
```

%Clear all
clear; close all; clc;
%load in rgb and label images
theFiles = dir('*rgb*.png');
labels = dir('*label*.png');
%Create variables for calculations
%accuracy for leaf count
av_acc_leaf = 0;
%array of missed leaves
miss_arr = [];
%upper limit for leaf finding
upper = 30;
%lower limit for leaf finding
lower = 5;
%similarity score
sim_score = 0;
%Arrays for leaf guessing and actual
leaf_guess_arr = [];
leaf_acc_arr = [];
%loop over dataset
for k = 1: length(theFiles)
    %Set miss to 0
    miss = 0;
    %Read in files
    baseFileName = theFiles(k).name;
    fullFileName = fullfile(theFiles(k).folder, baseFileName);
    fprintf(1, 'Now reading %s\n', fullFileName);

    %read file
    imageArrayOrig = imread(fullFileName);
    %Segment image
    segmented = segmentImage_from_back(imageArrayOrig);
    %Convert to grayscale
    Igray = rgb2gray(imageArrayOrig);
    %Convert to binary
    threshold_value= graythresh(Igray);
    binaryImg = imbinarize(Igray, threshold_value);
    %Find leaves with boundaries
    [centers, radii, metric] = imfindcircles(imageArrayOrig,[lower
upper]);
    figure;
    imshow(imageArrayOrig);
    %Show leaves found on image
    viscircles(centers, radii,'EdgeColor','b');
    %Take guess for leaves
    leafGuess = length(metric);

    %Read in labelled images
    baseFileName = labels(k).name;
    fullFileName = fullfile(labels(k).folder, baseFileName);
    fprintf(1, 'Now reading %s\n', fullFileName);

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%read file
groundtrutharray = imread(fullFileName);

%Convert labelled image to binary
gt_mask = groundtrutharray >= 1;

%calculate similarity score
similarity = dice(segmented, gt_mask);

%if similarity score is < 0.3 means that the background is more
%prominent therefore need to flip and redo score
%Segmentation is based on 2 objects so will pick put background
and
%object
if similarity < 0.3
    segmented = imcomplement(segmented);
    imshowpair(segmented, gt_mask, 'montage');
end
%redo score
similarity = dice(segmented, gt_mask);

%Segment the plant from background
segmented = bsxfun(@times, imageArrayOrig, cast(segmented, 'like',
imageArrayOrig));

%Show image thats segmented and ground truth binary image
figure;
imshowpair(segmented, gt_mask, 'montage');

%add sim score to score array for bar chart
score(k) = similarity;
%Add up scores for average
sim_score = sim_score + similarity;
%divide by how many files there are
dice_av = sim_score/length(theFiles);
%count the leaves in the labelled image
count = max(groundtrutharray);
leaf_count = max(count);
%leaf_count accuracy
if leafGuess == leaf_count
    av_acc_leaf = av_acc_leaf + 1
end

%If leafguess not accurate add to miss
if leafGuess ~= leaf_count
    %matlab to convert to numbers that can be negative
    miss= int32(leafGuess) - int32(leaf_count);
end
%add miss to array
miss_arr = [miss_arr, miss];

%Essentially brute forcing a better accuracy
% Increase upper limit since lower is at bottom for imfindcircles
%if 100 iterations stop probbaly won't find it

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    breaker = 0;
    while miss < 0
        breaker = breaker + 1;
        upper = upper + 1;
        [centers, radii, metric] = imfindcircles(imageArrayOrig,[lower
upper]);
        leafGuess = length(metric);

        %Check if any difference
        if leafGuess == leaf_count
            av_acc_leaf = av_acc_leaf +1
            viscircles(centers, radii,'EdgeColor','b');
            break;
        end
        if leafGuess ~= leaf_count
            %matlab to convert to numbers that can be negative
            miss= int32(leafGuess) - int32(leaf_count);
        end
        if breaker == 100
            break;
        end

    end
    %Add guess and actual to arrays
    leaf_guess_arr = [leaf_guess_arr, leafGuess];
    leaf_acc_arr = [leaf_acc_arr, leaf_count];
end
%Display bar chart with title
bar(score);
title('Dice scores');
%print dice average score
dice_av
%print and calculate accuracy overall
av_acc_leaf = av_acc_leaf / length(theFiles);
av_acc_leaf
%Reshape arrays for table
leaf_guess_arr = reshape(leaf_guess_arr, 16,1);
leaf_acc_arr = reshape(leaf_acc_arr, 16,1);
%holder for calculations for mean leaf count
holder = double(0.0);
for k = 1: length(miss_arr)
    %positive calc
    if miss_arr(k) > 0
        holder = double(miss_arr(k) + holder);
    %negative calc
    elseif miss_arr(k) < 0
        holder = double(abs(miss_arr(k)) + holder);
    end
end
end
%Calc mean diff for leaves
mean_diff_leaf = double(holder/16);
mean_diff_leaf
%Reshape miss array for table

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miss_arr = reshape(miss_arr, 16, 1);
%image number
img_num = [1;2;3;4;5;6;7;8;9;10;11;12;13;14;15;16];
%make table
T = table(img_num, leaf_guess_arr, leaf_acc_arr, miss_arr)
%print table
mean_diff_leaf

%Function for segmentation using matlab apps
function [BW,maskedImage] = segmentImage_from_back(RGB)
% Convert RGB image into L*a*b* color space.
X = rgb2lab(RGB);

% Auto clustering
s = rng;
rng('default');
%KMeans segmentation
L = imsegkmeans(single(X),2,'NumAttempts',2);
rng(s);
BW = L == 2;

% Create masked image.
maskedImage = RGB;
maskedImage(repmat(~BW,[1 1 3])) = 0;
end

Now reading /home/harry/Downloads/plant image dataset/plant001_rgb.png
Now reading /home/harry/Downloads/plant image dataset/
plant001_label.png

av_acc_leaf =

    1

Now reading /home/harry/Downloads/plant image dataset/plant002_rgb.png
Now reading /home/harry/Downloads/plant image dataset/
plant002_label.png
Now reading /home/harry/Downloads/plant image dataset/plant003_rgb.png
Now reading /home/harry/Downloads/plant image dataset/
plant003_label.png
Now reading /home/harry/Downloads/plant image dataset/plant004_rgb.png
Now reading /home/harry/Downloads/plant image dataset/
plant004_label.png
Now reading /home/harry/Downloads/plant image dataset/plant005_rgb.png
Now reading /home/harry/Downloads/plant image dataset/
plant005_label.png

av_acc_leaf =

    2

Now reading /home/harry/Downloads/plant image dataset/plant006_rgb.png
Now reading /home/harry/Downloads/plant image dataset/
plant006_label.png

```

```
Now reading /home/harry/Downloads/plant image dataset/plant007_rgb.png
Now reading /home/harry/Downloads/plant image dataset/
plant007_label.png
```

```
av_acc_leaf =
```

```
3
```

```
Now reading /home/harry/Downloads/plant image dataset/plant008_rgb.png
Now reading /home/harry/Downloads/plant image dataset/
plant008_label.png
Now reading /home/harry/Downloads/plant image dataset/plant009_rgb.png
Now reading /home/harry/Downloads/plant image dataset/
plant009_label.png
```

```
av_acc_leaf =
```

```
4
```

```
Now reading /home/harry/Downloads/plant image dataset/plant010_rgb.png
Now reading /home/harry/Downloads/plant image dataset/
plant010_label.png
```

```
av_acc_leaf =
```

```
5
```

```
Now reading /home/harry/Downloads/plant image dataset/plant011_rgb.png
Now reading /home/harry/Downloads/plant image dataset/
plant011_label.png
Now reading /home/harry/Downloads/plant image dataset/plant012_rgb.png
Now reading /home/harry/Downloads/plant image dataset/
plant012_label.png
Now reading /home/harry/Downloads/plant image dataset/plant013_rgb.png
Now reading /home/harry/Downloads/plant image dataset/
plant013_label.png
```

```
av_acc_leaf =
```

```
6
```

```
Now reading /home/harry/Downloads/plant image dataset/plant014_rgb.png
Now reading /home/harry/Downloads/plant image dataset/
plant014_label.png
Now reading /home/harry/Downloads/plant image dataset/plant015_rgb.png
Now reading /home/harry/Downloads/plant image dataset/
plant015_label.png
```

```
av_acc_leaf =
```

```
7
```

```
Now reading /home/harry/Downloads/plant image dataset/plant016_rgb.png
```

Now reading /home/harry/Downloads/plant image dataset/
plant016_label.png

dice_av =

0.971970927887298

av_acc_leaf =

0.4375

mean_diff_leaf =

0.8125

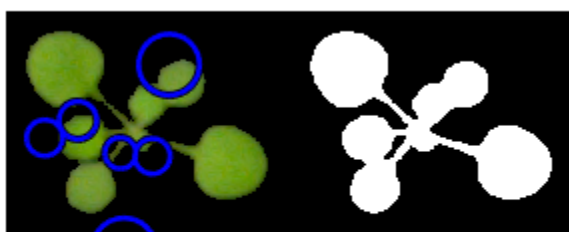
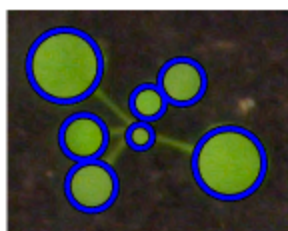
T =

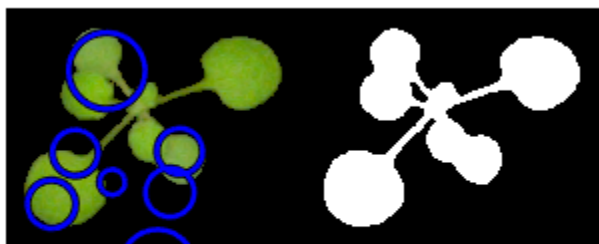
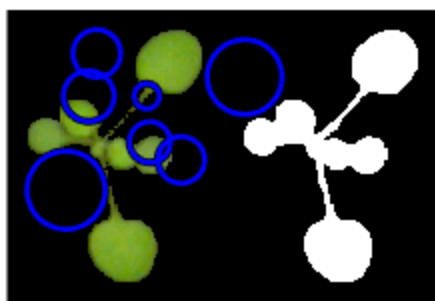
16×4 table

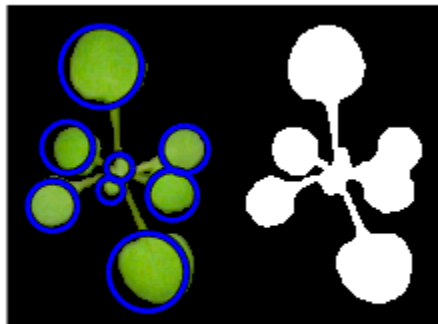
| <u>img_num</u> | <u>leaf_guess_arr</u> | <u>leaf_acc_arr</u> | <u>miss_arr</u> |
|----------------|-----------------------|---------------------|-----------------|
| 1 | 7 | 7 | 0 |
| 2 | 6 | 7 | -1 |
| 3 | 7 | 8 | -1 |
| 4 | 7 | 8 | -1 |
| 5 | 8 | 8 | 0 |
| 6 | 6 | 7 | -1 |
| 7 | 8 | 8 | 0 |
| 8 | 2 | 6 | -4 |
| 9 | 6 | 6 | 0 |
| 10 | 7 | 7 | -1 |
| 11 | 7 | 8 | -1 |
| 12 | 8 | 9 | -1 |
| 13 | 8 | 8 | 0 |
| 14 | 9 | 8 | 1 |
| 15 | 6 | 6 | 0 |
| 16 | 6 | 7 | -1 |

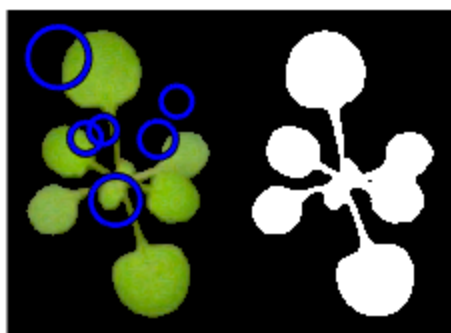
mean_diff_leaf =

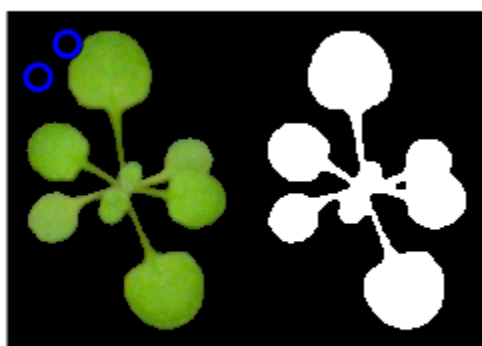
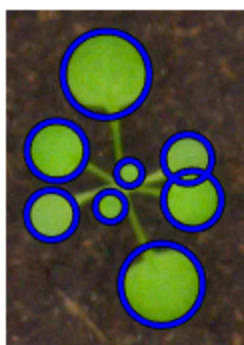
0.8125

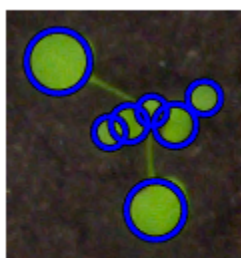
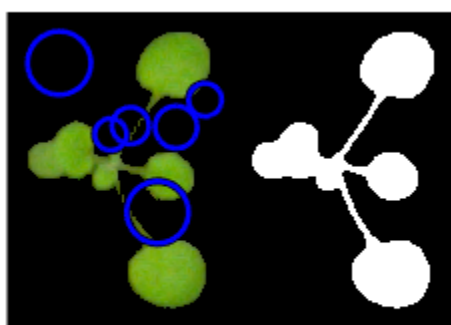
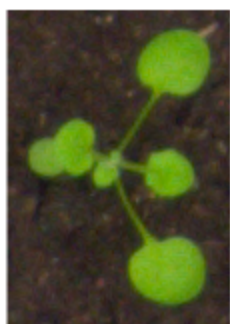


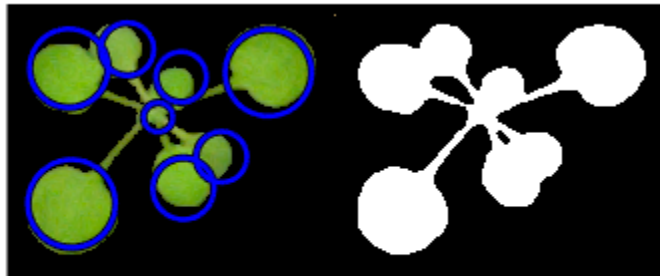






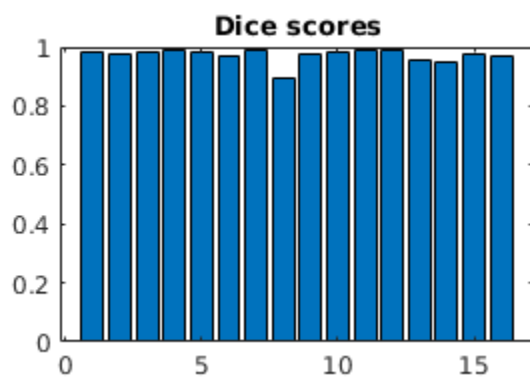












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