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README - tag_2.m

Electrical Subsystem

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tag_2.m()

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Reviwed by: Name of the person who has reviewed the code
Description:
This function is used to get the *sum of the coordinates* (see the numerator of the expression defining the centroid) and *sizes* of unmerged regions along with the *list of regions to be merged* from a grayscale image. (The connectivity referred to here is 4-connectivity.) The unmerged centroids are then taken along with the merging list by another function to give out the final coordinates of the centroids of regions (stars) in the input image. The centroid is defined as

$$\left(\frac{\sum_{p\in region} I_p x_p}{n_{pixels}}, \frac{\sum_{p\in region} I_p y_p}{n_{pixels}}\right)$$

where I_p is the intensity of the pixel and (x_p, y_p) are the coordinates of the pixel.
Formula & References:
The algorithm we are referring to basically tags connected pixels with the same tag (which is the index of the array where the sums of coordinates and the number of pixels corresponding to that region are stored) and noting which tagged regions with different tags meet so that they can be merged[1]. The algorithm has been modified because we do not need the regions, we only need the centroids. We have two arrays as output. The data in the arrays is as follows:

$\sum I_p x_p$	$\sum I_p y_p$	weight $= \sum I_p$	num_pixels	$final\_tag$

Table 1: arr_sums

num_tags	tag_1	tag_2	tag_3	tag_4	...

Table 2: arr_final_tags

Input parameters:

1. **arr_in_img** : (matrix) - input image, with pixel location wrt the top left corner as indices ([i, j]); and the reading at the corresponding pixel as the value stored at [i, j]

Output:

1. **arr_sums**: (matrix) - array containing values as indicated in table 1
2. **arr_merge**: (matrix) - array containing values as indicated in table 2

References

[1] Azriel Rosenfeld and John L. Pfaltz. Sequential operations in digital picture processing. *J. ACM*, 13(4):471–494, October 1966.