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README - tag.m

Electrical Subsystem

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tag.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 cetroid is defined as

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

Formula & References:
The algorithm 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 where two 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.

Input parameters:

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

Output:

1. **arr_sums**: (matrix) - array containing summations of the x and y coordinates wrt the top left corner of the image, corresponding to each tag as the first two columns and the corresponding number of pixels in the third column.

2. **arr_merge**: (matrix) - array containing pairs of tags corresponding to regions that are connected via at least one pixel

References

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