

Optical Character Recognition: Pada KTM

Kelompok 8



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Analisis data



1.jpg



2.jpg



3.jpg



4.jpg



5.jpg



6.jpg



7.jpg



8.jpg



9.jpg



10.jpg



11.jpg



12.jpg



13.jpg



14.jpg



15.jpg

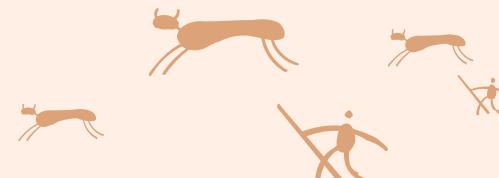
Tahapan

Preprocessing

1. Fix Orientasi & Perspektif
2. Penentuan ROI

Proses OCR

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



01

Preprocessing

Pengolahan gambar



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 pemberian 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))
```

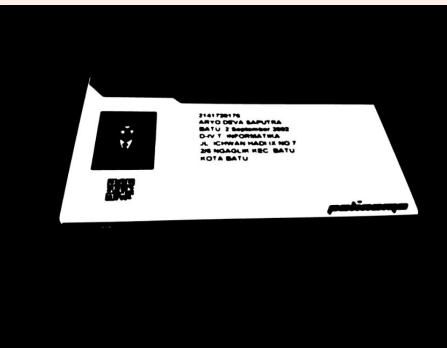
Preprocessing

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

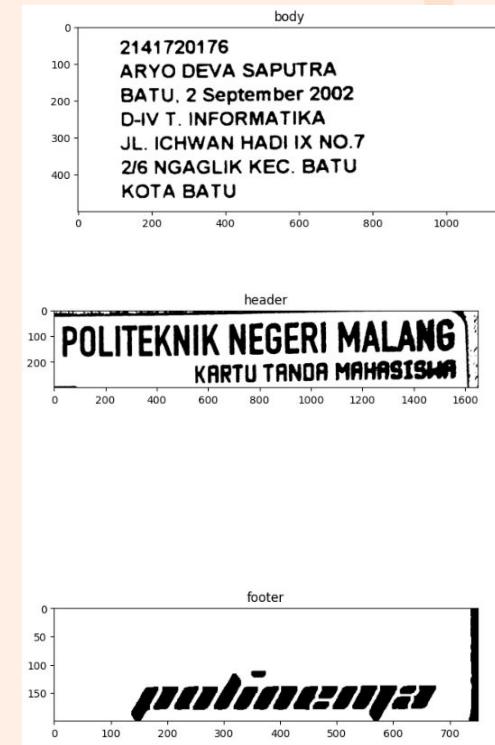
- Header, body, footer

```
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

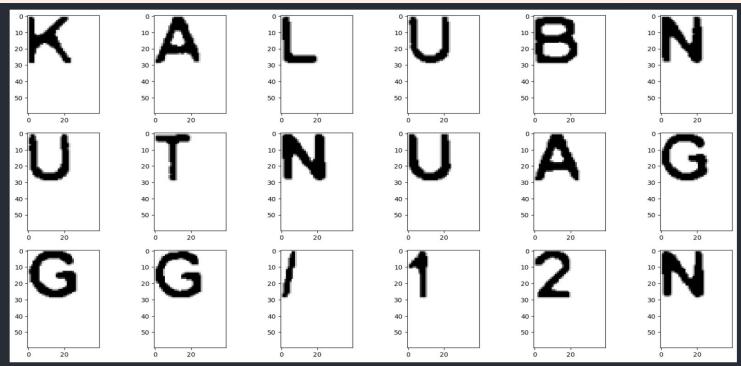
Deteksi dan pengenalan karakter

Proses OCR

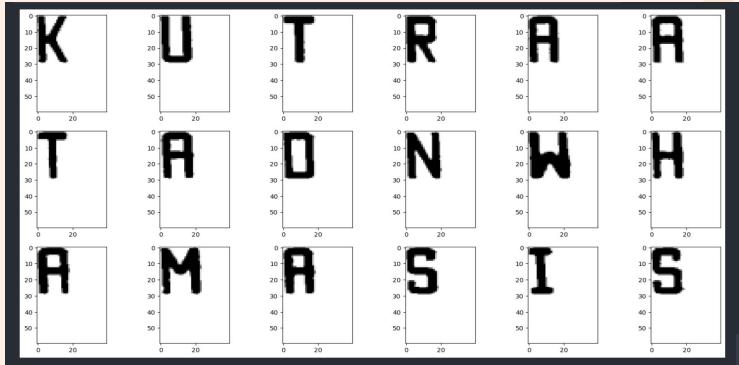
1. Deteksi Karakter

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

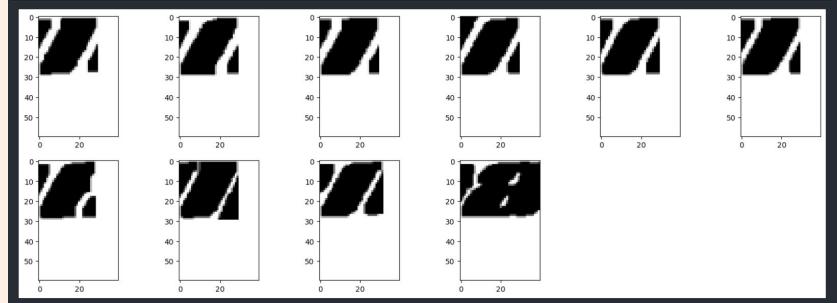
Body



Header



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_BGR2GRAY)
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

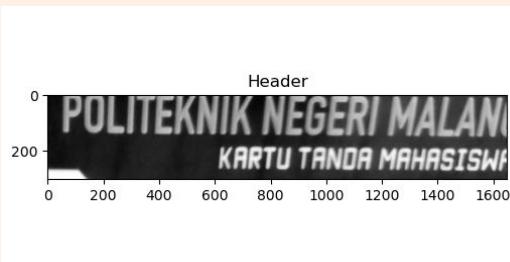
2. Pengenalan Karakter

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 = [{"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



Body

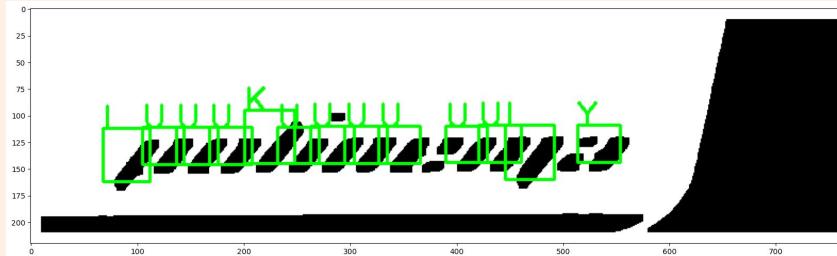
2141720066
MUKHAMAD FARUQ AL FAHMI
KEDIRI, 26 September 2002
D-IV T. INFORMATIKA
DSN. PULOSARI
4/1 PAPAR KEC. PAPAR
KAB. KEDIRI

Footer

polinema

Proses OCR

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Proses OCR

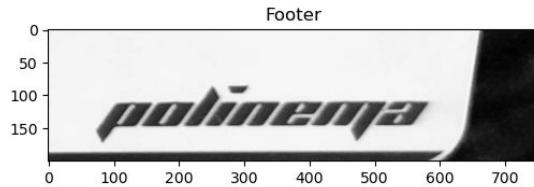
MUKHAMAD FARUQ AL FAHMI



Body

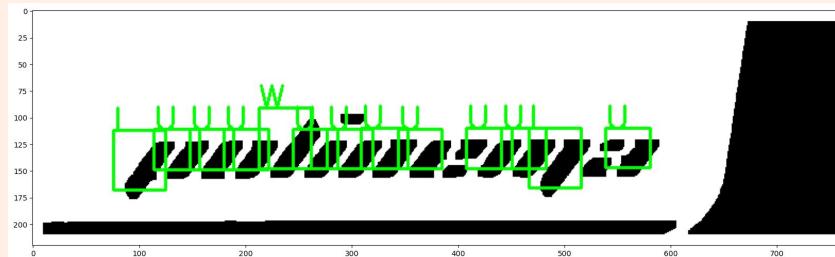
2141720066
MUKHAMAD FARUQ AL FAHMI
KEDIRI, 26 September 2002
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DSN. PULOSARI
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KAB. KEDIRI

This figure shows the extracted body text from the student ID card. It includes the student's ID number, name, date of birth, faculty, department, address, and district. The text is presented in a standard black font against a white background. The bounding box for this text is approximately [360, 150, 630, 330].



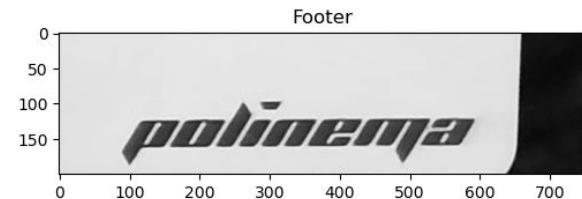
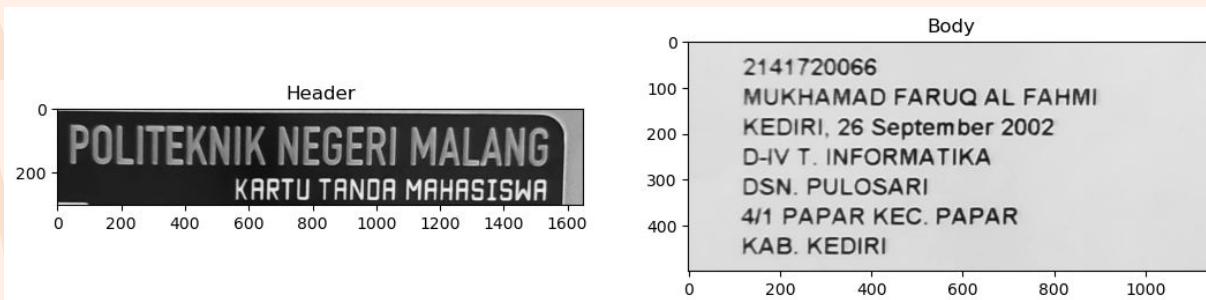
Proses OCR

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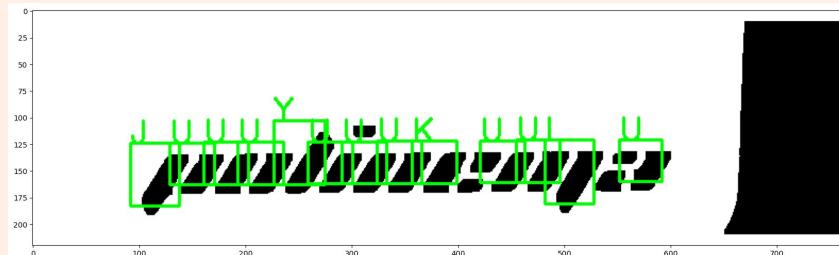
Proses OCR

MUKHAMAD FARUQ AL FAHMI



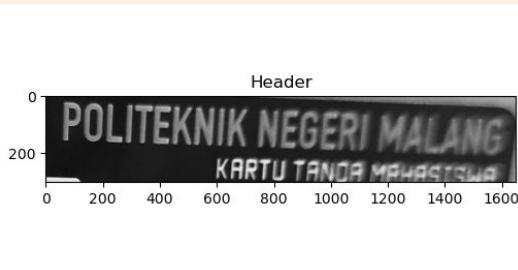
Proses OCR

MUKHAMAD FARUQ AL FAHMI



Proses OCR

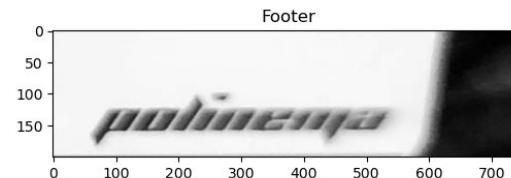
MUKHAMAD FARUQ AL FAHMI



Body

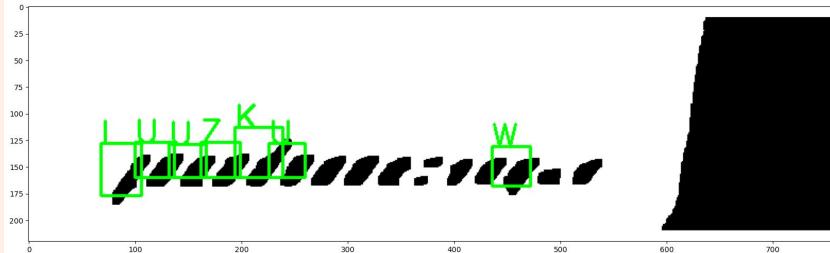
2141720066
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KEDIRI, 26 September 2002
D-IV T. INFORMATIKA
DSN. PULOSARI
4/1 PAPAR KEC. PAPAR
KAB. KEDIRI

This image shows the 'Body' component of the ID card, containing the student's identification number, name, date of birth, degree program, advisor's name, and address.



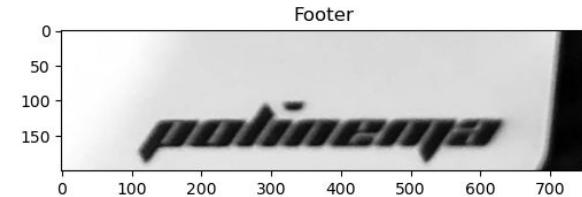
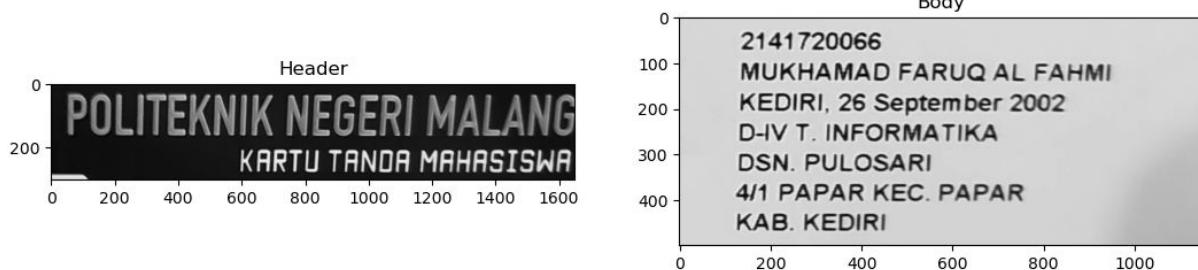
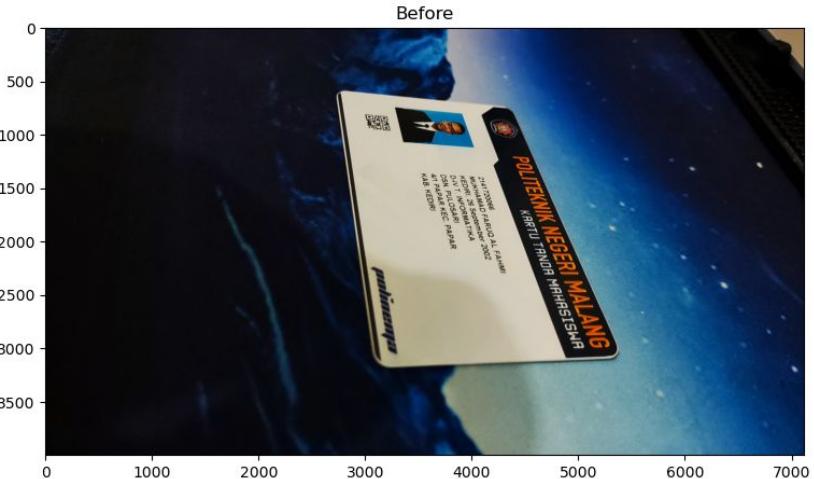
Proses OCR

MUKHAMAD FARUQ AL FAHMI



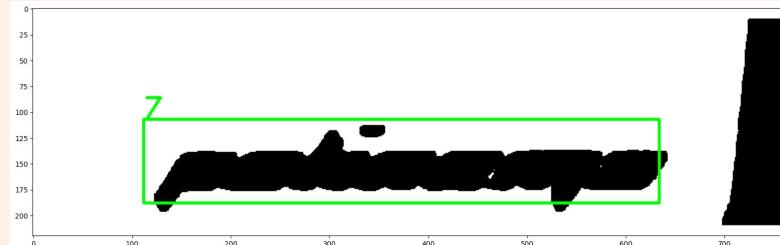
Proses OCR

MUKHAMAD FARUQ AL FAHMI



Proses OCR

MUKHAMAD FARUQ AL FAHMI



Proses OCR

MARIA FADILLA



Body

2141720063
MARIA FADILLA
KEDIRI, 17 Agustus 2002
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3/6 SIDOMULYO KEC. SEMEN
KAB. KEDIRI

Footer

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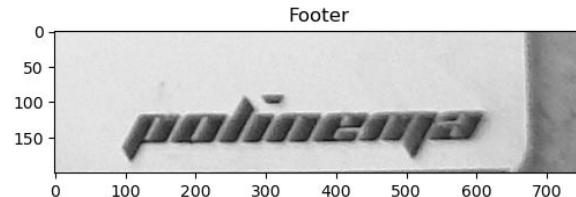
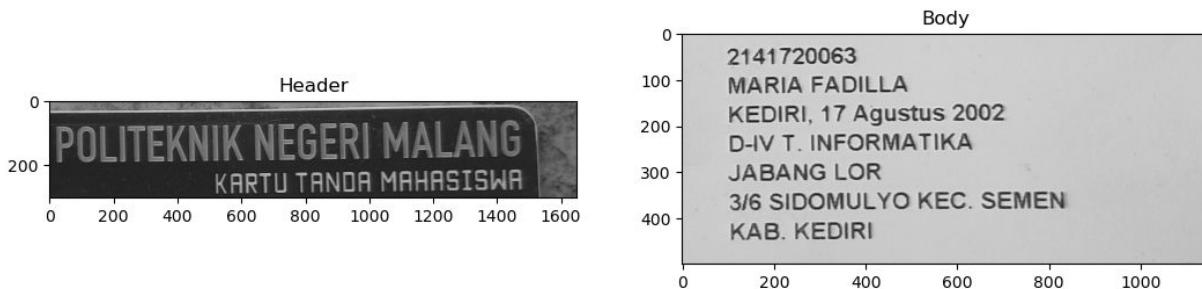
Proses OCR

MARIA FADILLA



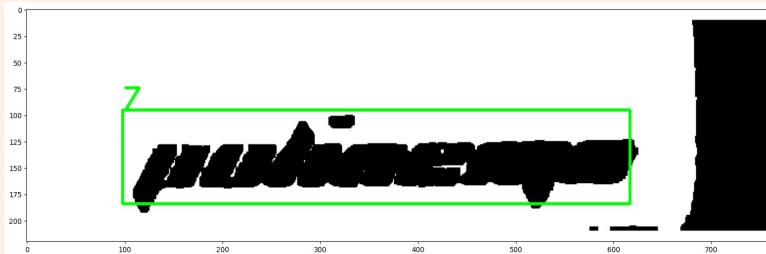
Proses OCR

MARIA FADILLA



Proses OCR

MARIA FADILLA



Proses OCR

MARIA FADILLA



Body

2141720063
MARIA FADILLA
KEDIRI, 17 Agustus 2002
D-IV T. INFORMATIKA
JABANG LOR
3/6 SIDOMULYO KEC. SEMEN
KAB. KEDIRI

Footer

polinema

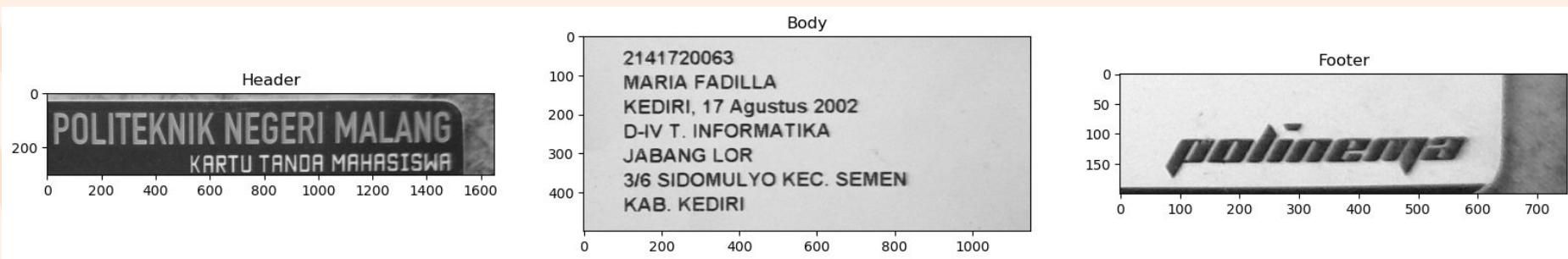
Proses OCR

MARIA FADILLA



Proses OCR

MARIA FADILLA

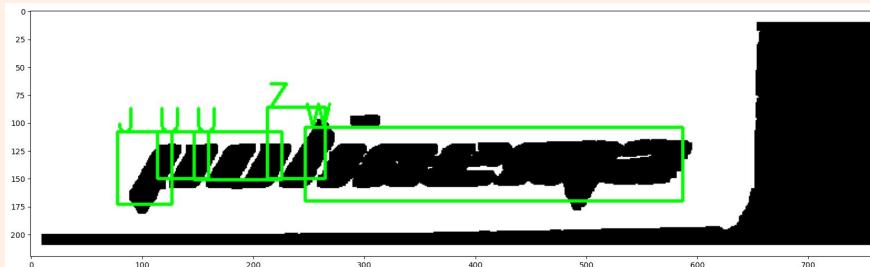


Proses OCR

MARIA FADILLA

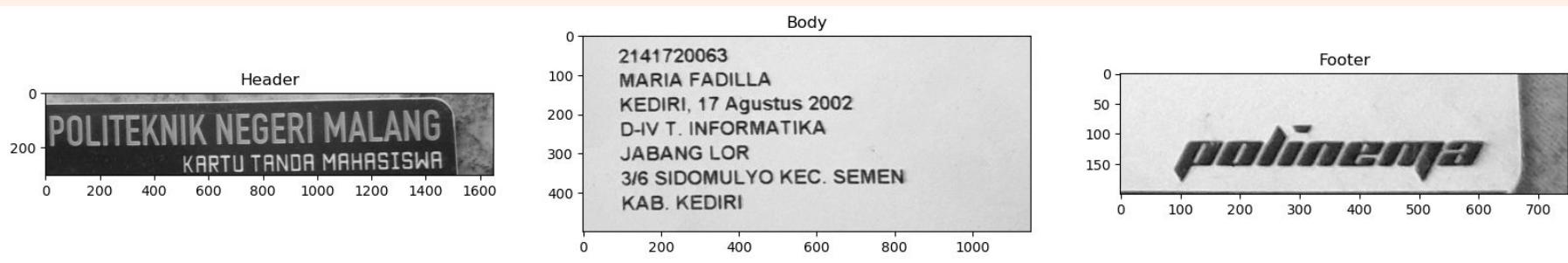


2141720063
MARIA FADILLA
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JABANG LOR
3/6 SIDOMULYO KEC. SEMEN
KAB. KEDIRI



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MARIA FADILLA



Proses OCR

MARIA FADILLA



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BILLIE FAIQUL IZZAT

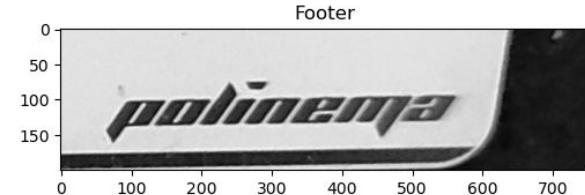


Body

0
100
200
300
400

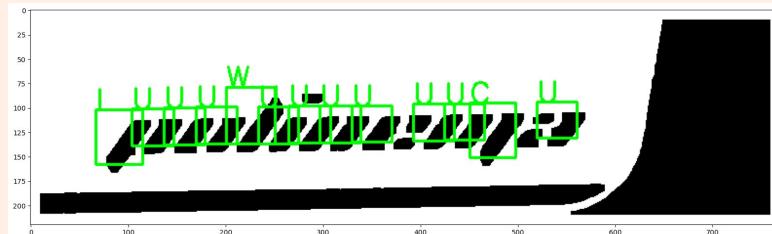
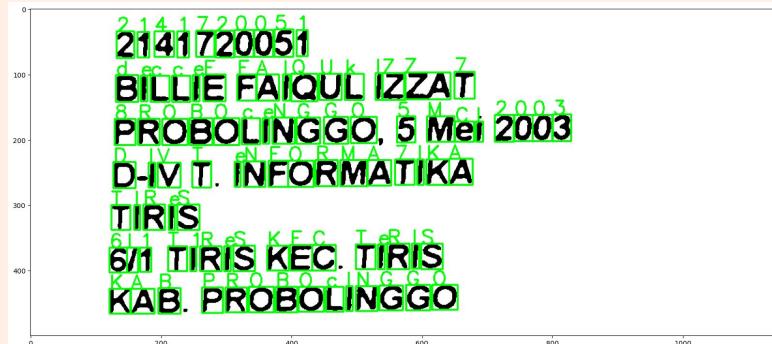
2141720051
BILLIE FAIQUL IZZAT
PROBOLINGGO, 5 Mei 2003
D-IV T. INFORMATIKA
TIRIS
6/1 TIRIS KEC. TIRIS
KAB. PROBOLINGGO

This figure shows a zoomed-in view of the body area of the ID card, containing the student's details. The text includes the ID number, name, date of birth, program, and address. The image is labeled "Body" at the top.



Proses OCR

BILLIE FAIQUL IZZAT



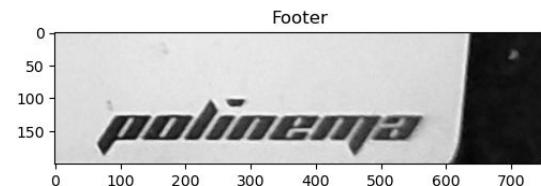
Proses OCR

BILLIE FAIQUL IZZAT



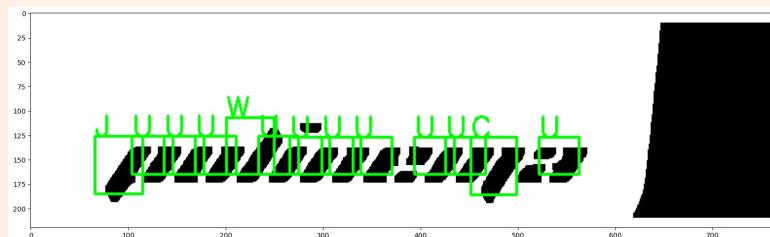
Body

2141720051
BILLIE FAIQUL IZZAT
PROBOLINGGO, 5 Mei 2003
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TIRIS
6/1 TIRIS KEC. TIRIS
KAB. PROBOLINGGO



Proses OCR

BILLIE FAIQUL IZZAT



Proses OCR

BILLIE FAIQUL IZZAT



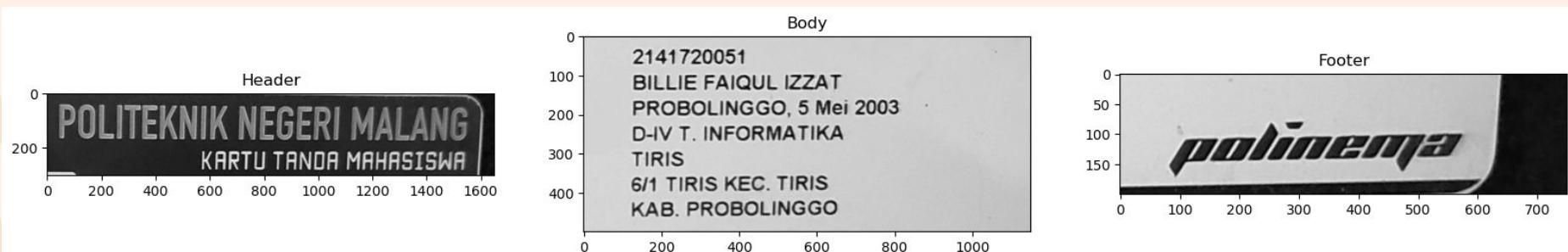
Proses OCR

BILLIE FAIQUL IZZAT



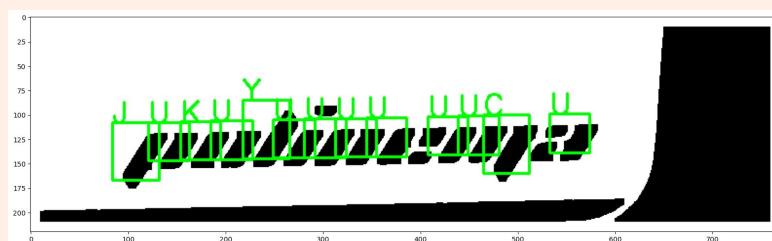
Proses OCR

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Proses OCR

BILLIE FAIQUL IZZAT



Proses OCR

BILLIE FAIQUL IZZAT



Header

POLITEKNIK NEGERI MALANG
KARTU TANDA MAHASISWA

Body

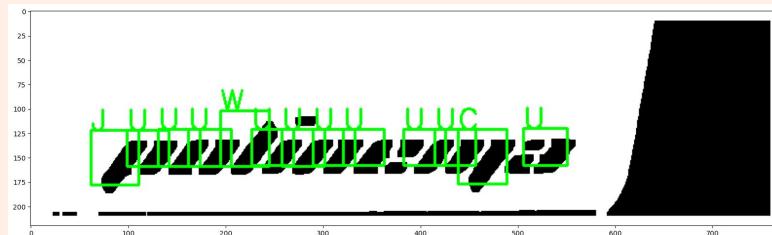
2141720051
BILLIE FAIQUL IZZAT
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KAB. PROBOLINGGO

Footer

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Proses OCR

BILLIE FAIQUL IZZAT





THANKS !

Do you have any questions ?