DIP PROJECT PROPOSAL:IMAGE SMOOTHENING USING GRADIENT ANALYSIS

Project ID:16

Github repository:https://github.com/Digital-Image-Processing-IIITH/dip-project-theconvoluted.git

Problem Definition

Digital image processing is the process of digital images with the use of digital computers. These digital images contain various types of noises which reduces the quality of the image. So, there is a high necessity to enhance the contrast and to emphasize the borders of the image. Image smoothening is an image enhancement technique used to reduce the noise present in the image and for the blurring of an image. Smoothening of an image can be done in either the spatial or frequency domain. In the spatial domain, smoothening is done by considering the neighbour pixels and making a better determination of this pixel. Gradient analysis is a simple and efficient approach with the best results among other algorithms.

Goals of the Project

The main objective is to do edge-preserving smoothing on an image using the gradient analysis method. The algorithm initially starts with filtering and then smoothens the image by using magnitude and direction gradient vectors. L0 gradient minimization is an optimized version of the previous method. L0 gradient minimization globally reduces the number of non-zero gradients and will result in a

prominent structure of the image. Fast global image smoothing based on weighted least squares algorithm is a combination of efficient edge-preserving filters and optimized based smoothing.

We implement the image smoothening based on the gradient algorithm. As an extension to this, we are planning to implement either L0 gradient minimization or Fast global image smoothing.

There are a good number of algorithms for smoothening in digital processing but our approach using gradient analysis is very simple and gives the best results. We will then compare our approach results with other popular algorithms like bilateral filtering etc.

Results of the Project

- Enhancing an image with high contrast edges using gradient algorithm.

- Given an input image, we enhance it by magnifying only the gradients in the original image. But repeated   enhancement cannot be done to avoid loss of information.

- Making a GUI according to the given transformation.

Milestones and Timelines

Aa Timeline	Milestones
Week 0	Project allocation and project proposal submission
Week 1	Detailed reading of the research papers and implementation of 'IMAGE SMOOTHENING USING GRADIENT ANALYSIS'
Week 2	Implementation of L0 gradient minimization or Fast global image smoothing
Week 3	Comparison with existing algorithms and creating GUI
Week 3+	Compiling results, Finishing steps and Submission

Datasets

We plan to use the dataset from [1]. This contains a total of 500 images(400 for training and 100 for testing). Each image is associated with 14 human-selected smoothing results. Only five most

chosen results are kept. Thus each image has 5 corresponding ground truth images. The dataset is obtained from:
https://github.com/zhufeida/Benchmark_EPS

References

[1] F. Zhu, Z. Liang, X. Jia, L. Zhang, and Y. Yu, "A benchmark for edge-preserving image smoothing,"IEEE Transactions on Image Processing,vol. 28, no. 7, pp. 3556–3570, 2019.

[2]Min, Dongbo & Choi, Sunghwan & Lu, Jiangbo & Ham, Bumsub & Sohn, Kwanghoon & Do, Minh. (2014). Fast Global Image Smoothing Based on Weighted Least Squares. IEEE transactions on image processing : a publication of the IEEE Signal Processing Society. 23. 10.1109/TIP.2014.2366600.