Project ID: 30

Title: Non-Local Patch-Based Image Inpainting

Team Name: Formula51

Team Members:
Trinadh *(2019101043)*
Nikit *(2019101022)*
Harsha *(2019101040)*
Sri Ram *(2019101032)*

GitHub Link

https://github.com/Digital-Image-Processing-IIITH/dip-project-formula51

GOALS

The main goal of the project is to implement an image inpainting algorithm by minimizing a patch-based function. We would try to improve the algorithm by using the following components of the algorithm.

- Approximate Nearest neighbor Search
- Reconstructing the Image
- Inpainting with Textures
- Initialization
- Multiscale Scheme
- Algorithm Parameters

Apart from these we also see the effect of various parameters on the output of the images, like patch size etc.

We will apply this framework on a dataset of images and observe that our framework produces best results when compared to existing algorithms.

PROBLEM DEFINITION

Image inpainting is the task of filling in an unknown region in an image. This is useful, for example, if an area is damaged, or if one wishes to remove an unwanted object from the image. Inpainting can be used for personal purposes or for professional image restoration. Two of the main goals of image inpainting are the convincing restitution of structures and textures which are coherent with the unoccluded part of the image.

Insights on what this paper does:

- The algorithm attempts to minimize a highly non-convex functional, The functional specifies that a good solution to the inpainting problem should be an image where each patch is very similar to its nearest neighbor in the unoccluded area.
- Iterations are performed in a multi-scale framework which yields globally coherent results. In this manner two of the major goals of image inpainting, the correct reconstruction of textures and structures, are addressed.
- We reduce execution times by using the PatchMatch.
- We address the crucial issue of initialization and the choice of the number of pyramid levels, two points which are rarely discussed in such approaches.

RESULTS OF THE PROJECT

What will be done:

1. We modify the patch distance to address the problem, concerning the correct inpainting of textures with patch-based methods
2. We compare the proposed approach with different initialization and main tunable parameters. (((We provide specific details concerning the influential initialization.)))
3. We use the PatchMatch algorithm to provide a crucial speedup for the nearest neighbor search, which is needed for the algorithm.
4. We set the number of levels automatically in the multi-scale approach using a theoretically motivated approach.
5. Along with these we make sure that we are doing proper image reconstruction and nearest neighbour search properly.

In short we will do the following in this algorithm

- Approximate Nearest neighbor Search
- Reconstructing the Image
- Inpainting with Textures
- Initialization
- Multiscale Scheme
- Algorithm Parameters tuning

Expected Final result:

- If an area in an image is damaged, then we might want to remove that. The implementation in paper will give the final image as if the damaged part is not damaged at all. [We need to mark the damaged part beforehand.]

- If one wishes to remove an unwanted object from the image. The implementation in paper will give the final image as if the unwanted part is not there at all. [We need to mark the unwanted part beforehand.]
- Final image must look as if that is the original image. I.e the texture and the edges of the occluded part in the final image looks the same as the neighbourhood of the occluded region.

TIMELINE

TimeLine	Milestone
9th November	Project Proposal
11th November	Researching potential resources [dataset, codes, etc.]
14th November	Approximate Nearest neighbor Search part of the algorithm
17th November	Reconstructing the Image part of the algorithm
19st November	Inpainting with Textures part of the algorithm
22nd November	Initialization, multiscale scheme, algorithm parameters.
22th November	Complete code of the algorithm
24th November	Data set gathering and storing which is ready to use.
26th November	Testing on the dataset should be done
[OPTIONAL] 28th November	Visualization of the results.
29th November	Code Freeze
28th November - 1st December	PPT/Slides/Demo etc

DATASET:

All images used in paper are from the dataset of Hays et al.

We will need to create the dataset of images which has portions of the parts occluded.