Projek Akhir
Komputasi Citra Digital
Semester Antara 2022

“Klasifikasi Pisang Jenis Kelapasari dengan Pisang Jenis Awak Menggunakan Fitur Warna dan Tesktur”

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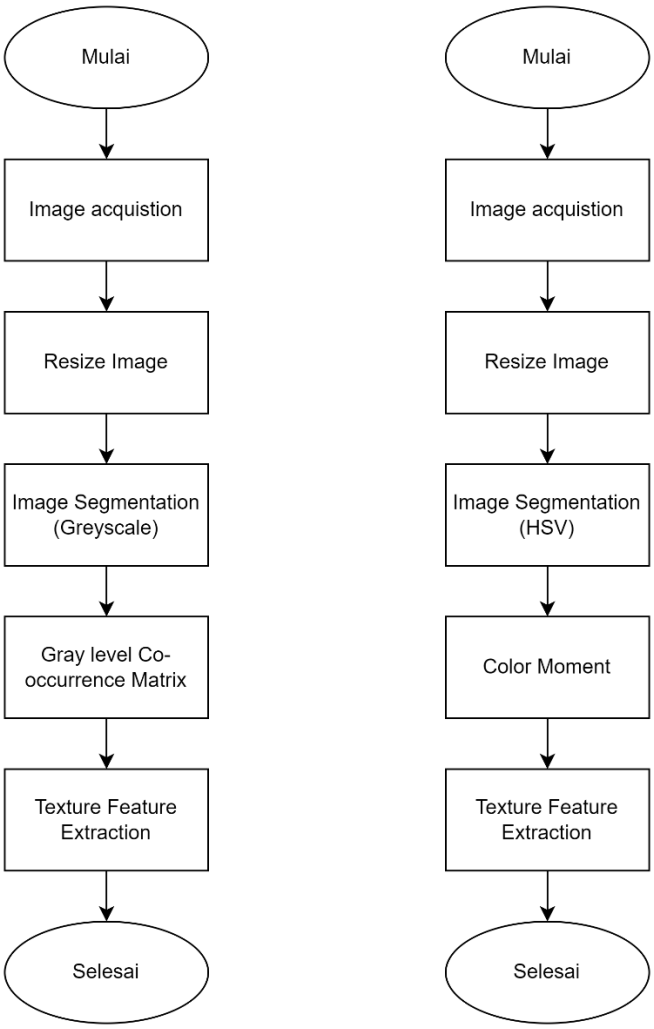
BAB 1. OBJEK IMPLEMENTASI

Projek ini bertujuan untuk mengklasifikasikan pisang kelapasari dengan pisang awak dengan memanfaatkan implementasi dari esktrasi fitur warna dan tesktur. Ekstraksi fitur tekstur akan menggunakan Gray level Co-occurrence Matrix dengan mengambil nilai dari contrast nya sedangkan ekstraksi fitur warna menggunakan Color Moment dengan mengambil nilai H, S, dan V dari mean nya.

BAB 2. FLOWCHART PENGOLAHAN CITRA DIGITAL

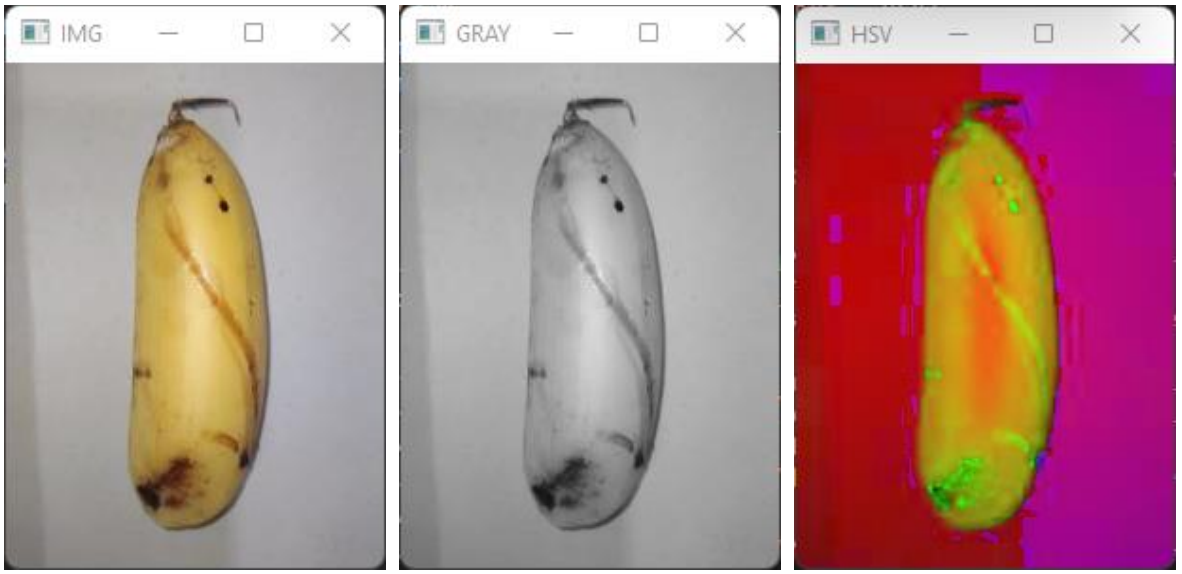
Berikut ini adalah gambar diagram dari proses ekstraksi fitur tekstur Gray level Co-occurrence Matrix dan proses ekstraksi fitur warna Color Moment

Gambar diagram alir



BAB 3. PROSES PENGOLAHAN CITRA DIGITAL

Berikut adalah perubahan dari proses pengolahan warnanya. Dimana pertama saya gambar di inputkan pada program, akan menjadi sebuah gambar RGB atau gambar berwarna biasa. Kemudian gambar akan disegmentasikan dan di konversi ke *Grayscale* agar bisa dilakukan proses ekstraksi fitur tekstur *Gray level Co-occurrence Matrix.* Selain itu, gambar RGB juga disegmentasikan dan di konversi ke HSV agar bisa dilakukan proses ekstraksi fitur warna *Color Moment.*



BAB 4. IMPLEMENTASI PYTHON

Berikut ini adalah kode program dan *screenshot* dari proses ekstraksi fitur tekstur *Gray level Co-occurrence Matrix* dan proses ekstraksi fitur warna *Color Moment.*

1. Color moment

Color-Moment.py

```
# Nama  : Abimanyu Sri Setyo
# NIM   : 195150300111005

# Import Library
import numpy as np
import cv2

def color_moments(image):
    img = cv2.imread(image)
    if img is None:
        return
    # Convert BGR to HSV colorspace
    hsv = cv2.cvtColor(img, cv2.COLOR_BGR2HSV)
    # Split the channels - h,s,v
    h, s, v = cv2.split(hsv)
    # Initialize the color feature
    color_feature = []
    # N = h.shape[0] * h.shape[1]
    # The first central moment - average
    h_mean = np.mean(h)  # np.sum(h)/float(N)
    s_mean = np.mean(s)  # np.sum(s)/float(N)
    v_mean = np.mean(v)  # np.sum(v)/float(N)
    color_feature.extend([h_mean, s_mean, v_mean])
    return color_feature


# Menampilkan hasil Ekstrasi Fitur Warna
print(color_moments('imgx/kelapasari1.jpg'))

# Menampilkan hasil segmentasi
hsv = cv2.cvtColor(cv2.imread('imgx/kelapasari1.jpg'), cv2.COLOR_BGR2HSV)
cv2.imshow("HSV", hsv)
cv2.waitKey(0)
cv2.destroyAllWindows()
```

2. GLCM

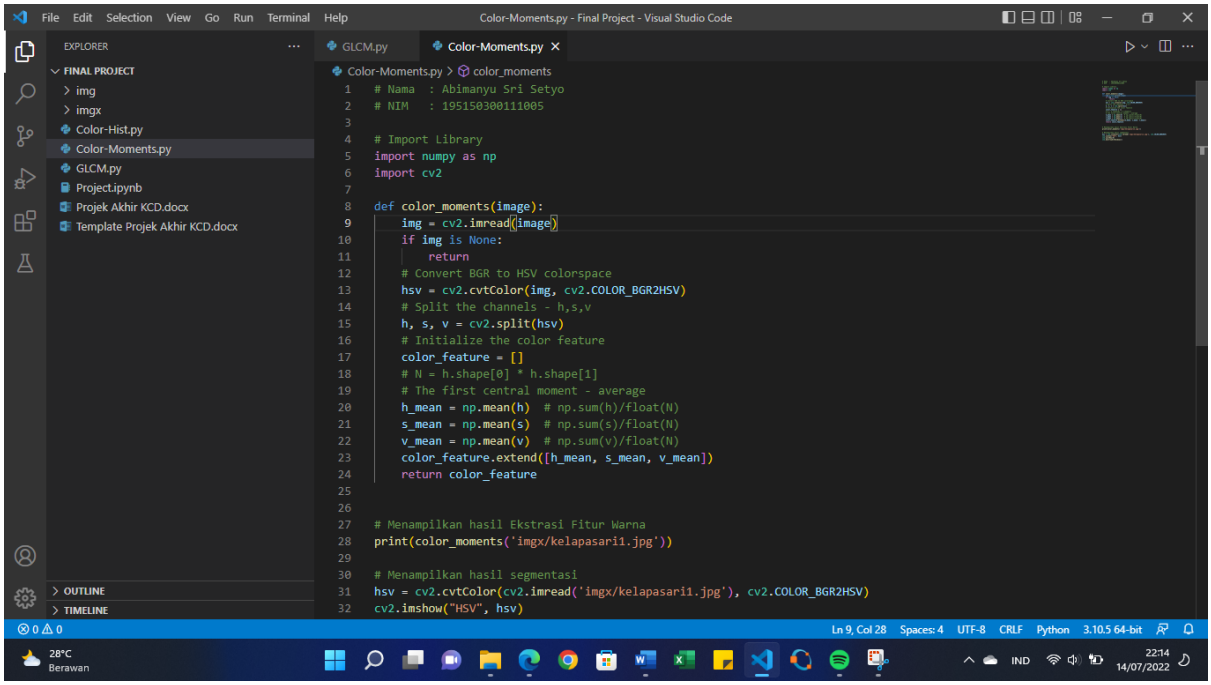
GLCM.py

```
# Nama  : Abimanyu Sri Setyo
# NIM   : 195150300111005

# Import Library
```

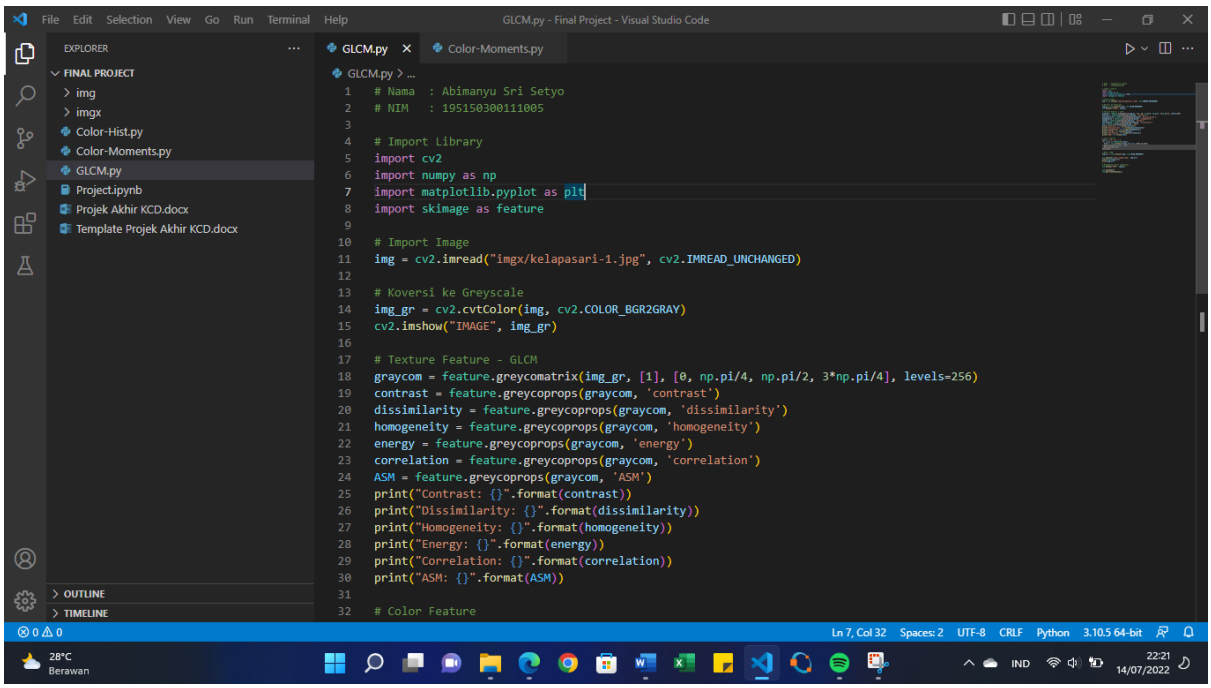
```python
import cv2
import numpy as np
import matplotlib.pyplot as plt
import skimage as feature

# Import Image
img = cv2.imread("imgx/kelapasari-1.jpg", cv2.IMREAD_UNCHANGED)

# Koversi ke Greyscale
img_gr = cv2.cvtColor(img, cv2.COLOR_BGR2GRAY)
cv2.imshow("IMAGE", img_gr)

# Texture Feature - GLCM
graycom = feature.greycomatrix(img_gr, [1], [0, np.pi/4, np.pi/2,
3*np.pi/4], levels=256)
contrast = feature.greycoprops(graycom, 'contrast')
dissimilarity = feature.greycoprops(graycom, 'dissimilarity')
homogeneity = feature.greycoprops(graycom, 'homogeneity')
energy = feature.greycoprops(graycom, 'energy')
correlation = feature.greycoprops(graycom, 'correlation')
ASM = feature.greycoprops(graycom, 'ASM')
print("Contrast: {}".format(contrast))
print("Dissimilarity: {}".format(dissimilarity))
print("Homogeneity: {}".format(homogeneity))
print("Energy: {}".format(energy))
print("Correlation: {}".format(correlation))
print("ASM: {}".format(ASM))

# Color Feature
color = ('b','g','r')
for i,col in enumerate(color):
  histr = cv2.calcHist([img],[i],None,[256],[0,256])
  plt.plot(histr,color = col)
  plt.xlim([0,256])
plt.show()

# BGR -> RGB
img_arr = cv2.cvtColor(img, cv2.COLOR_BGR2GRAY)

cv2.imwrite('opncv_sample.png', img_arr)
print(type(img_arr))
print(img_arr)

# Menampilkan hasil segmentasi
cv2.imshow("GRAY", img_gr)

cv2.waitKey(0)
cv2.destroyAllWindows()
```

Beri screen shoot implementasi program pada python

1. Color moment

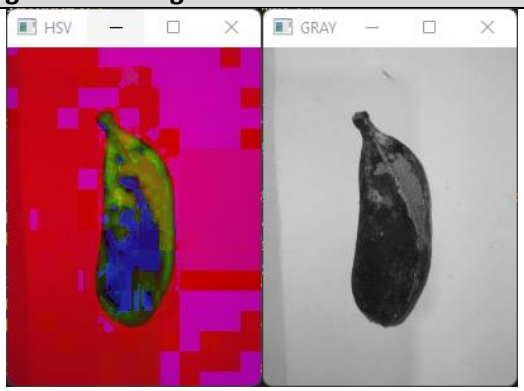
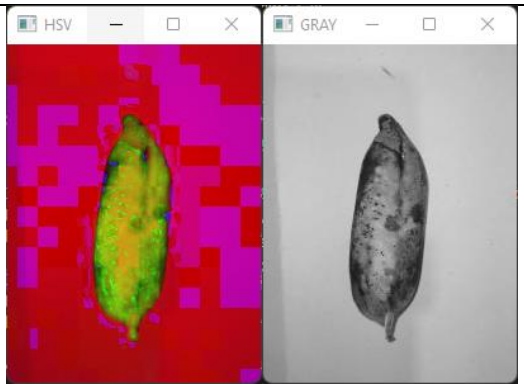
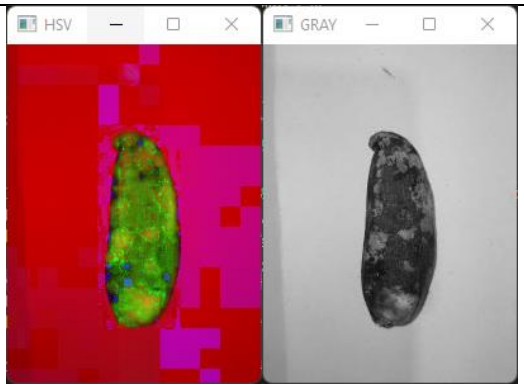


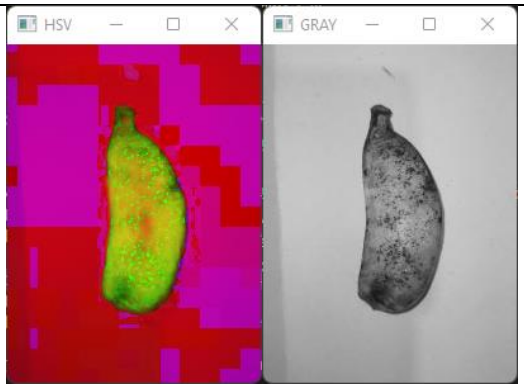
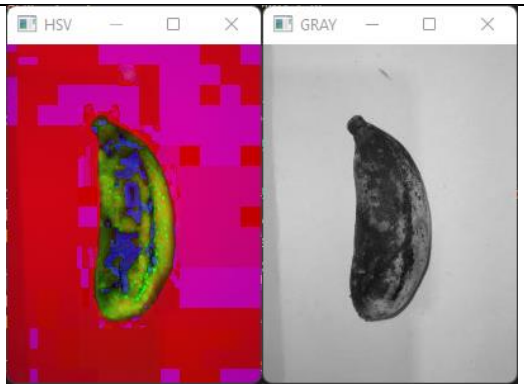
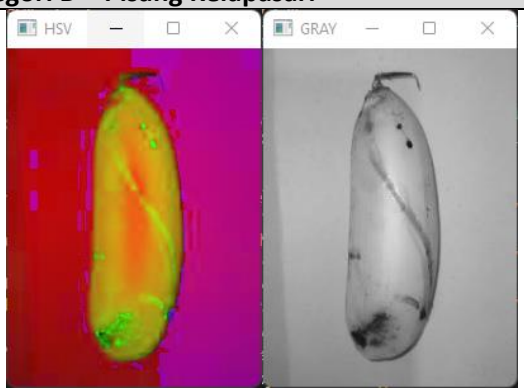
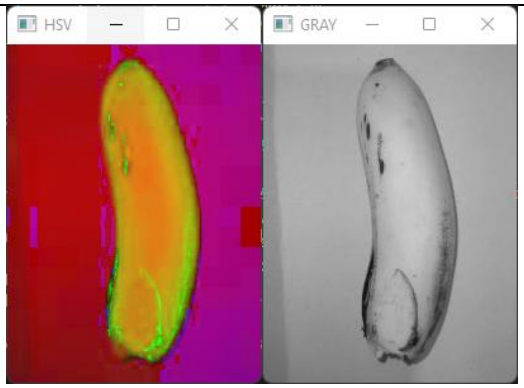
2. GLCM

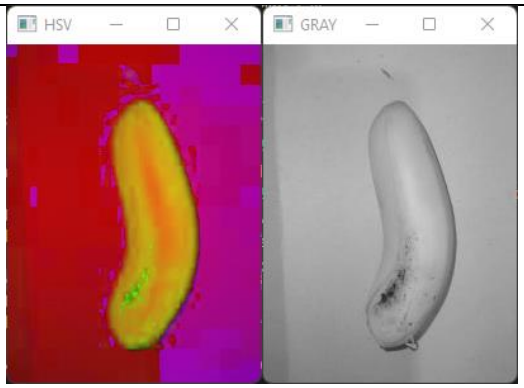


BAB 5. HASIL DAN PEMBAHASAN

Isi hasil segmentasi yang sudah baik berikut nilai fitur di Tabel berikut:

	Hasil Segmentasi (HSV dan Grayscale)	Nilai Fitur 1 (Color Moment)	Nilai Fitur 2 (GLCM)
Kategori A – Pisang Awak			
1		[67.71097378277153, 13.000168539325843, 168.86185393258427]	Contrast: [[23.49535714 94.83462425 69.77819811 74.62904749]]
2		[58.71138576779026, 24.119494382022474, 178.20243445692884]	Contrast: [[29.91545113 96.39486908 80.9349745 101.25272981]]
3		[33.750355805243444, 17.80368913857678, 172.4891947565543]	Contrast: [[32.60847744 101.06064155 77.77061337 94.56685684]]

4		[72.44934456928839, 27.466853932584268, 177.23440074906367]	Contrast: [[46.78005639 107.32861677 76.52155911 97.67686175]]
5		[65.40883895131086, 17.19810861423221, 173.76923220973782]	Contrast: [[33.46966165 103.38874825 77.26983231 90.25053841]]
Kategori B – Pisang Kelapasari			
1		[60.510299625468164, 42.07996254681648, 172.31013108614232]	Contrast: [[17.61806391 49.62865077 34.75662959 47.81490158]]
2		[53.911460674157304, 44.4810861423221, 166.42634831460674]	Contrast: [[14.21768797 61.89613481 55.46820244 65.60405411]]

3		[59.15964419475655, 34.24007490636704, 169.20561797752808]	Contrast: [[9.75159774 27.71243435 21.39837766 26.85684059]]
4		[47.46488764044944, 38.41370786516854, 170.95659176029963]	Contrast: [[15.55906015 35.06005592 32.40519075 47.54345033]]
5		[64.5387265917603, 38.08820224719101, 177.10865168539326]	Contrast: [[22.45342105 66.45709752 47.47925018 56.05423735]]

Rentang dari fitur 1 dan fitur 2 untuk setiap kategori adalah sebagai berikut:

Kategori	**Rentang Fitur 1 (Color Moment)**	**Rentang Fitur 2 (GLCM)**
A – Pisang Awak	[H,S,V] [33,17,168] – [72,27,178]	Contrast: [[23 94 69 74]] - [[46 107 80 101]]
B – Pisang Kelapasari	[H,S,V] [47,34,166] – [64,44,177]	Contrast: [[9 27 21 26]] - [[22 66 47 56]]