Problem 1. Foreground-background texture-based segmentation via clustering

OBJECTIVE: To segment an image that contains multiple textures into a foreground and background region, using a bank of filters to identify the different textures in the image.

IMPLEMENTATION: The input to this program are two images and the output is a single image where the foreground of one image is placed on the other. The approach used is texture based segmentation using k means clustering.

- Suppose the image to be segmented is I. Initially, a bank of filters are created using the provided Leung-Malik (LM) bank of filters to identify different texture in the image. The LM filter set is a set of 48 filters.

- The input image I is then convolved with each of the filters in the filter set to transform I to an N dimensional vector where N is the number of filters.

- A matrix X is created which holds the points to be clustered and the k means algorithm is run on X and k where k denotes the number of clusters to divided into. K means clustering algorithm defines r centroids, one for each cluster and places the points in these clusters based on the distance from the centroid of each cluster.

- The result is then transferred onto the second image which is the background image.

LIMITATIONS: K-means clustering algorithm is very sensitive to the initial cluster values where different initial cluster center may produce different segmentation results. Determining the best initial cluster is a challenging and difficult task for images. It is also very sensitive to outliers and noise. It does not work well with clusters that do not have well defined centers.

K Means ALGORITHM: Own implementation of k means algorithm is not added.

RESULT:

(K=4)

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(K=2)

(K=2)

(K=2)

(iv) The reason we have holes in our segmented image is because of the difference is texture at some places in the foreground compared to the rest of the foreground image.
For example, in the image of cheetah, because of its fine white hair which is not similar to the rest of the cheetah, it is difficult to segment it as part of the foreground.
We can use various techniques to overcome this problem such as color filling, etc.

NOTE: Code used to run the file:

```
I = imread('images\zebra.jpg');
idx=segmentImg(I,2);
I1 = imread('images\bg.jpg');
n=transferImg([1],idx,I,I1);
imshow(n);
```