Proposal for EIE 4512 Final Project 2023

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Title: innovative algorithms for the astronomy image restoration

Description:

(Brief statement of your problem: what the task is; how does previous work solve it and their potential drawback; in what aspect you want to build upon previous work (aka, novelty/motivation/pipeline); other misc: datasets, which deep learning system will be used, etc.)

- **Task and goal**

Our task is to reconstruct the damaged astronomy images with our algorithms whose noise can be generated by various sources.

Previous work may implement different algorithms to solve such kind of restoration problems, such as different kinds of spatial filters and frequency filters to cope with different kind of noise, like inverse filter, wiener filter, constrained least squares filter, blind deblurring, etc. Meanwhile, different algorithms may have their own limitations and drawbacks, and some of them can leave unpleasant processed results. We may firstly take a look at the previous works' different ideas to have a rough understanding of the current progress and then carry on our work.

Our goal is to design some innovative algorithms to overcome some of those limitations and output better processed images. At the same time, the time and computation complexity of the algorithm is also considered as one of our target. We may try to derive some algorithms with lower computation complexity so that we can have higher efficiency.

- **Dataset and experiment**

We will derive some typical degraded astronomy images as our dataset from the online source such as NASA, shutterstock. We will carefully select different kinds of corrupted images, which will contain different kinds of noise patterns so that we can apply different kind of algorithms. Generally, all of the selected images would be appropriate for image restoration, which means finally we can get a much more satisfactory result if we apply the appropriate algorithm.

We will take advantage of some of the algorithms' idea from the lectures, and some of our the operations may be combined in order to achieve a better result. We will use python programming language as our main tool to process our experiment, and the processed image will be output as the result of the code.

- **Expected results**

We expect better output results than those of some ordinary algorithms after our restoration. In detail, we hope our processed results can have better spatial resolution and less area to be influenced by the noise, compared with the original image, so that we can have a better visualization of the original astronomy images.

Tentative Timeline/To-do lists:

- Jul 7 – Jul 9: Investigation of the topic
- Jul 10 - Jul 12: Build up codebase and derive the datasets
- Jul 13 - Jul 15: develop the algorithm idea
- Jul 16 - Jul 19: write the code and test the results
- Jul 20- Jul 22: finish the PPT slides for presentation
- Jul 23- Jul 30: paper writing

[STOP. Maximum length of your proposal is One-page.]