Optical Character Recognition: Pada KTM

Kelompok 8

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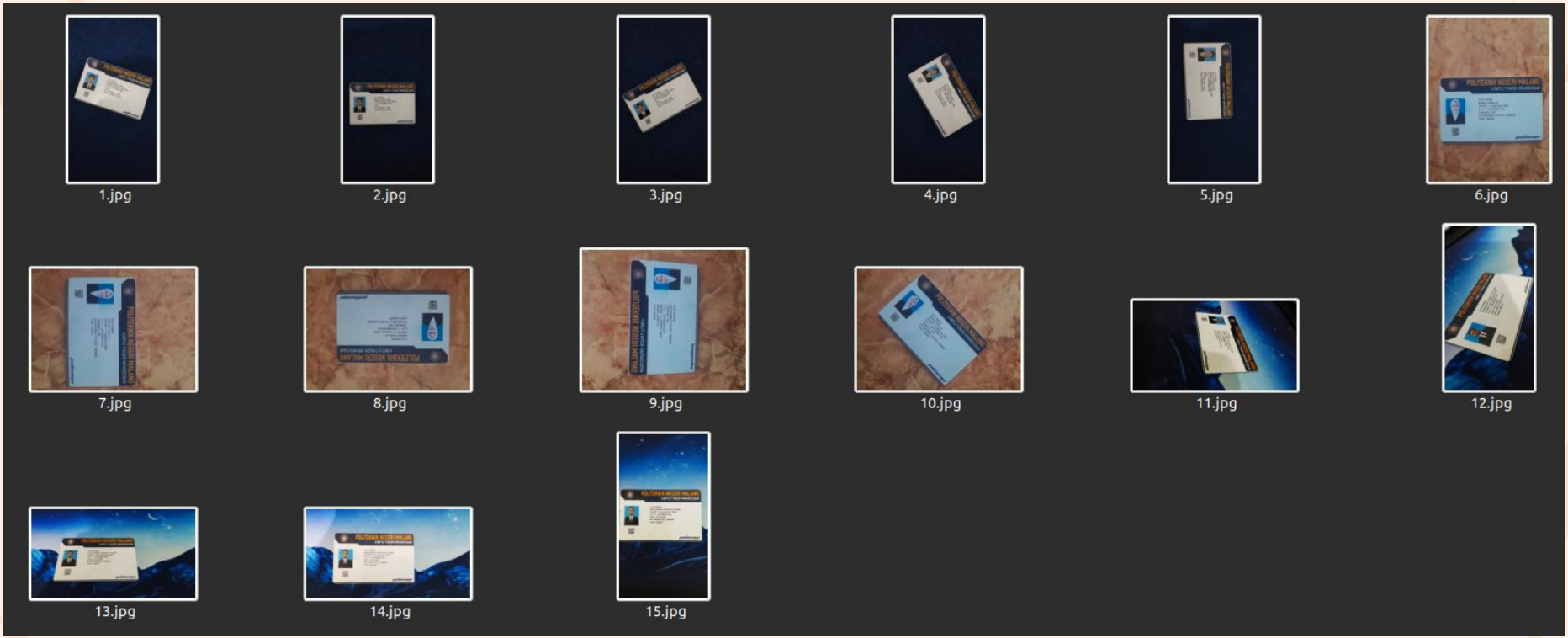
Analisis data



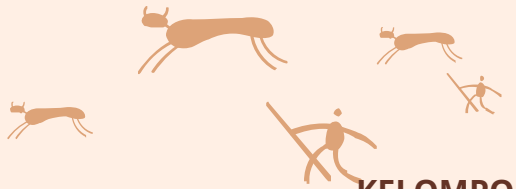
Tahapan

Preprocessing

1. Fix Orientasi & Perspektif
2. Penentuan ROI

Proses OCR

1. Preprocessing
2. Deteksi karakter (segmentasi)
3. Pengenalan karakter



01

Preprocessing

Pengolahan gambar

KELOMPOK 8

Preprocessing

1. Orientasi dan perspektif

- Pada ktm memiliki sebuah objek yang sudah pasti memiliki bentuk dan ukuran yang konsisten yakni pasfoto mahasiswa

- Dari foto tersebut didapatkan 4 titik yang bisa digunakan untuk pembenaran perspektif KTM

Preprocessing

1. Orientasi dan perspektif

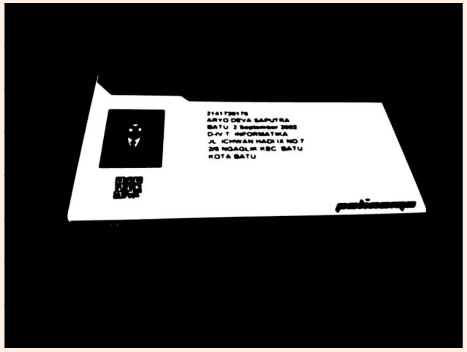
```
image = img.copy()
resize_ratio = 4000 / image.shape[0]
image = opencv_resize(image, resize_ratio)
gray = cv2.cvtColor(image, cv2.COLOR_BGR2GRAY)
# hilangkan noise
blurred = cv2.GaussianBlur(gray, (51, 51), 0)
thresh = cv2.threshold(blurred, 170, 255, cv2.THRESH_BINARY)[1]
edged = cv2.Canny(thresh, 100, 200, apertureSize=3)
contours, _ = cv2.findContours(edged, cv2.RETR_TREE, cv2.CHAIN_APPROX_SIMPLE)
largest_contours = sorted(contours, key = cv2.contourArea, reverse = True)[:10]
receipt_contour = get_contour(largest_contours)
if receipt_contour is None:
    return None
rect = contour_to_rect(receipt_contour)
pts1 = np.float32(rect)
# pts2 = np.float32([[375,25],[375,525],[0,525],[0,25]])
# pts2 = np.float32([[0,525],[0,25],[375,25],[375,525]])
pts2 = np.float32([[0, 450], [375, 450], [375, 950], [0, 950]])
# pts2 = np.float32([[100, 400], [475, 400], [475, 900], [100, 900]])
# pts2 = np.float32([[375, 525], [0, 525], [0, 25], [375, 25]])
M = cv2.getPerspectiveTransform(pts1,pts2)
dst = cv2.warpPerspective(image,M,(2100,1300))
```

Preprocessing

1. Orientasi dan perspektif (proses)

- Find contours

Grayscale dan blur



Thresholding

Canny dan Find Contours

Filter 10 contours terbesar

Preprocessing

1. Orientasi dan perspektif (proses)

- Cari contour berbentuk segi 4 dan ubah menjadi koordinat


```
array([[[1211, 1235]],

       [[1094, 1908]],

       [[1819, 1904]],

       [[1858, 1244]]], dtype=int32)
```

Preprocessing

1. Orientasi dan perspektif (proses)

- Warp perspective

```
pts1 = np.float32(rect)
# pts2 = np.float32([[375,25],[375,525],[0,525],[0,25]])
# pts2 = np.float32([[0,525],[0,25],[375,25],[375,525]])
pts2 = np.float32([[0, 450], [375, 450], [375, 950], [0, 950]])
# pts2 = np.float32([[100, 400], [475, 400], [475, 900], [100, 900]])
# pts2 = np.float32([[375, 525], [0, 525], [0, 25], [375, 25]])
M = cv2.getPerspectiveTransform(pts1,pts2)
dst = cv2.warpPerspective(image,M,(2100,1300))
```

Preprocessing

2. Penentuan ROI

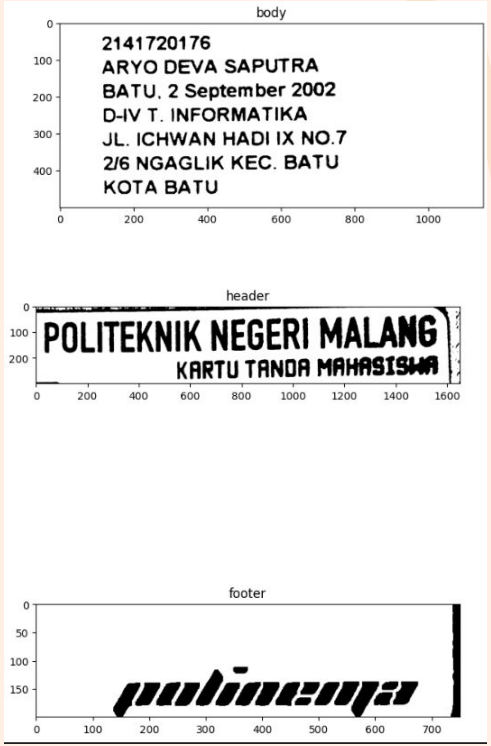
- Header, body, footer

```
text_area = dst
gray_text = cv2.cvtColor(text_area, cv2.COLOR_BGR2GRAY)

header = gray_text[0:300, 400:2050]
header_thres = cv2.threshold(header, 0, 255, cv2.THRESH_BINARY_INV + cv2.THRESH_OTSU)[1]
header_close = cv2.morphologyEx(header_thres, cv2.MORPH_OPEN, np.ones((3,3), np.uint8), iterations=1)

body = gray_text[420:920, 550:1700]
body_thres = cv2.threshold(body, 0, 255, cv2.THRESH_BINARY_INV + cv2.THRESH_OTSU)[1]
body_close = cv2.morphologyEx(body_thres, cv2.MORPH_OPEN, np.ones((3,3), np.uint8), iterations=1)
body_close = 255 - body_close

footer = gray_text[1100:1350, 1300:2050]
footer_thres = cv2.threshold(footer, 0, 255, cv2.THRESH_BINARY_INV + cv2.THRESH_OTSU)[1]
footer_close = cv2.morphologyEx(footer_thres, cv2.MORPH_OPEN, np.ones((3,3), np.uint8), iterations=3)
footer_close = 255 - footer_close
```



02

Proses OCR

Deteksi dan pengenalan karakter

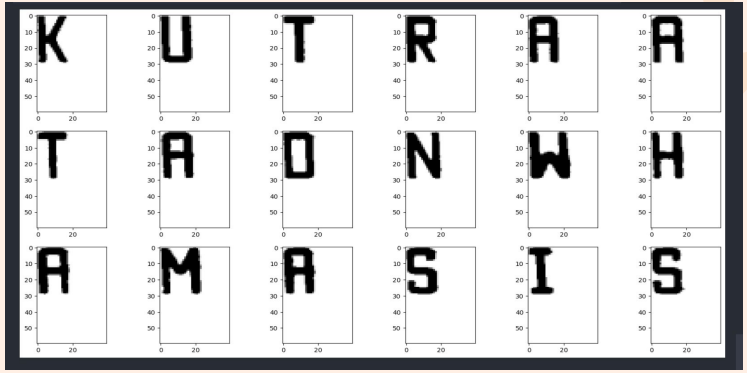
KELOMPOK 8

Proses OCR

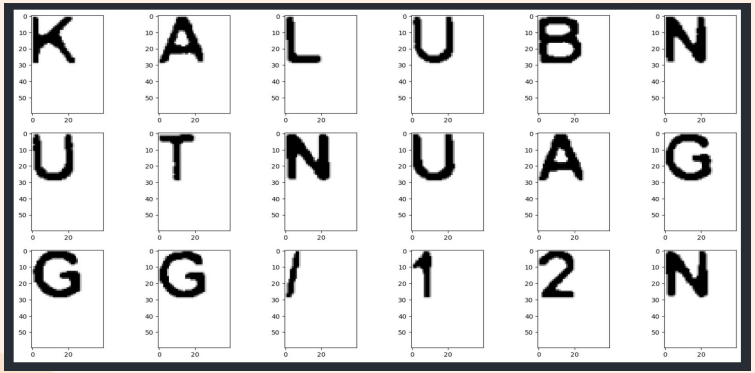
1. Deteksi Karakter

- Setelah didapatkan 3 bagian KTM dilakukan proses deteksi karakter yang nantinya akan digunakan untuk pengenalan karakter

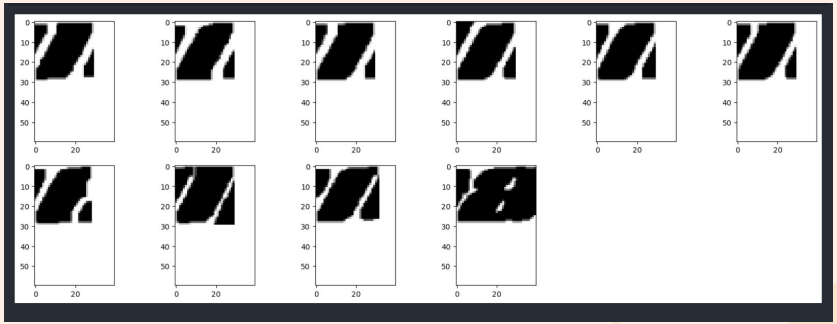
Header



Body



Footer



Proses OCR

1. Deteksi Karakter

- Pada tahap ini akan didapatkan karakter yang terdeteksi contours dan memenuhi syarat ukuran

```
contours, hierarchy = cv2.findContours(body, cv2.RETR_TREE, cv2.CHAIN_APPROX_SIMPLE)
roi_copy = cv2.cvtColor(body, cv2.COLOR_GRAY2BGR)
chars = []
for contour in contours:
    if cv2.contourArea(contour) > 50:
        [x,y,w,h] = cv2.boundingRect(contour)
        if h > 28 and h < 50:
            char = roi_copy[y:y+h, x:x+w]
            ratio_size = 30 / h
            char = opencv_resize(char, ratio_size)
            if char.shape[1] > 40:
                char = char[:,0:40]
            if char.shape[0] > 60:
                char = char[0:60,:]
            if char.shape[1] < 40:
                char = cv2.copyMakeBorder(char,0,0,0,40-char.shape[1],cv2.BORDER_CONSTANT,value=[255,255,255])
            if char.shape[0] < 60:
                char = cv2.copyMakeBorder(char,0,60-char.shape[0],0,0,cv2.BORDER_CONSTANT,value=[255,255,255])
            resize = tf.image.resize(tf.image.rgb_to_grayscale(char),(60,40))
            resize = tf.keras.preprocessing.image.img_to_array(resize)
            resize = resize / 255.0
            chars.append(resize)
```

Proses OCR

2. Pengenalan Karakter

Pada tahap ini karakter yang sudah dideteksi akan tandai dan diberi label sesuai karakter yang dikenali

```
class_names = ['0', '1', '2', '3', '4', '5', '6', '7', '8', '9', 'A', 'B', 'C', 'D', 'E', 'F', 'G', 'H',
'I', 'J', 'K', 'L', 'M', 'N', 'O', 'P', 'Q', 'R', 'S', 'T', 'U', 'V', 'W', 'X', 'Y', 'Z', 'a', 'b', 'c',
'd', 'e', 'f', 'g', 'h', 'i', 'j', 'k', 'l', 'm', 'n', 'o', 'p', 'q', 'r', 's', 't', 'u', 'v', 'w', 'x',
'y', 'z']

def get_chars_header(img):
    contours, _ = cv2.findContours(img, cv2.RETR_TREE, cv2.CHAIN_APPROX_SIMPLE)
    # image_with_contours = cv2.drawContours(text_area.copy(), contours, -1, (0,255,0), -1)
    roi_copy =  cv2.cvtColor(img, cv2.COLOR_GRAY2RGB)
    # add padding to the image
    roi_copy = cv2.copyMakeBorder(roi_copy,10,10,10,10,cv2.BORDER_CONSTANT,value=[255,255,255])
    img = cv2.cvtColor(img, cv2.COLOR_GRAY2RGB)
    for contour in contours:
        if cv2.contourArea(contour) > 100:
            [x,y,w,h] = cv2.boundingRect(contour)
            if h > 30 and h < 200:
                char = img[y:y+h, x:x+w]
                ratio_size = 30 / h
                char = opencv_resize(char, ratio_size)
                if char.shape[1] > 40:
                    char = char[:,0:40]
                if char.shape[0] > 60:
                    char = char[0:60,:]
                if char.shape[1] < 40:
                    char = cv2.copyMakeBorder(char,0,0,0,40-char.shape[1],cv2.BORDER_CONSTANT,value=[255,255,
                    255])
                if char.shape[0] < 60:
                    char = cv2.copyMakeBorder(char,0,60-char.shape[0],0,0,cv2.BORDER_CONSTANT,value=[255,255,
                    255])
                # check if black area is more than 50%
                black_area = np.sum(char == 0) / (char.shape[0] * char.shape[1])
                if black_area > 0.07:
                    resize = tf.image.resize(tf.image.rgb_to_grayscale(char),(60,40))
                    yhat = loaded_model.predict(tf.expand_dims(*np.expand_dims(resize/255, 0),0))
                    acc_pred = [f"{round(float(yhat[i][np.argmax(yhat[i])]),2)} - {class_names[np.argmax(yhat
                    [i])]}" for i in range(len(yhat))]
                    # add rectangle and text
                    cv2.rectangle(roi_copy, (x,y), (x+w,y+h), (0, 255, 0), 2)
                    cv2.putText(roi_copy, class_names[np.argmax(yhat[0])], (x,y), cv2.FONT_HERSHEY_SIMPLEX,
                    1, (0, 255, 0), 2)
    return roi_copy
plt.figure(figsize=(20,10))
plt.imshow(get_chars_header(header))
plt.show()
```

Proses OCR

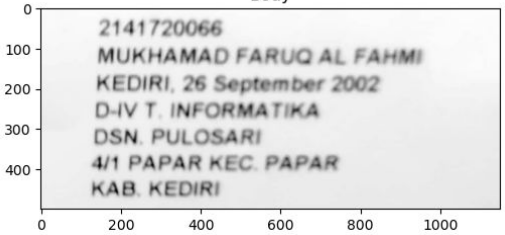
MUKHAMAD FARUQ AL FAHMI

Before

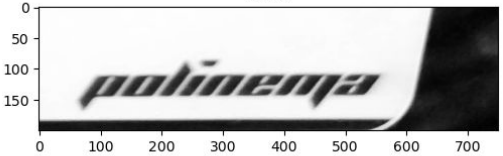
After

Header

Body

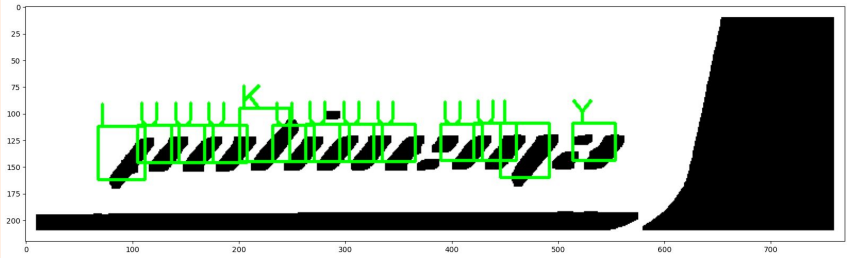


Footer



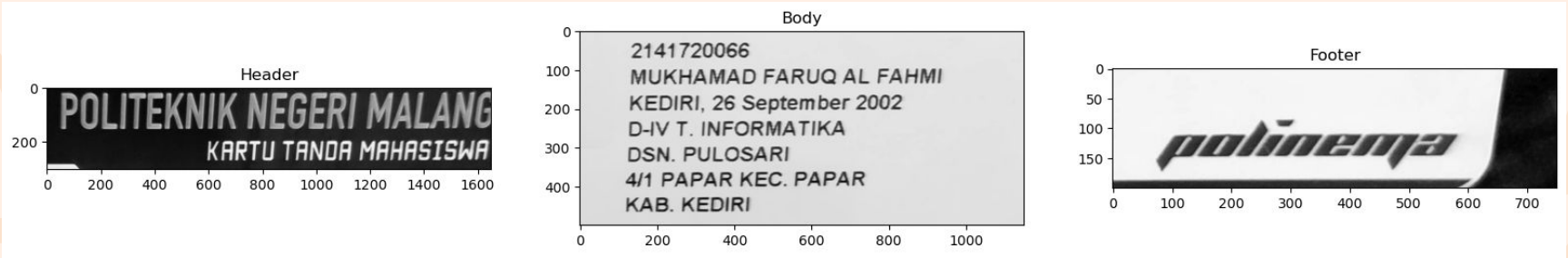
Proses OCR

MUKHAMAD FARUQ AL FAHMI



Proses OCR

MUKHAMAD FARUQ AL FAHMI



Proses OCR

MUKHAMAD FARUQ AL FAHMI

Proses OCR

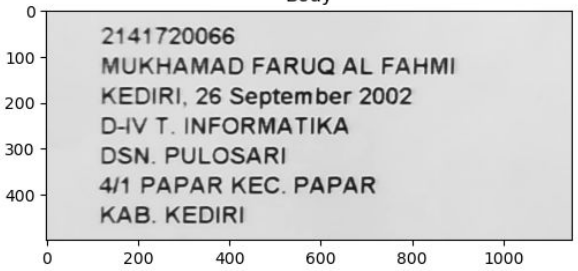
MUKHAMAD FARUQ AL FAHMI

Before

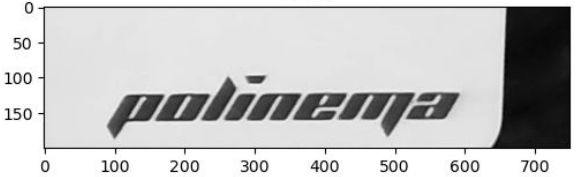
After

Header

Body

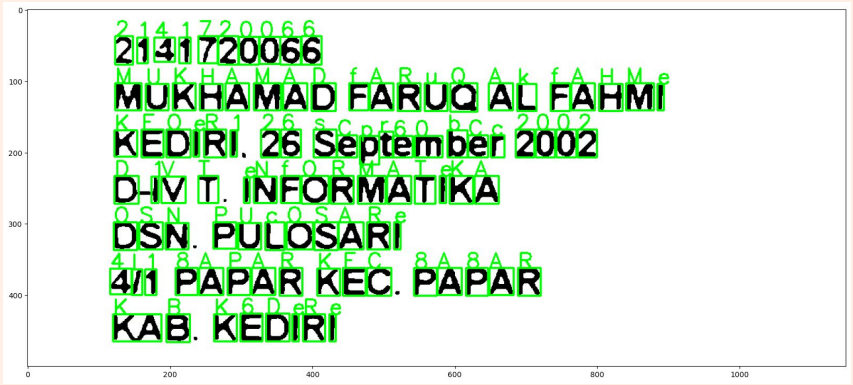


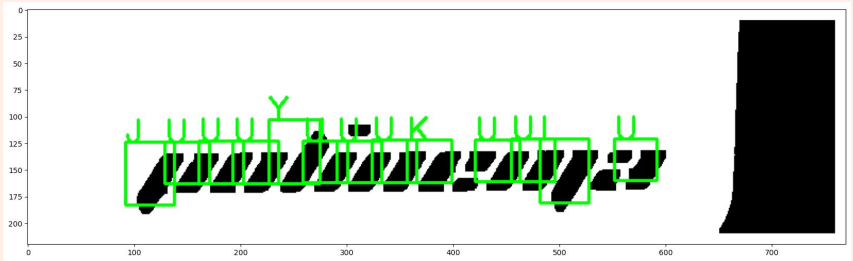
Footer



Proses OCR

MUKHAMAD FARUQ AL FAHMI





Proses OCR

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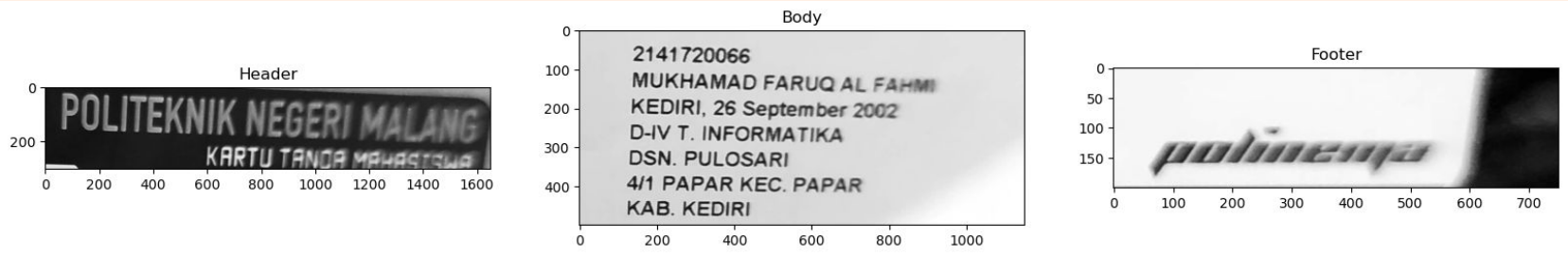

Proses OCR

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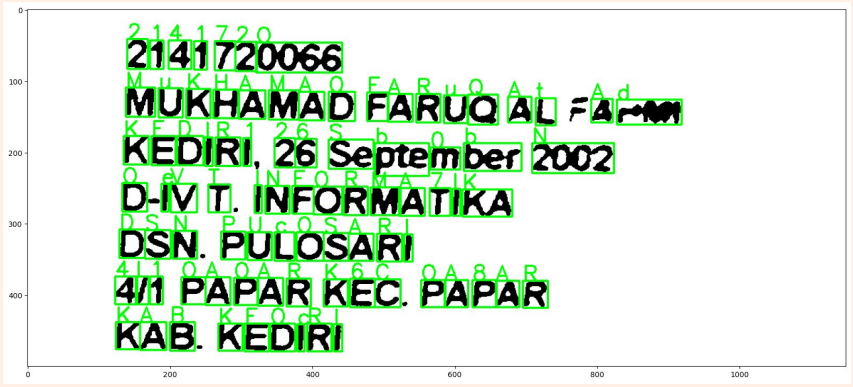
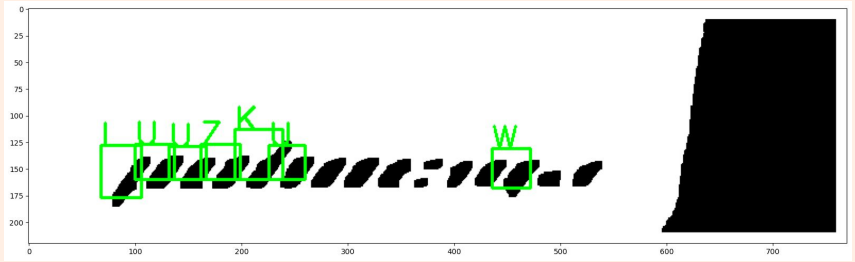




Proses OCR

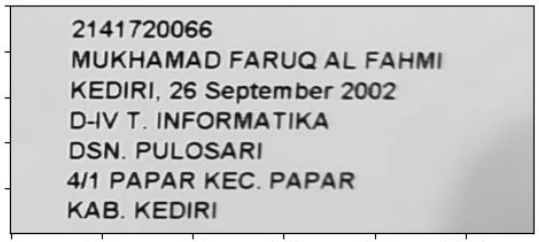
MUKHAMAD FARUQ AL FAHMI

Before

After

Header

Body



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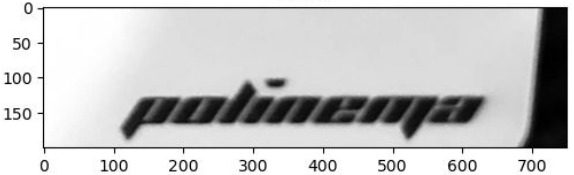
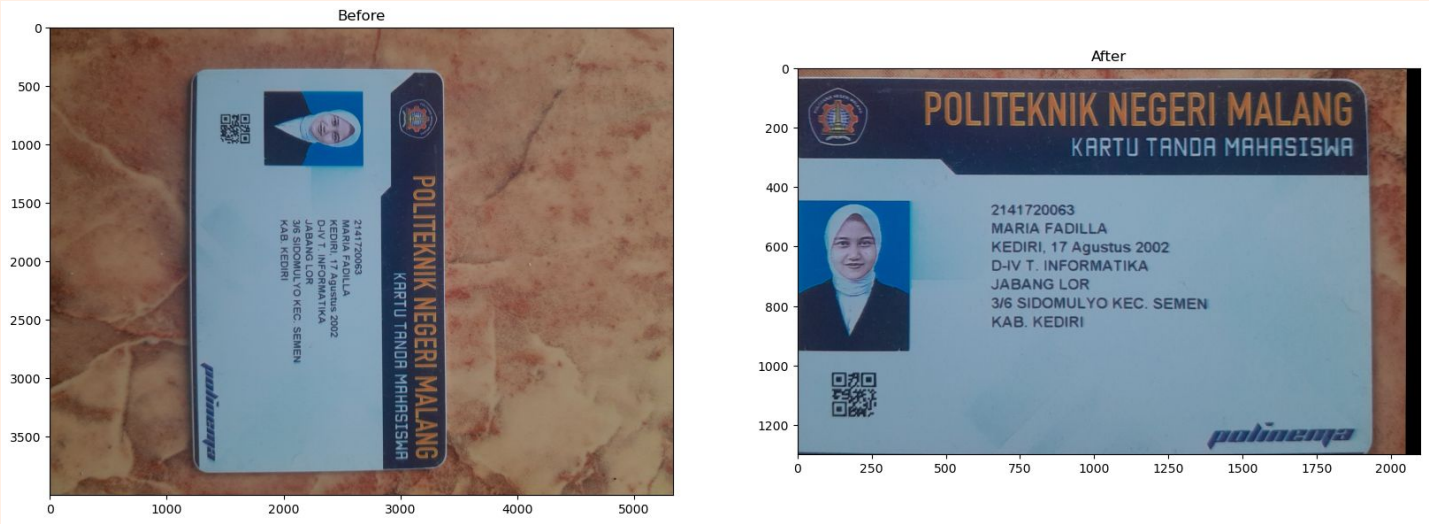


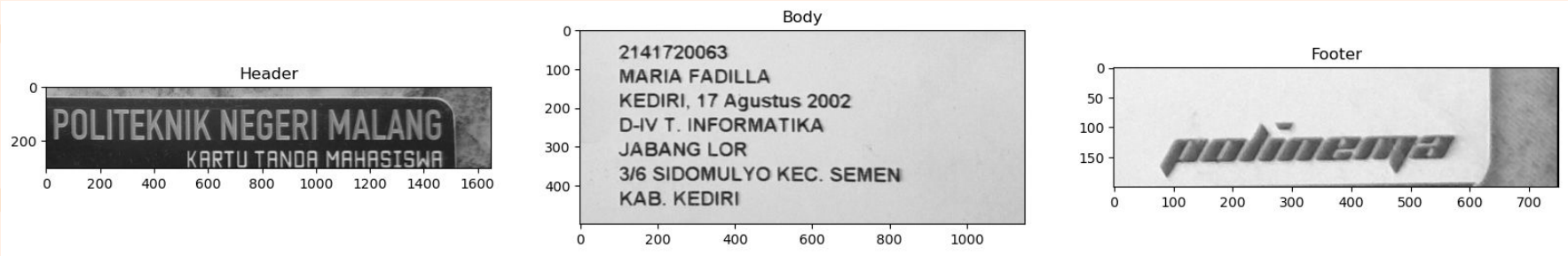
Proses OCR

MUKHAMAD FARUQ AL FAHMI

Proses OCR

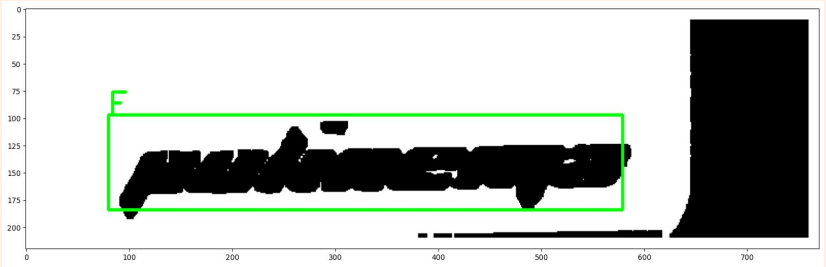
MARIA FADILLA





Proses OCR

MARIA FADILLA



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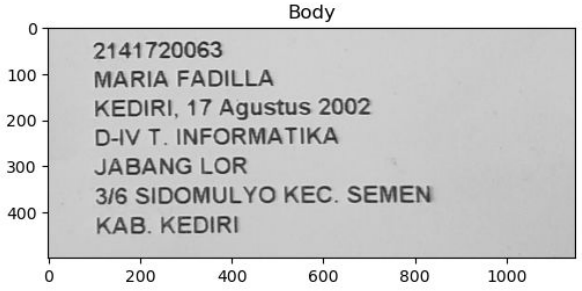

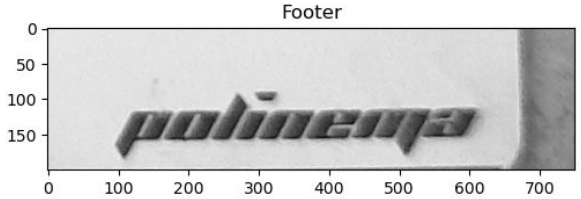

Proses OCR

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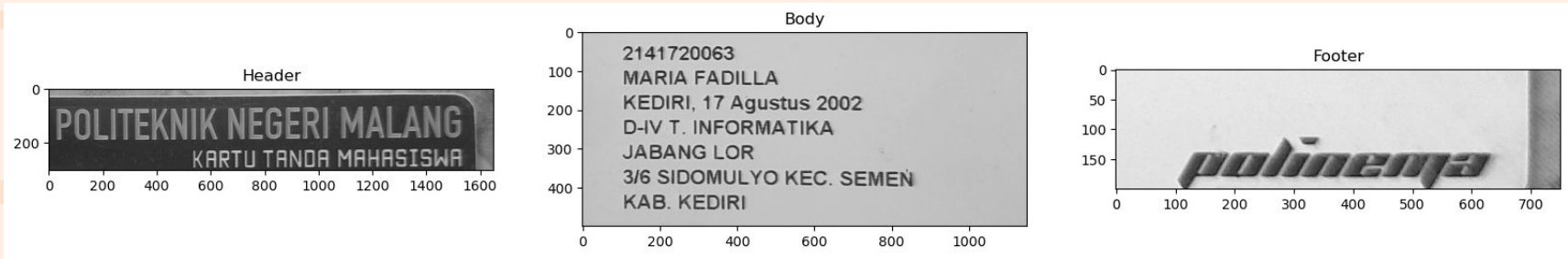
Proses OCR

MARIA FADILLA



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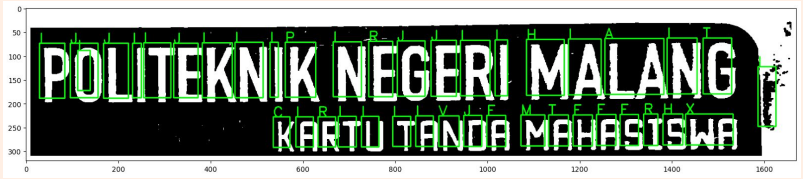

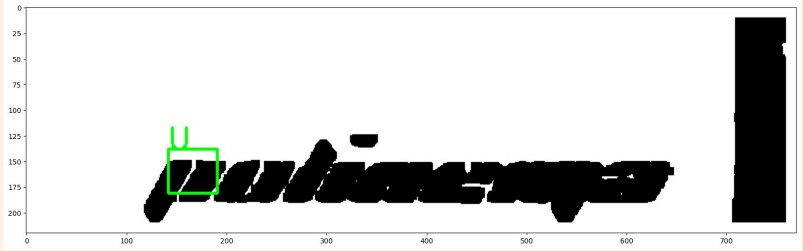

Proses OCR

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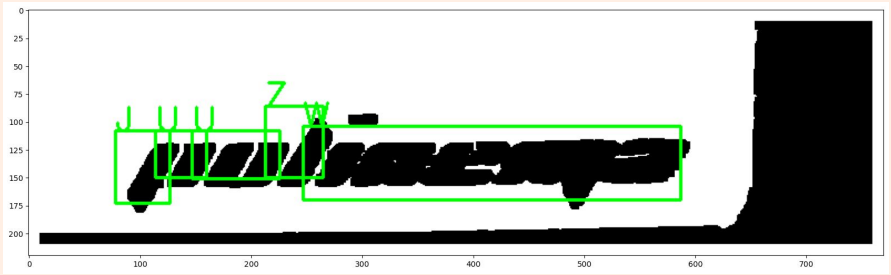
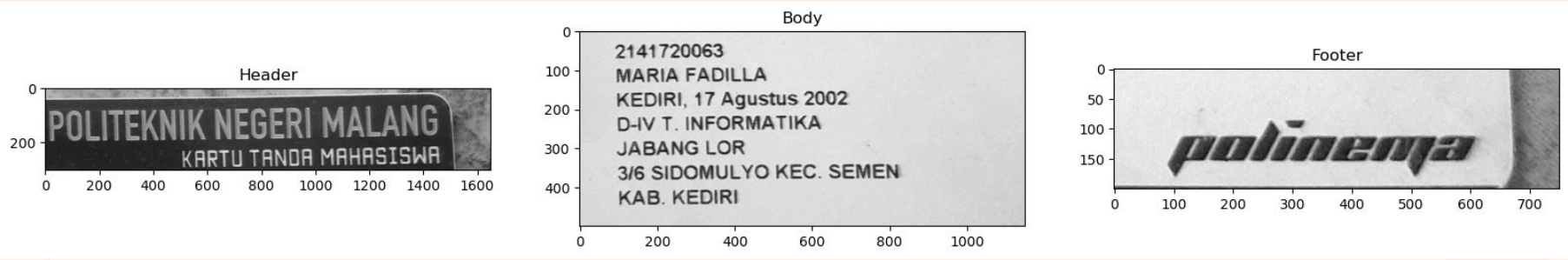
Proses OCR

MARIA FADILLA



Proses OCR

MARIA FADILLA



Proses OCR

MARIA FADILLA

Proses OCR

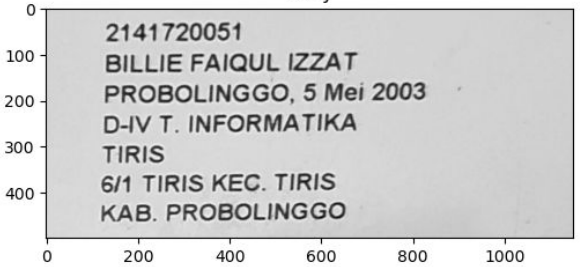
BILLIE FAIQUL IZZAT

Before

After

Header

Body



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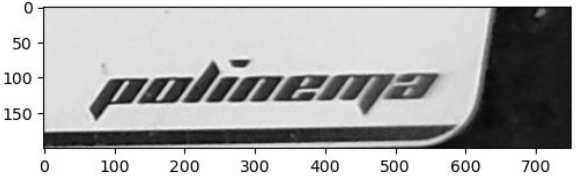
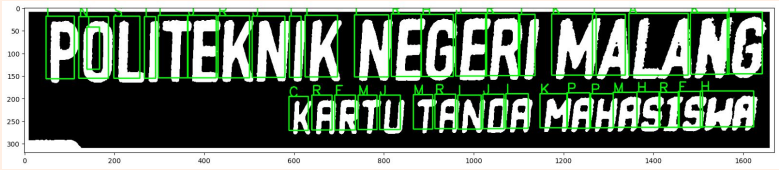
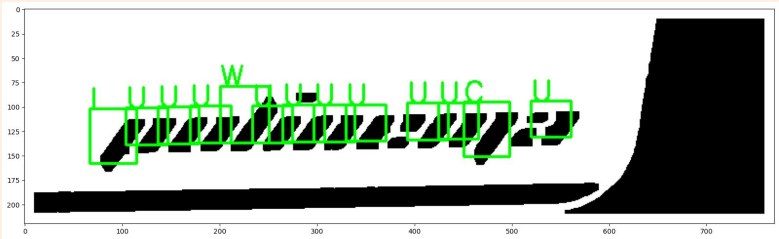


Proses OCR

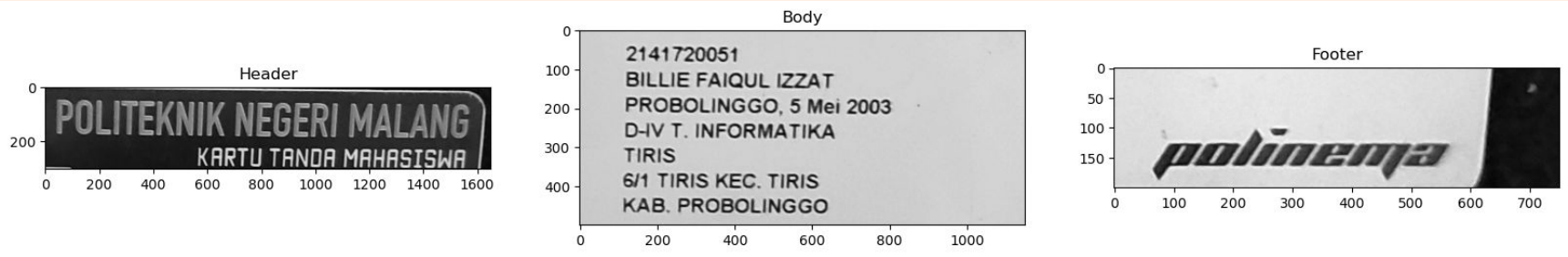
BILLIE FAIQUL IZZAT





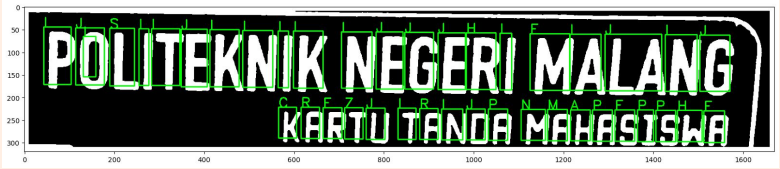
Proses OCR

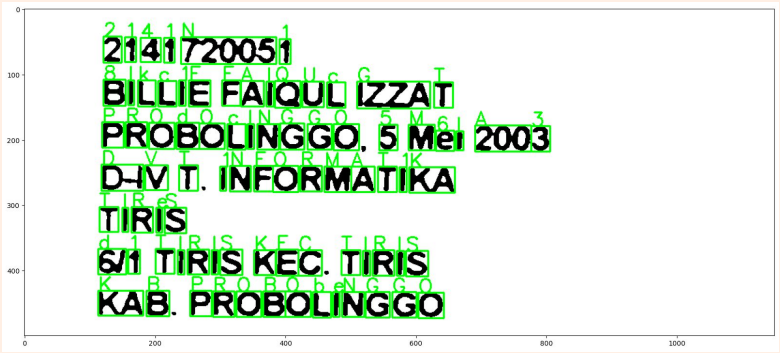
BILLIE FAIQUL IZZAT

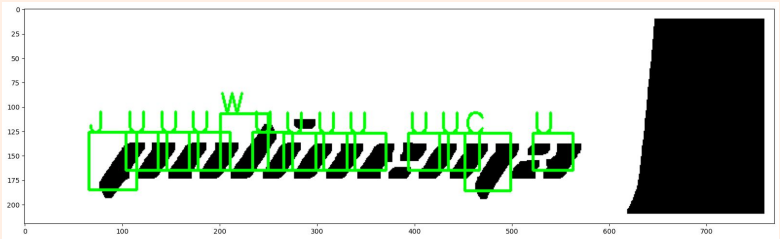


Proses OCR

BILLIE FAIQUL IZZAT







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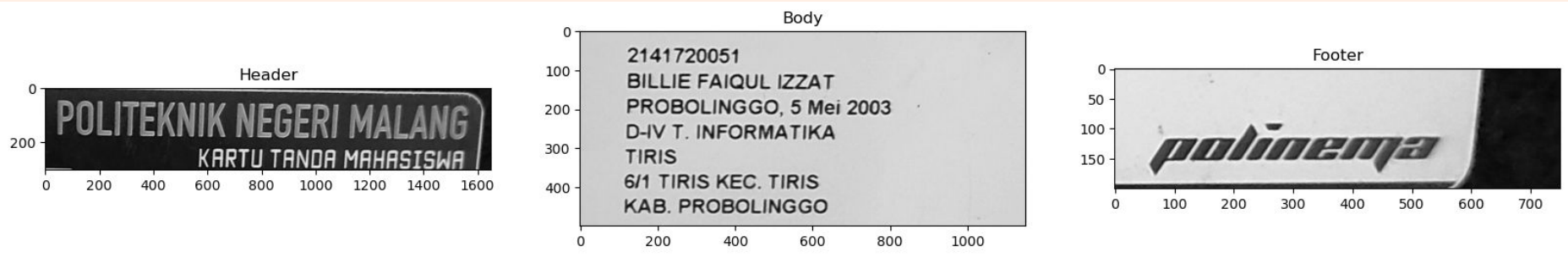

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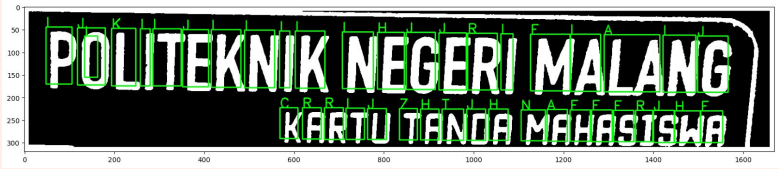

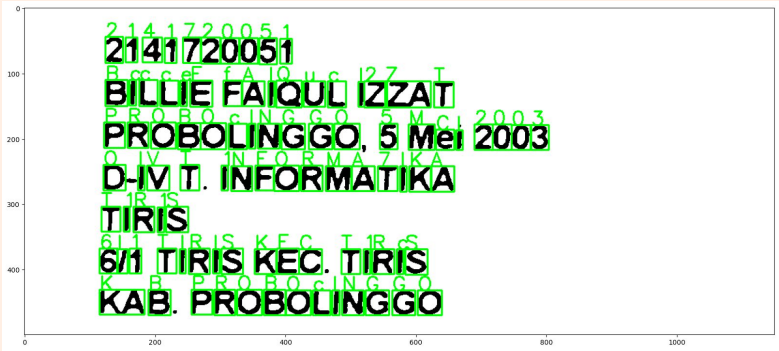

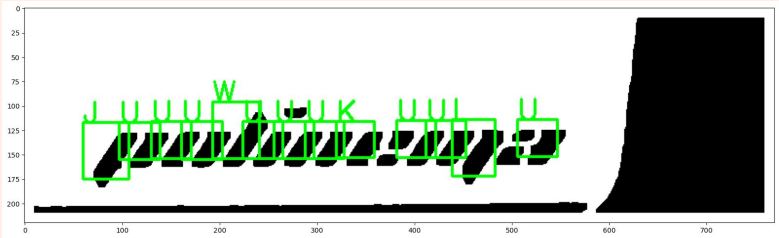

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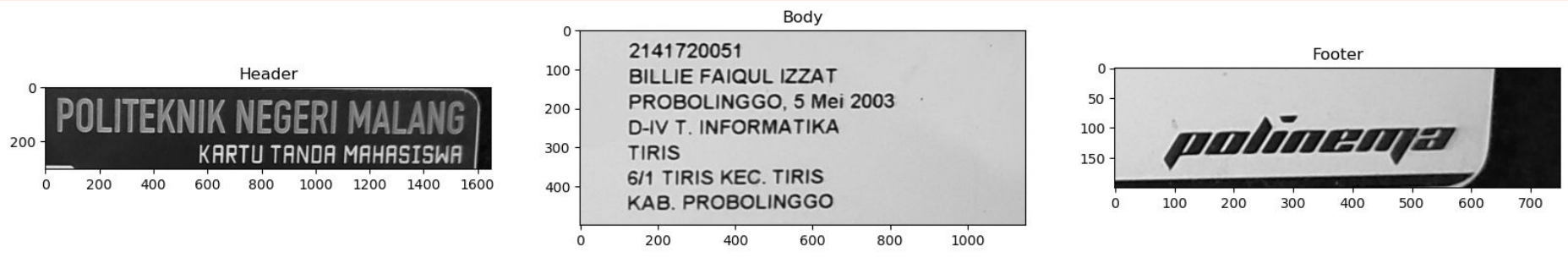

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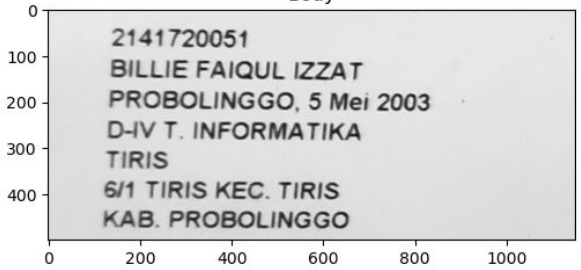
Before

After

Header

Body



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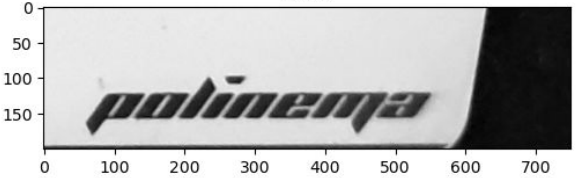

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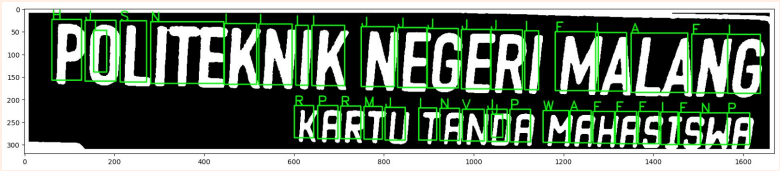
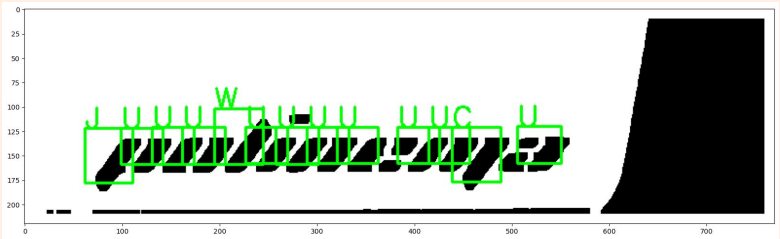
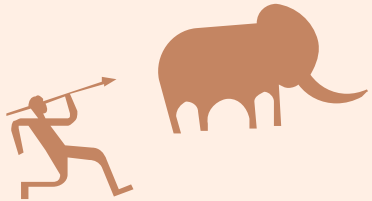




THANKS !

Do you have any questions ?



KELOMPOK 8