

CS 520

Project Proposal

Zahra Iman

Project Title: Algorithmic graph solution for the problem of photograph enhancement

Project type: research for the graph applications

Project Abstract:

This problem is involved with finding a good split of a picture into different pieces to be enhanced separately. In this regard, we want to find part of the image that needs enhancement such as brightness improvement while leave the other parts untouched.

There are two concerns for this problem. First, separation should have high contrast in order to have smoother enhancement on different pieces. Second, pieces should be large enough to avoid having enhancement on small patches on different parts of the image.

There are existing works on a similar topic i.e. image segmentation. Image segmentation is the process of partitioning the image into multiple regions based on some specific homogeneity criterion such as color, texture, etc. The graph-theoretical algorithm introduced for this problem is Normalized-Cuts. Normalized cuts [1] is a graph based clustering and is based on finding the cut between graph partitions. But, this problem differs from image segmentation in the sense that we have to satisfy the mentioned constraints.

Therefore, we have a graph with homogenous patches of pixels as vertices. Each vertex has a weight representing the number of pixels. We would have the constraint to have large pieces included as well. The problem is splitting the graph into two connected subgraphs while preserving the constraint.

References

This problem is based on the problem introduced by David Eppstein on “Open Problems in Graph Theory and Computational Geometry” list.

[1] Jianbo Shi and [Jitendra Malik](#) (1997): "Normalized Cuts and Image Segmentation", *IEEE Conference on Computer Vision and Pattern Recognition*, pp 731–737