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Lampiran 1

```
function hasil = concavity(s)
    Bc = bwboundaries(s.ConvexImage);
    Center = regionprops(s.FilledImage,'centroid');
    Iconv = s.ConvexImage-s.FilledImage;
    L = bwlabel(Iconv);
    regconv = regionprops(L,'all');
    for i=1:numel(regconv);
       if regconv(i).Area < 20,
          Iconv(find(L==i))=0;
       end
    end;
    cnt = Center.Centroid;

     hold on
    B = bwboundaries(Iconv);
    hasil = 0;
    d = [0];

     for i=1:numel(B),
      C = setdiff(B{i},Bc{1},'rows');
      if isempty(C),
         d(i)=0;
      else
         Bco = intersect(B{i},Bc{1},'rows');
         if isempty(Bco),
            d(i)=0;
         else

              u = max(Bco);u(3)=0;
              v = min(Bco);v(3)=0;
              l = dist(max(Bco),min(Bco)');
              maxdist = 0;
              for r=1:size(C,1),
                 C(r,3)=0;
                 ds = point_to_line(C(r,:),u,v)/l;
                 if ds > maxdist,
                    maxdist = ds;
                 end;
              end;

           d(i)= maxdist;
    nd
```

```
    end;

    if numel(d)>0,
       hasil = max(d);
    else
       hasil = 0;
    end
end

function d = point_to_line(pt, v1, v2)
     a = v1 - v2;
     b = pt - v2;
     d = norm(cross(a,b)) / norm(a);
end
```

Lampiran 2

```
clear;
close all;

% INPUT CITRA DIGITAL
Image = imread('6a.jpg');
figure;imshow(Image);title('citra asli');

% GRAYSCALE
gray = rgb2gray(Image);
figure;imshow(gray);title('citra grayscale');

% THRESHOLD
threshold=graythresh(gray);
bw=im2bw(gray,threshold);
croppedImage=~bw;
figure; imshow(croppedImage);title('threshold');
bw2 = imfill(croppedImage,'hole');
figure; imshow(bw2);title('imfill');
selisih = bw2-croppedImage;
figure; imshow(selisih); title('Selisih');
LK = bwlabel(selisih);
cont = regionprops(LK,'All');
seli = [cont.Solidity];
nconv = find(seli > 0.85);
for i=1:size(nconv,2),
    (find(LK==nconv(i)))=0;
```

```
C = bw2-selisih;
B = ones(15);
C = imclearborder(C,4);
figure;imshow(C);title('clear border');
ncenter = [];
sts = 1;
i = 10;
idx = 1;

% MORFOLOGI
bw2 = C;
It = imtophat(bw2,strel('disk',10));
 I3 = bw2-It;
 s = regionprops(I3,'all');
obje2 = I3;
figure;imshow(obje2); title('Morfologi');

% UECS
rho = 0.1;
a = {};
k = 1;
hold on;
while sts == 1
    cnct = [];
    L = bwlabel(obje2);
    s = regionprops(L,'All');
    luas = [];
    for i=1:numel(s),
        luas(i) = s(i).Area;
        [cnct(i)] = ce_concavity(s(i));
    end;
    nconv = find([cnct] < rho);
    if isempty(nconv)==0,
        arrcnt = [s(nconv).Centroid];
        if luas(nconv) > 2
        cnt = vec2mat(arrcnt,2);
        ncenter = [ncenter; cnt];
        end;
         for i=1:size(nconv,2),
            obje2(find(L==nconv(i)))=0;
            [r,c] = find(L==nconv(i));
            {k}.region = [r c];
            = k+1;
```

```
    end;

    obje2 = bwmorph(obje2,'erode',4);
    obje2 = bwmorph(obje2,'dilate',2);
     figure;imshow(obje2); title('hasil erosi');
    if numel(s)==0
        sts = 0;
    end;
end;

% CENTROID
BW3=edge(uint8(bw2),'canny',0.16,2);
EDGE=BW3;
for i=1:numel(a),
    for j=1:size(a{i}.region,1),
        BW3(a{i}.region(j,1),a{i}.region(j,2))=1;
    end;
end;

figure,imshow(BW3);title('hasil centroid');
hold all;

for i=1:size(ncenter,1),
    plot(ncenter(:,1), ncenter(:,2), 'rx');
end;
```

Lampiran 3

```
badan =I3;
cen = fliplr(double(ncenter));
baris = cen(:,1);
kolom = cen(:,2);
[rows,columns] = find(badan);
sisi = [rows columns];
distances = pdist2(sisi,cen);
    for i=1:length(rows)
        mn(i,:)=min(distances(i,:));
        new(i,:)=find(distances(i,:)==(mn(i,:)));
    end
    baru=zeros(size(badan));
    [p,l]=size(badan);
 [pl,lp]=size(sisi);
                tal iterasi = %d \n',pl);
                ')
```

```
while z<=pl
   for y=1:p
   for x=1:l
      if sisi(z,:)==[y,x];
         baru(y,x)=new(z);
      end
   end
   end
   fprintf('iterasi ke %d \n',z);
   z=z+1;
end

bg=label2rgb(baru);
figure, imshow(bg);
```