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CSE 5524 Computer Vision for HCI SP'22

Homework Assignment #7 Due: Thursday 3/10

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% Tristan Roman
% CSE 5524 - HW7
% 3/10/2022

%% Problem 1
for i = 1:5
    A = imread('JOJOimage.jpg');
    % Shows the image at 5 different pixilization levels
    [L, NumLabels] = superpixels(A, 10.^i,'Compactness',100);

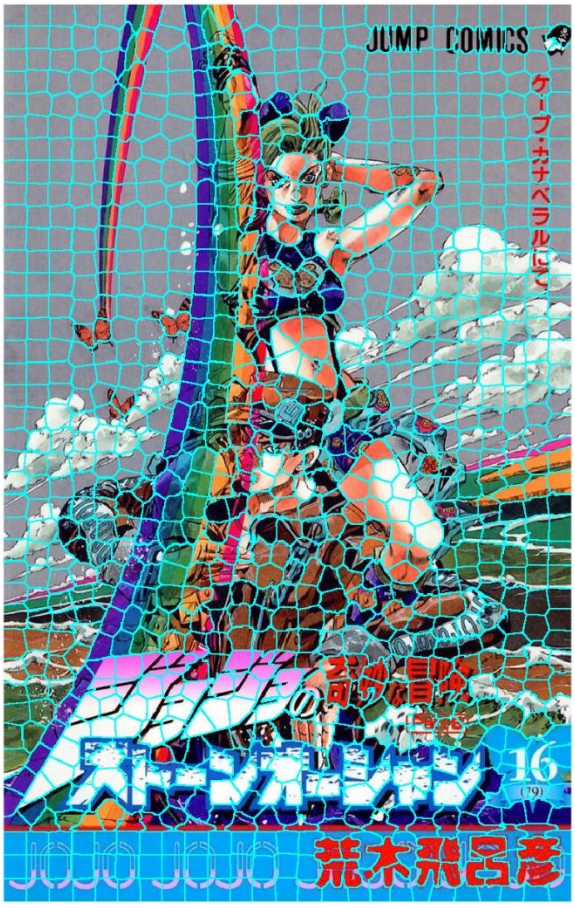
    BW = boundarymask(L);
    imshow(imoverlay(A,BW,'cyan'),'InitialMagnification',67)
    pause();

    outputImage = zeros(size(A),'like',A);
    idx = label2idx(L);
    numRows = size(A,1);
    numCols = size(A,2);
    for labelVal = 1:NumLabels
        redIdx = idx{labelVal};
        greenIdx = idx{labelVal}+numRows*numCols;
        blueIdx = idx{labelVal}+2*numRows*numCols;
        outputImage(redIdx) = mean(A(redIdx));
        outputImage(greenIdx) = mean(A(greenIdx));
        outputImage(blueIdx) = mean(A(blueIdx));
    end

    figure
    imshow(outputImage,'InitialMagnification',67)
    pause();
end
```

< original image

Med-cutout >
(10^3 regions)



(verylow-res : 10^1 regions)

(low-res : 10^2 regions)

(medium-res : 10^3 regions)

Super cool effect. Like to see how the resolution changes as the regions change, but also what regions it chooses. If you look in the low-res image (middle), it actually picks out the characters in the title and author a bit.

(veryhigh-res : 10^5 regions) >

(high-res : 10^4 regions) v

```
%% Problem 2
template = im2double(imread('template.png'));
search = im2double(imread('search.png'));

[r,c,l] = size(search);
scores = zeros(r,c,l);

% mean and standard deviation for each channel
meanTemp = meanOfChannels(template);
stdTemp = stdOfChannels(template);

% compute NCC score
for i = 1:3
    for r = 24:277
        for c = 35:366

            P = search(r-23:r+23,c-34:c+34,:);
            T = template;
            meanP = meanOfChannels(P);
            stdP = stdOfChannels(P);
            val = 0;
            for x = 1:47
                for y = 1:69
                    val = val + ((P(x,y,i)-meanP(i))*(T(x,y,i)-
meanTemp(i))/(stdP(i)*stdTemp(i)));
                end
            end
            val = val/(47*69-1);
            scores(r,c,i) = val;

        end
    end
end

% best match found
scores = mean(scores,3);
k1 = max(max(scores));
[a,b] = find(scores == k1);
imagesc(search(a-23:a+23,b-34:b+34,:));

% plot the NCC scores
ls = reshape(scores,1,[]);
ls = sort(ls,'descend');
plot(ls,'-r');
xlabel('k');
ylabel('NCC');

[a,b]= find(scores == ls(1));
imagesc(search(a-23:a+23, b-34:b+34, :));

[a,b]= find(scores == ls(2));
imagesc(search(a-23:a+23, b-34:b+34, :));

[a,b]= find(scores == ls(5));
imagesc(search(a-23:a+23, b-34:b+34, :));
```

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[a,b]= find(scores == ls(10));
imagesc(search(a-23:a+23, b-34:b+34, :));

[a,b]= find(scores == ls(100));
imagesc(search(a-23:a+23, b-34:b+34, :));

[a,b]= find(scores == ls(500));
imagesc(search(a-23:a+23, b-34:b+34, :));


function result = meanOfChannels(image)
    meanR = mean(image(:,:,1),'all');
    meanG = mean(image(:,:,2),'all');
    meanB = mean(image(:,:,3),'all');
    result = [meanR,meanG,meanB];
end

function result = stdOfChannels(image)
    stdR = std(image(:,:,1),0,'all');
    stdG = std(image(:,:,2),0,'all');
    stdB = std(image(:,:,3),0,'all');
    result = [stdR,stdG,stdB];
end
```
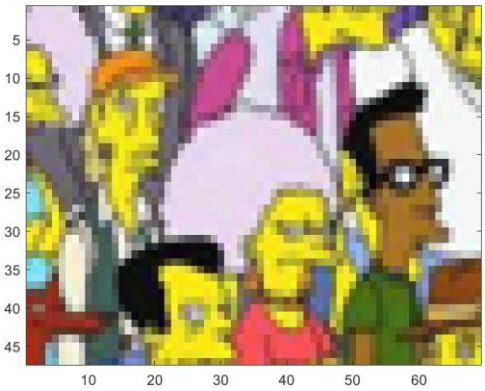

The differences between 1, 2, 5, and 100 are all pretty close, only moving by a couple pixels.

On the other hand:



500th is starkly different, but the grey/pink afro plus the figure on the right who's complexion is similar to the Duff bottle in the target images and the man with the dark hair that sort of matches the suit all make sense when comparing them to the target.