Include a detailed evaluation of the effect of varying segmentation parameters (feature transform, clustering method, number of clusters, resize) on the mean accuracy of foreground-background segmentations on the provided dataset. You should test a minimum of 10 combinations of parameters. To present your results, add rows to the table below (you may delete the first row).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Feature Transform** | **Clustering Method** | **Number of segments** | **Scale** | **Mean Accuracy** |
| Color | K-Means | 3 | 0.5 | 0.7775 |
| Color and Position | K-Means | 3 | 0.5 | 0.7757 |

Observe your results carefully and try to answer the following question:

1. Based on your quantitative experiments, how do each of the segmentation parameters affect the quality of the final foreground-background segmentation?
2. Are some images simply more difficult to segment correctly than others? If so, what are the qualities of these images that cause the segmentation algorithms to perform poorly?
3. Also feel free to point out or discuss any other interesting observations that you made.

Write your analysis in the cell below.

**Your answer here**:

While we could not test out hierarchical agglomerative clustering, since the algorithm doesn't scale up well with regard to large number of data points, we could test the kmeans algorithm and we varied the feature space to only color and a combination of color and position. The accuracy obtained on using either of the feature spaces is very similar.

Some images are difficult to segment because the colors of the foreground and the background are very similar and the distance between the feature vector representing these points are very less, thus making them the part of the same cluster, whereas the expectation is that they would be parts of different clusters.

Whenever we encounter a scenario as mentioned above, it is imperative to incorporate the position of the pixel into the feature vector, as the distance between the corresponding vectors in the feature space of the pixel is not solely determined by their color, thus reducing the chances that pixels belonging to the background and the foreground will be put under the same cluster. But even this approach will fail if the foreground and background share a border and have the same color composition.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Feature Transform** | **Clustering Method** | **Number of segments** | **Scale** | **Mean Accuracy** |
| Color | K-Means | 3 | 0.5 | 0.7775 |
| Color and Position | K-Means | 3 | 0.5 | 0.7757 |

Feature Transform Clustering Method Number of segments Scale Mean Accuracy

Color K-Means 3 0.5 0.7979

Color K-Means 4 0.5 0.7664

Color K-Means 2 0.5 0.7609

Color K-Means 3 0.4 0.7904

Color K-Means 3 0.6 0.7935

Color K-Means 3 0.8 0.7963

Color K-Means 3 1 0.7974

Color-Postion K-Means 3 1 0.7767

Color-Postion K-Means 3 0.5 0.7883

... ... ... ... ...

На основании наблюдений за результатами:

Эффект кластеризации на основе функции цветового расположения хуже, чем эффект кластеризации на основе функции цвета.

Количество кластеров 3 - лучшее, увеличение или уменьшение повлияет на эффект

Чем ближе масштаб к исходному изображению, то есть чем ближе к 1, тем выше точность

Действительно, есть изображения, которые труднее идентифицировать. Некоторые характеристики этих диаграмм включают:

Более сложный фон

Цвет и яркость переднего плана близки к фону

Я обнаружил, что при кластеризации, основанной на особенностях расположения цветов, масштаб не настолько велик, насколько это возможно. Возможно, я не провел достаточно экспериментов.

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链接: https://shenxiaohai.me/2018/09/11/cs131-homework5/#3-Quantitative-Evaluation-30-points

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|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Feature Transform** | **Clustering Method** | **Number of segments** | **Scale** | **Mean Accuracy** |
| Color | K-Means | 3 | 0.3 | 0.7855 |
| Color | K-Means | 3 | 0.5 | 0.7948 |
| Color | K-Means | 3 | 0.7 | 0.7872 |
| Color and Position | K-Means | 3 | 0.3 | 0.6304 |
| Color and Position | K-Means | 3 | 0.5 | 0.6353 |
| Color and Position | K-Means | 3 | 0.7 | 0.64 |
| Color | K-Means | 4 | 0.5 | 0.7679 |
| Color | K-Means | 5 | 0.5 | 0.7700 |
| Color and Position | K-Means | 4 | 0.5 | 0.6563 |
| Color and Position | K-Means | 5 | 0.5 | 0.7024 |