
CS-754 PROJECT PROPOSAL: ROBUST VIDEO DENOISING USING LOW RANK MATRIX COMPLETION

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ABSTRACT

Most existing video denoising algorithms assume a single noise model but which is often violated in practice. We will work on patch based video denoising algorithm based on grouping similar patches in spatial and temporal domain. We will formulate this as low-rank matrix completion matrix. Our implementation based on the paper (1) will be effective for removing mixed noise in video sequences.

1 INTRODUCTION

In general, video data tend to be more noisy than single image due to high speed capturing rate of video camera. Video denoising aims at efficiently removing noise from all frames of a video by utilizing information in both spatial and temporal domains. Standing out from most of the denoising techniques, our implementation will be able to perform well for video frames with mixed noise.

2 IMPLEMENTATION

We will do patch-wise denoising of the video and then combine the patches to obtain the reconstructed mean video. Patch-wise denoising is more of a matrix completion problem, as the outliers will be removed from a reference patch after grouping together similar patches using three-step search hierarchical algorithm (3). Before this, the data would be preprocessed for impulsive noise (2).

We will use MATLAB extensively for this project.

3 EVALUATION/VALIDATION STRATEGY

We are planning to evaluate our implementation on the basis of PSNR values for our denoised video as compared to the values mentioned in the paper (1). Also for the images validated in the paper, we will compare our generated video with the paper's implementation and other implementations (VBM3D, PCA-based method) to get a better evaluation of our algorithm.

4 RELATED WORK

- BM3D: Image and video denoising by sparse 3D transform-domain collaborative filtering
- A robust patch matching are proposed by using the depth as a constraint in the matching process and the patch stack is denoising by both PCA and Tensor analysis.

5 DATASET

Videos' Dataset: <https://media.xiph.org/video/derf/>

This is the exhaustive dataset we will use for our project.

REFERENCES

- [1] Hui Ji, Chaoqiang Liu, Zuowei Shen and Yuhong Xu. *Robust video denoising using Low rank matrix completion.*
- [2] H. Wang, R. A. Haddad *Adaptive median filters: New algorithms and research*
- [3] Bede Liu, André Zaccarin *New fast algorithms for the Estimation of Block motion vectors*