the numbers 12,12,10 is 0,0,0

Table 2 Grayscale Image Results

160	160	160	160	160
150	**12**	**12**	**10**	147
146	163	163	163	163
156	155	154	150	150
147	146	166	166	167

Table 3 Binner Image Results

1	1	1	1	1
1	**0**	**0**	**0**	1
1	1	1	1	1
1	1	1	1	1
1	1	1	1	1

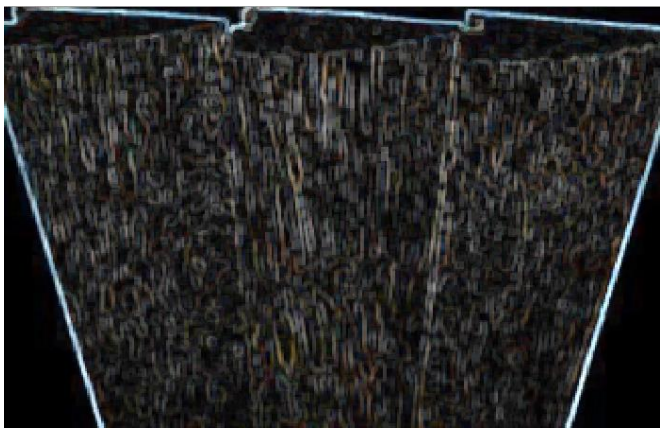

Figure 2 Sobel edge detection algorithm image result

Canny Method Calculation

1. Divide the Image into 5 x 5 Pixel Sizes to match Sobel, then the size of the image to be processed is divided by blocks with a size of 5 x 5 pixels per block.

Pixel Matrix Separating the RGB image The pixel matrix is taken from the convolution matrix as a sample to calculate to the Sobel algorithm process. The following is a sample pixel matrix table.

Table 4 Resolution 5 x 5

160	**160**	**160**	**160**	**160**
150	**150**	**147**	**147**	**147**
146	**163**	**163**	**163**	**163**
156	**155**	**154**	**150**	**150**
147	**146**	**166**	**166**	**167**

Define the Canny operators and Use the mask matrix of the Sobel operators and to perform edge detection.
These pixel values will be processed by the canny method to detect edges in the image. The pixel value of the image above is processed according to the provisions of the canny method. Convolution of grayscale image with horizontal canny kernel(Gx) and vertical canny kernel(Gy).

2. Determine the gradient value of the gray image that has been operated with the mask matrix via the canny operator.

Table 5 Image Pixel Neighbors

160	160	160	160	160
150	150	147	147	147
146	163	163	163	163
156	155	154	150	150
147	146	166	166	167

160	**160**	**160**
150	**150**	**147**
146	**163**	**163**

Gx = (160)(1) + (160)(0) + (160) (-1) + (150) (2) + (150) (0) + (147) (-2) + (146) (1) + (163) (0) + (163) (-1) = -11

Gy = (160)(-1) + (160)(-2) + (160) (-1) + (150) (0) + (150) (0) + (147) (0) + (146) (1) + (163) (2) + (163) (1) = -5

G[f(x,y)] = $\sqrt{-11^2 + -5^2}$ = 12

The pixel value obtained from the pixel calculation operated by the Sobel method at the point Row 1, Column 1 is 12

160	**160**	**160**
150	**147**	**147**
163	**163**	**163**

Gx = (160)(1) + (160)(0) + (160) (-1) + (150) (2) + (147) (0) + (147) (-2) + (163) (1) + (143) (0) + (163) (-1) = 6

Gy = (160)(-1) + (160)(-2) + (160) (-1) + (150) (0) + (147) (0) + (147) (0) + (163) (1) + (143) (2) + (163) (1) = -28

G[f(x,y)] = $\sqrt{6 + 28^2}$ = 29

The pixel value obtained from the pixel calculation operated by the Sobel method at the point Row 1, Column 2 is 29 .

160	**160**	**160**
147	**147**	**147**
163	**163**	**163**

Gx = (160)(1) + (160)(0) + (160) (-1) + (147) (2) + (147) (0) + (147) (-2) + (163) (1) + (143) (0) + (163) (-1) = 0

Gy = (160)(-1) + (160)(-2) + (160) (-1) + (147) (0) + (147) (0) + (147) (0) + (163) (1) + (143) (2) + (163) (1) = -28

G[f(x,y)] = $\sqrt{0^2 + -28^2}$ = -28

The pixel value obtained from the pixel calculation operated by the Sobel method at the point Row 1, Column 3 is -28.
Determine the Thresholding Value

By checking the numbers if the value of the number >= 128 then the binary value given is 1, if the value of the number < 128 then the binary value given is 0, then the binary value given for the numbers 12,29,-28 is ,0,0, 0.

Tabel 6 Grayscale Image Results

160	160	160	160	160
150	**12**	**29**	**28**	147
146	163	163	163	163
156	155	154	150	150
147	146	166	166	167

Tabel I.7 Binner Image Results

1	1	1	1	1
1	**0**	**0**	**0**	1
1	1	1	1	1
1	1	1	1	1
1	1	1	1	1

Figure 3 Canny edge detection algorithm image result

.

CONCLUSION

After testing the digital image processing application, detection of edge coconut wood density and getting an analysis of some of the experiments carried out it can be said that Canny method can perform edge detection more perfect than with the Sobel method. In the results of Canny's conversion, you can see the edges and boundaries on the output image is very clearly visible.

REFERENCES

A. H. Hasibuan, T. Zebua, and R. K. Hondro, "Penerapan Metode Sobel Edge Detection dan Image Processing Untuk Mengetahui Diameter Apel Fuji Menggunakan Aplikasi Matlab," *JURIKOM (Jurnal Ris. Komputer)*, vol. 7, no. 3, p. 450, 2020, doi: 10.30865/jurikom.v7i3.2261.

I. G. N. Suryantara, "Implementasi Deteksi Tepi Untuk Mendeteksi Keretakan Tulang Orang Lanjut Usia (Manula) Pada Citra Rontgen Dengan Operator Sobel Dan Prewitt," *J. Algoritm. Log. dan Komputasi*, vol. 1, no. 2, pp. 51–60, 2018, doi: 10.30813/j-alu.v1i2.1368.

C. Mauludin, "Deteksi Tepi Tingkat Transparan Batu Permata," vol. 6, no. 01, pp. 45–50, 2017.