REPORT ON MARKER CONTROLLED WATERSHED ALGORITHM FOR COCONUT TREE DETECTION AND DELINEATION IN G.E. IMAGES

Working:

START- READ IMAGE(a)- SPLITS INTO RED, BLUE, GREEN CHANNELS(b1, b2,b3) – TAKES RED CHANNEL(b1) AND TURNS IT INTO A BINARY IMAGE BY THRESHOLDING(c) – NOISE REMOVAL and REMOVAL OF PIXELS IN THE BORDERS(d) – DILATING (d) TO CREATE DEFINITE BACKGROUND(e) - APPLYING DISTANCE TRANSFORM IN (d) (finds the distance of each and every pixel from the zero pixels) TO CREATE DEFINITE FORE GROUND(f) – UNKNOWN=BG-FG AND ASSIGNING IT A KNOWN VALUE TO DIFFERENTIATE IT FROM THE DEF BG(g) – CREATING MARKERS WITH THE HELP OF FOREGROUND – PERFORMING MARKER CONTROLLED WATERSHED TO DELINEATE(h) – USING DISTANCE TRANSFORM TO GET THE COUNT OF TREES – STOP

NOTE: () are the outputs of the corresponding steps.

Cases:

Case 1: Definite contrast between trees and ground and no crown overlapping

In grayscale, trees appear black and the ground in shades of grey, easy to change to binary by thresholding.

Case 2: Definite contrast, presence of shadow and little crown overlapping

Here, trees and their shadow both are black and the ground appears white; thresholding considers both the trees and their shadows.
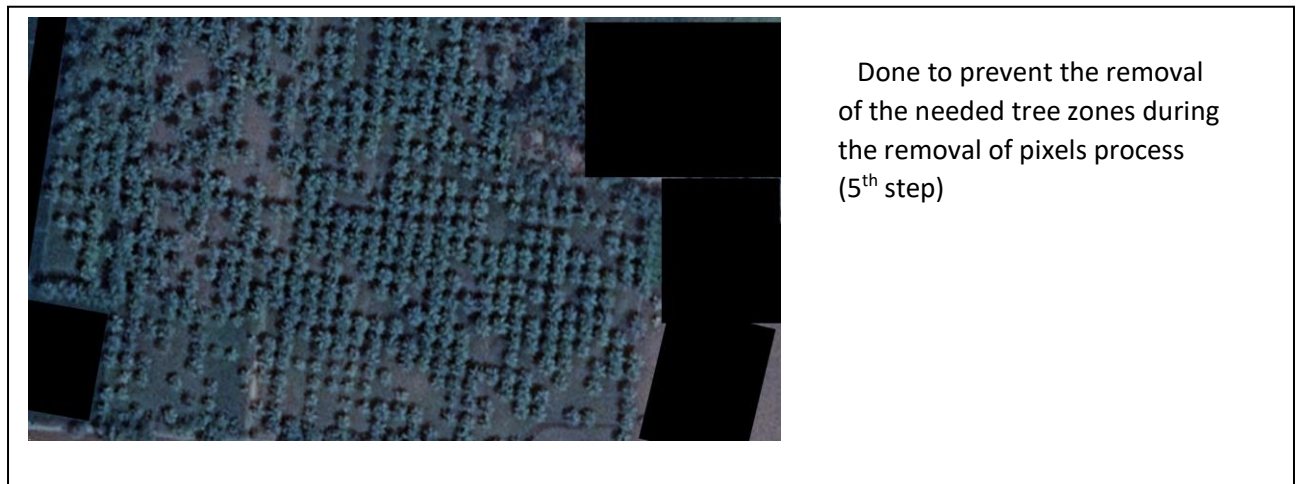

Case 3: No definite contrast, presence of shadow and little crown overlapping

In grayscale, trees and ground both appears in the same shades of grey, the shadow of the trees is black so thresholding is done with their shadows not with the trees.

Addtl:

Images taken at an eye altitude in the range 800ft – 1000ft works fine for densely vegetated areas i.e case 3. (saved at the highest resolution 1280 x 720)
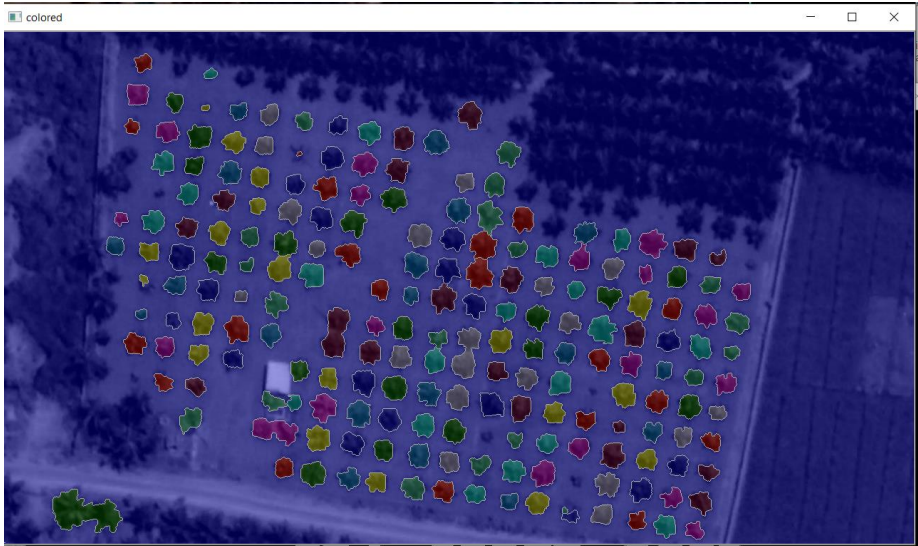
Masked the unwanted regions in paint like below:

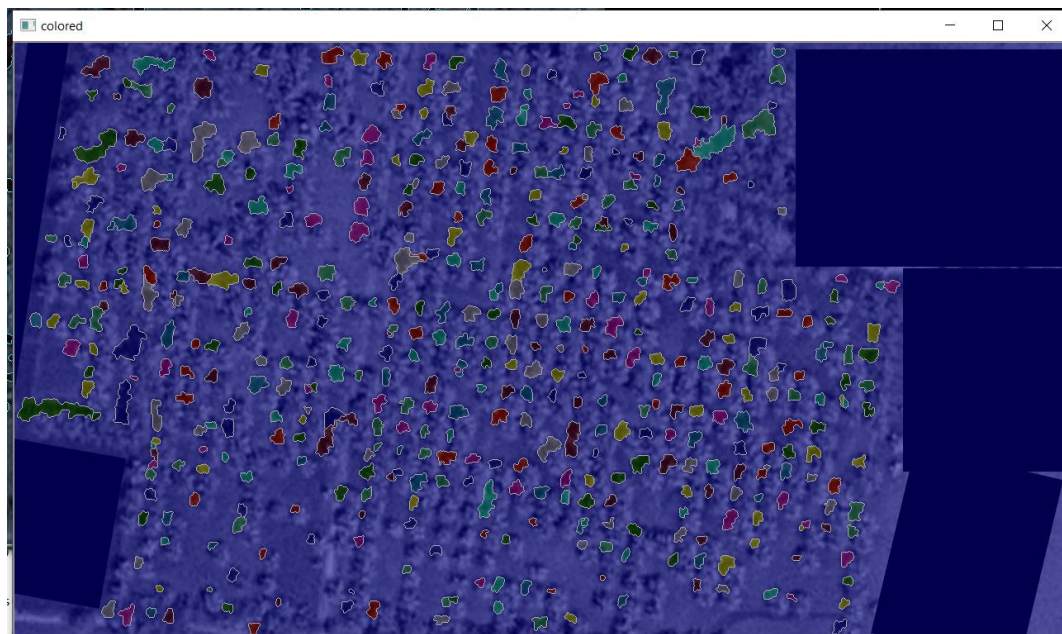Done to prevent the removal of the needed tree zones during the removal of pixels process (5th step)

Accuracy:

CASE	DELINEATION	COUNTING
1	High	High
2	Medium	Medium - High
3	Low	Low

Note: In case 3, only the shadow is being used for delineation and counting

Outputs:

1	 Count = 204 (nearly 220 manually, 92.7%)
2	 Count = 864 (app 950 manually, 90.9%)

3	
	colored
	Count = 466 (nearly 600 manually, 77.6%)