

Laporan

Tugas Besar - Pengolahan Citra Digital

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Penjelasan Algoritma Ekstraksi Area Region of Interest (ROI)

Sebelum mengambil area ROI, citra dibaca terlebih dahulu dengan menggunakan fungsi `cv2.imread()` dan memasukkan lokasi file citra pada parameter fungsi tersebut. Kemudian mencari titik tengah dari citra yang telah dibaca dengan menggunakan rumus sebagai berikut.

$$x_{tengah} = \frac{\text{lebar citra}}{2}$$

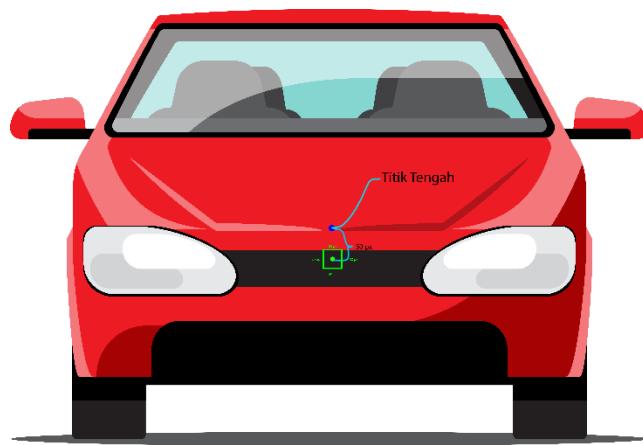
$$y_{tengah} = \frac{\text{tinggi citra}}{2}$$

Setelah mendapatkan titik tengah, program akan mencari titik tengah dari area ROI dengan rumus sebagai berikut.

$$x_{ROI} = x_{tengah}$$

$$y_{ROI} = y_{tengah} + 50$$

Kemudian dari titik tengah ROI tersebut, akan diambil area sebesar 50 piksel ke kanan, kiri, atas, dan bawah seperti ilustrasi berikut.



Setelah itu, program akan menghilangkan warna selain warna mobil. Deteksi warna dilakukan dengan cara mengubah warna gambar yang sebelumnya BGR menjadi HSV. Kemudian user akan memasukkan input berupa nilai dari hue min, sat min, value min, hue max, sat max, dan value max. Lalu gambar yang telah diubah menjadi HSV difilter warnanya sesuai dengan nilai yang diinputkan oleh user dengan menggunakan fungsi `cv2.inRange()`.

Selanjutnya gambar hasil deteksi warna ditampilkan dengan fungsi `cv2.bitwise_and()`. Fungsi ini berfungsi untuk menampilkan area citra asli dengan area citra mask yang beririsan. Setelah mendapatkan area ROI yang hanya berisi warna mobil, area ROI akan ditulis dan disimpan sebagai citra yang baru.

Kode Program

Kode program untuk mendapatkan ROI adalah sebagai berikut:

```
import cv2 as cv
import numpy as np
import os
from tkinter import *
from tkinter import messagebox
from tkinter import filedialog
from tkinter import ttk
from ttkbootstrap import Style           # ttkbootstrap version 0.5.1
import tkinter as tk
from PIL import Image, ImageTk

def setOriginal(img):
    imgTk = ImageTk.PhotoImage(img)
    lblImgOri.configure(image=imgTk)
    lblImgOri.image = imgTk
    lblImgOri.pack()

def setRoi(img):
    imgTk = ImageTk.PhotoImage(img)
    lblImgRoi.configure(image=imgTk)
    lblImgRoi.image = imgTk
    lblImgRoi.pack()

def setResult(img):
    imgTk = ImageTk.PhotoImage(img)
    lblImgRes.configure(image=imgTk)
    lblImgRes.image = imgTk
```

```

    lblImgRes.pack()

def opencv2Pill(img):
    img = cv.cvtColor(img, cv.COLOR_BGR2RGB)
    imgPill = Image.fromarray(img)
    return imgPill

def resizeImg(img, width, height):
    img = cv.resize(img, (width, height), interpolation=cv.INTER_CUBIC)
    return img

def getXMid(img):
    return int(img.shape[1] / 2)

def getYMid(img):
    return int(img.shape[0] / 2)

def drawCircleMid(img):
    xMid = getXMid(img)
    yMid = getYMid(img)
    cv.circle(img, (xMid,yMid), 5, (0,0,255), cv.FILLED)

def getRectanglePos(xMid, yMid):
    yRec = yMid + 50
    xRec = xMid - 25
    yRec = yRec - 25
    wRec, hRec = 50, 50
    return xRec, yRec, wRec, hRec

def drawRectangle(img, xMid, yMid):
    xRec, yRec, wRec, hRec = getRectanglePos(xMid, yMid)
    cv.circle(img, (xMid,yRec), 5, (0,255,255), cv.FILLED)
    cv.rectangle(img, (xRec,yRec), (xRec+wRec, yRec+hRec), (255,0,0), 2)

def getColorObject():
    hueMin = int(sldHueMin.get())
    satMin = int(sldSatMin.get())
    valueMin = int(sldValueMin.get())
    hueMax = int(sldHueMax.get())
    satMax = int(sldSatMax.get())
    valueMax = int(sldValueMax.get())
    return hueMin, satMin, valueMin, hueMax, satMax, valueMax

def getResult(img,):
    hueMin, satMin, valueMin, hueMax, satMax, valueMax = getColorObject()

```

```

    imgHSV = cv.cvtColor(img, cv.COLOR_BGR2HSV)
    lower = np.array([hueMin, satMin, valueMin])
    upper = np.array([hueMax, satMax, valueMax])
    mask = cv.inRange(imgHSV, lower, upper)

    imgResult = cv.bitwise_and(img, img, mask = mask)
    return imgResult

def getRoi(img):
    xMid = getXMid(img)
    yMid = getYMid(img)
    xRec, yRec, wRec, hRec = getRectanglePos(xMid, yMid)
    imgRoi = img[xRec:xRec+wRec, yRec:yRec+hRec]
    return imgRoi


def btnBrowseClicked():
    global fln

    fln = filedialog.askopenfilename(initialdir=os.getcwd(), title="Select
Image File",
                                    filetypes=(
                                        ("All Files", "*.*"),
                                        ("PNG File", "*.png"),
                                        ("JPG File", "*.jpg"),
                                        ("JFIF File", "*.jfif"))
                                    )

    img = cv.imread(fln)
    imgShow = opencv2Pill(resizeImg(img, 354, 472))

    setOriginal(imgShow)

def sldMove(e):
    global fln

    hueMin, satMin, valueMin, hueMax, satMax, valueMax = getColorObject()

    lblHueMin.configure(text=f'HUE Min : {hueMin}')
    lblSatMin.configure(text=f'SAT Min : {satMin}')
    lblValueMin.configure(text=f'VALUE Min : {valueMin}')
    lblHueMax.configure(text=f'HUE Max : {hueMax}')
    lblSatMax.configure(text=f'SAT Max : {satMax}')
    lblValueMax.configure(text=f'VALUE Max : {valueMax}')

```

```
    img = cv.imread(fln)
    imgResult = getResult(img)
    imgShow = opencv2Pill(resizeImg(imgResult, 354, 472))

    setResult(imgShow)

def btnRoiClicked():
    global fln

    imgResult = getResult(cv.imread(fln))
    imgRoi = getRoi(imgResult)
    imgShow = opencv2Pill(resizeImg(imgRoi, 100, 100))

    setRoi(imgShow)

def btnSaveClicked():
    global fln

    imgResult = getResult(cv.imread(fln))
    imgRoi = getRoi(imgResult)
    imgSave = opencv2Pill(resizeImg(imgRoi, 100, 100))

    extension = [("JPG File", "*.jpg")]
    file = filedialog.asksaveasfile(filetypes = extension, defaultextension =
extension)
    if file:
        imgSave.save(file)
        messagebox.showinfo('Notification', 'Image save successfully!')
    else:
        messagebox.showerror('Error', 'Image save failed!')

if __name__ == '__main__':
    style = Style()
    window = style.master
    fln = None

    frm = ttk.Frame(window, style='primary.TFrame')
    # frm.pack(side='top')
    frm.pack_propagate(0)
    frm.pack(fill=tk.BOTH, expand=1)
```

```

# Size window : 852 x 480

# Frame

frmImg = ttk.Frame(frm, style='secondary.TFrame', width=1000, height=472)
frmImg.grid(row=0, column=0, columnspan=3, padx=50, pady=20)

frmImgOri = ttk.Frame(frmImg, style='info.TFrame', width=354, height=472)
frmImgOri.grid(row=1, column=0, padx=30, pady=(10,20))

frmImgRoi = ttk.Frame(frmImg, style='info.TFrame', width=100, height=100)
frmImgRoi.grid(row=1, column=1, padx=30, pady=(10,20))

frmImgRes = ttk.Frame(frmImg, style='info.TFrame', width=354, height=472)
frmImgRes.grid(row=1, column=2, padx=30, pady=(10,20))

frmSlider = ttk.Frame(frm, style='secondary.TFrame', width=1000,
height=150)
frmSlider.grid(row=1, column=0, columnspan=2, padx=50, pady=20)

frmSliderMin = ttk.Frame(frmSlider, style='info.TFrame', width=500,
height=150)
frmSliderMin.grid(row=0, column=0, padx=20, pady=20)

frmBtn = ttk.Frame(frmSlider, style='secondary.TFrame', width=40,
height=150)
frmBtn.grid(row=0, column=1, padx=10, pady=20)

frmSliderMax = ttk.Frame(frmSlider, style='info.TFrame', width=500,
height=150)
frmSliderMax.grid(row=0, column=2, padx=20, pady=20)

# Label Description

lblDescOri = ttk.Label(frmImg, text='Original', font='20',
style='secondary.Inverse.TLabel')
lblDescOri.grid(row=0, column=0, padx=20, pady=(10,0))

lblDescRoi = ttk.Label(frmImg, text='ROI', font='20',
style='secondary.Inverse.TLabel')
lblDescRoi.grid(row=0, column=1, padx=20, pady=(10,0))

lblDescRes = ttk.Label(frmImg, text='Color Detection', font='20',
style='secondary.Inverse.TLabel')

```

```
    lblDescRes.grid(row=0, column=2, padx=20, pady=(10,0))

    # Label Image
    # Size Image : 354 x 472

    lblImgOri = ttk.Label(frmImgOri)
    # lblImgRes.pack()

    lblImgRoi = ttk.Label(frmImgRoi)
    # lblImgRes.pack()

    lblImgRes = ttk.Label(frmImgRes)
    # lblImgRes.pack()

    # Button

    btnBrowse = ttk.Button(frmBtn, text='Browse Image',
                           style='success.TButton', cursor="hand2", width=12, command=btnBrowseClicked)
    btnBrowse.grid(row=0, column=0, padx=10, pady=10)

    btnRoi = ttk.Button(frmBtn, text='ROI', style='success.TButton',
                        cursor="hand2", width=12, command=btnRoiClicked)
    btnRoi.grid(row=1, column=0, padx=10, pady=10)

    btnSave = ttk.Button(frmBtn, text='Save ROI', style='success.TButton',
                          cursor="hand2", width=12, command=btnSaveClicked)
    btnSave.grid(row=0, column=1, padx=10, pady=10)

    btnExit = ttk.Button(frmBtn, text='Exit', style='danger.TButton',
                          cursor="hand2", width=12, command=lambda: exit())
    btnExit.grid(row=1, column=1, padx=10, pady=10)

    # Slider

    sldHueMin = ttk.Scale(frmSliderMin, from_=0, to=179, value=0,
                          orient='horizontal', style='info.Horizontal.TScale', length=255,
                          command=sldMove)
    lblHueMin = ttk.Label(frmSliderMin, text=f'HUE Min : {sldHueMin.get()}', style='info.Inverse.TLabel', width=15)
    lblHueMin.grid(row=0, column=0, padx=20, pady=10)
    sldHueMin.grid(row=0, column=1, padx=20, pady=10)
```

```
    sldSatMin = ttk.Scale(frmSliderMin, from_=0, to=255, value=0,
orient='horizontal', style='info.Horizontal.TScale', length=255,
command=sldMove)
    lblSatMin = ttk.Label(frmSliderMin, text=f'SAT Min : {sldSatMin.get()}', style='info.Inverse.TLabel', width=15)
    lblSatMin.grid(row=1, column=0, padx=20, pady=10)
    sldSatMin.grid(row=1, column=1, padx=20, pady=10)

    sldValueMin = ttk.Scale(frmSliderMin, from_=0, to=255, value=0,
orient='horizontal', style='info.Horizontal.TScale', length=255,
command=sldMove)
    lblValueMin = ttk.Label(frmSliderMin, text=f'VALUE Min : {sldValueMin.get()}', style='info.Inverse.TLabel', width=15)
    lblValueMin.grid(row=2, column=0, padx=20, pady=10)
    sldValueMin.grid(row=2, column=1, padx=20, pady=10)

    sldHueMax = ttk.Scale(frmSliderMax, from_=0, to=179, value=179,
orient='horizontal', style='info.Horizontal.TScale', length=255,
command=sldMove)
    lblHueMax = ttk.Label(frmSliderMax, text=f'HUE Max : {sldHueMax.get()}', style='info.Inverse.TLabel', width=15)
    lblHueMax.grid(row=0, column=0, padx=20, pady=10)
    sldHueMax.grid(row=0, column=1, padx=20, pady=10)

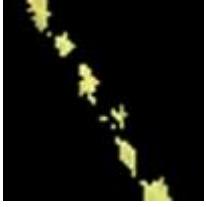
    sldSatMax = ttk.Scale(frmSliderMax, from_=0, to=255, value=255,
orient='horizontal', style='info.Horizontal.TScale', length=255,
command=sldMove)
    lblSatMax = ttk.Label(frmSliderMax, text=f'SAT Max : {sldSatMax.get()}', style='info.Inverse.TLabel', width=15)
    lblSatMax.grid(row=1, column=0, padx=20, pady=10)
    sldSatMax.grid(row=1, column=1, padx=20, pady=10)

    sldValueMax = ttk.Scale(frmSliderMax, from_=0, to=255, value=255,
orient='horizontal', style='info.Horizontal.TScale', length=255,
command=sldMove)
    lblValueMax = ttk.Label(frmSliderMax, text=f'VALUE Max : {sldValueMax.get()}', style='info.Inverse.TLabel', width=15)
    lblValueMax.grid(row=2, column=0, padx=20, pady=10)
    sldValueMax.grid(row=2, column=1, padx=20, pady=10)
```

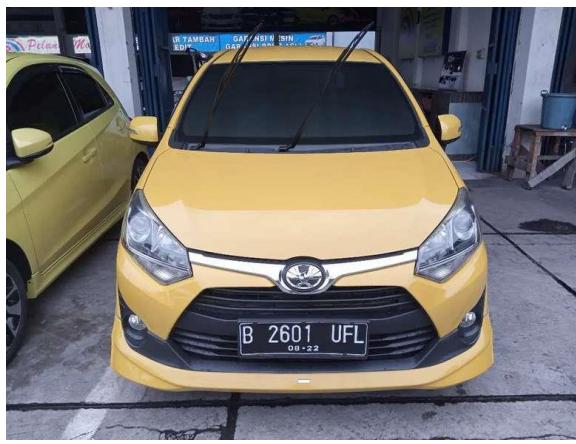
```
    window.title("Color Detection")
    # window.geometry("1280x720")
    window.resizable(0, 0)
    window.mainloop()
```

Hasil Running Program untuk Proses Ekstraksi ROI

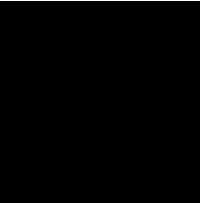
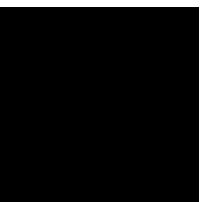
No.	Citra	ROI	Keterangan
1.	 <div style="text-align: center;">  JUAL - BELI - TUKAR TAMBAH </div> <div style="text-align: right; margin-top: -10px;">  </div>		Tidak Baik
2	 <div style="text-align: center;">  JUAL - BELI - TUKAR TAMBAH </div> <div style="text-align: right; margin-top: -10px;">  </div>		Tidak Baik

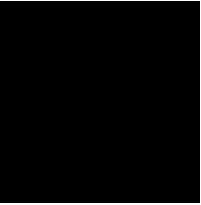
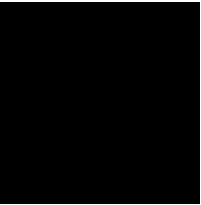
3			Tidak Baik	
4			Kurang Optimal	

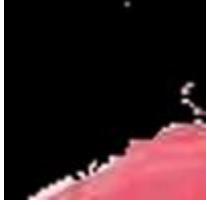
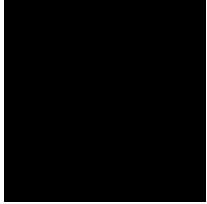
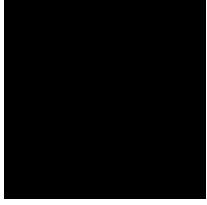
5	 <p>SANUWA MOBIL JL. Ngagel 181 A</p>		Tidak Baik
6	 <p>OXX AUTOS MIRACLE AUTO</p>		Tidak Baik
7	 <p>CUN-CUN AUTO JUAL BELI MOBIL BEKAS BERKUALITAS CASH/KREDIT/TURAT TEMBARA</p>		Kurang Optimal

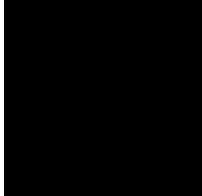
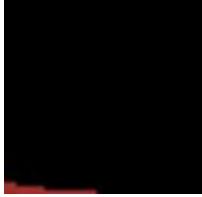
8			Tidak Baik
9			Tidak Baik
10			Tidak Baik

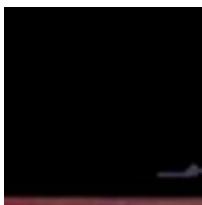
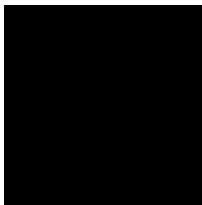
11			Tidak Baik
12			Tidak Baik
13			Tidak Baik

14			Tidak Baik
15			Tidak Baik
16			Tidak Baik

17			Tidak Baik
18			Tidak Baik
19			Tidak Baik

20			Tidak Baik
21			Tidak Baik
22			Tidak Baik

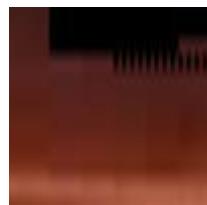
23			Sangat Baik
24	 		Tidak Baik
25			Tidak Baik

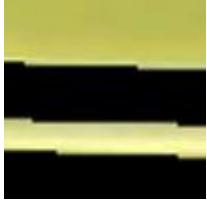
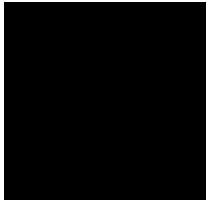
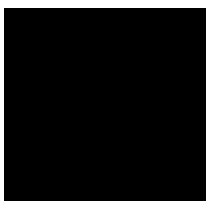
26			Kurang Optimal
27			Tidak Baik
28			Tidak Baik

29			Tidak Baik	
30			Tidak Baik	
31			Tidak Baik	

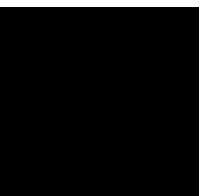
32			Tidak Baik
33			Tidak Baik
34			Tidak Baik

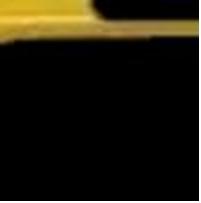
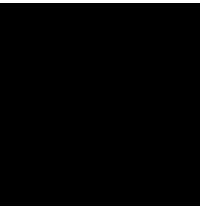
35	 <div style="display: flex; justify-content: space-between;"> <div style="flex: 1;"> <p>Olx AUTOS JUAL - BELI - TUKAR TAMBAH</p> </div> <div style="flex: 1; text-align: right;">  </div> </div>		Tidak Baik
36	 <div style="display: flex; justify-content: space-between;"> <div style="flex: 1;"> <p>Olx AUTOS JUAL - BELI - TUKAR TAMBAH</p> </div> <div style="flex: 1; text-align: right;">  </div> </div>		Tidak Baik
37			Tidak Baik

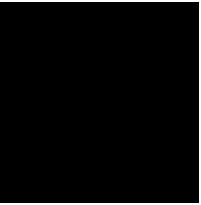
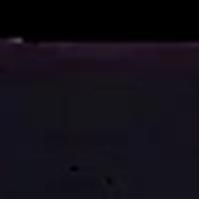
38			Tidak Baik
39			Sangat Baik
40			Tidak Baik

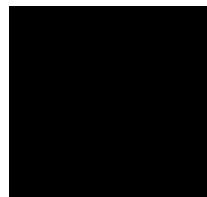
41			Kurang Optimal
42			Tidak Baik
43			Tidak Baik

44			Sangat Baik
45			Kurang Optimal
46			Sangat Baik

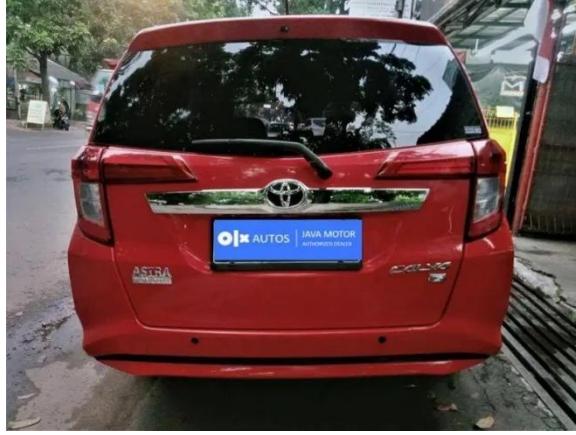
47	 <p>OIX AUTOS JUAL - BELI - TUKAR TAMBAH</p>		Kurang Optimal
48			Sangat Baik
49			Tidak Baik

50	 O x AUTOS JUAL - BELI - TUKAR TAMBAH		Tidak Baik
51			Tidak Baik
52			Tidak Baik

53			Tidak Baik
54			Tidak Baik
55			Sangat Baik

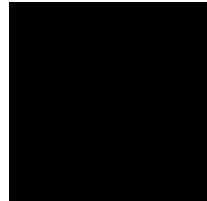
56	 <p>OIX AUTOS AUTHORIZED DEALER MEGA JAYA MOBIL</p>		Kurang Optimal
57			Kurang Optimal
58			Tidak Baik

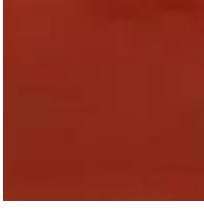
59				Tidak Baik
60				Tidak Baik
61				Tidak Baik

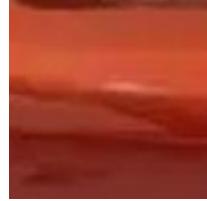
62	 <p>OJX AUTOS JUAL - BELI - TUKAR TAMBAH</p>		Tidak Baik
63			Sangat Baik
64	 <p>OJX AUTOS JUAL - BELI - TUKAR TAMBAH</p>		Kurang Optimal

65			Sangat Baik
66	 Olx AUTOS JUAL - BELI - TUKAR TAMBAH		Kurang Optimal
67	 Olx AUTOS JUAL - BELI - TUKAR TAMBAH		Sangat Baik

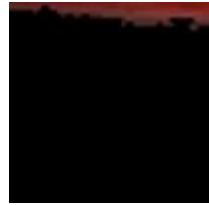
68	 <p>Olx AUTOS AUTHORIZED DEALER</p> <p>USED CAR SOLUTION</p>		Sangat Baik
69	 <p>Olx AUTOS JUAL - BELI - TUKAR TAMBAH</p>		Sangat Baik
70	 <p>Olx AUTOS JUAL - BELI - TUKAR TAMBAH</p>		Sangat Baik

71			Kurang Optimal
72			Tidak Baik
73			Kurang Optimal

74	 <p>O x AUTOS JUAL - BELI - TUKAR TAMBAH</p>		Sangat Baik
75	 <p>O x AUTOS JUAL - BELI - TUKAR TAMBAH</p>		Sangat Baik
76	 <p>O x AUTOS AUTHORIZED DEALER MAMIN MOTOR</p>		Sangat Baik

77			Sangat Baik
78	 		Sangat Baik
79			Sangat Baik

80



Tidak Baik

Rekap Hasil Eksperimen Program ROI

Kategori	Jumlah	Percentase
Sangat Baik	18/80	22,5%
Kurang Optimal	12/80	15,0%
Tidak Baik	50/80	62,5%