Computer Graphics

Course project

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1. Title:

The implementation of photomosaics with K-means clustering

2. Summary:

a. Problem Description:

To implement image mosaics, two things need to be prepared : a set of images which would be taken as "tiles", and a target image which we are going to present. Roughly talking the process of producing a photo mosaics, first make a grid over the target image, then for each cell on the grid, calculate its average color and go to the set of reference images to find the nearest image with the same average color of the cell and substitute it in that cell. For the step of searching the nearest image, original way has to go through all set of images, which would take a lot of effort. My idea is that first separate all reference images into several cluster, and each time a cell comes in, I find out which cluster this cell belongs to and return the most representative image of that cluster as the tile for that cell.

b. Importance of problem:

Like what is mentioned above, the traditional way of searching the nearest image for a cell may take too much effort if the set of reference images is quite large. My idea is based on a thinking that if the set of reference images actually consists of several cluster and the difference within a cluster is small while the difference between clusters is large, there is no need to search through all image set. Therefore, by using the representative image of each cluster instead of all images of that cluster, we can accelerate the searching process. But if the reference images are not distributed like the way mentioned above, then the effect of applying this approach may not be very obvious.

c. Previous Work on Problem:

To speed up the process of searching the nearest image for a cell, other works usually use kd-tree structure to decrease the search time.(logN, N is the number of reference images) My idea is that can we even decrease N by selecting some most representative image within the whole reference image set.

d. Plan:

First I would create a reference image set and try to apply K-means algorithms on this set.(I would try different values of K to find out which kinds of clustering has the better performance of creating image mosaics). After finishing the preprocessing of the reference images, I will create the image mosaic of the target image.(I would also try several grid sizes to see the results)

e. Originality:

Trying a new way to preprocess the references images in order to acceleration the process of generating the image mosaic.

3. List of Goals(mile stones):

a. Create a reference image set.(collect as much image as possible and make sure this image set has a wide enough color range)

b. Finish the process of applying K-means algorithm to cluster the image set.

c. Create the image mosaic with the cluster information generated by K-means algorithm.

d. If the work proceeds better, I would do the comparison between my idea and the original way in terms of speed and how well the result looks.