A User Guide

A Novel Family of Edge Preserving Anisotropic Filters

In this study, new anisotropic image filters are introduced and their performances are compared with existing isotropic and anisotropic filters. The developed filters were examined according to their image noise removing performances in terms of standard image quality metrics, as well as the edge preserving properties of the filtered images. Mathematical inferences of anisotropic filters are made based on the minimization of the Polyakov action energy integral. New anisotropic metrics are found by means of Finsler metrics that minimize the corresponding integral. The new metrics perform filtering by updating the image with anisotropic Laplace-Beltrami flow. After filtering, it was observed that the introduced metrics perform well against other anisotropic metrics. It is also observed that the developed New Randers, New Normalized Miron, and New Metric filters preserve edges better than other filters, making it a plausible noise removal tool prior to edge detection in image processing. The source codes of proposed filters are publicly available at **https://github.com/HAYDARKILIC**.

As you can see below, the main panel of the application is seen. In general, the filtering performances and edge protection performances of any image are compared by using isotropic and anisotropic filters.

You can select any picture on your computer from the following section of the main panel by pressing the "Select Image" button. You can also add Gaussian or Salt Pepper Noise in this section. No noise will be added if you don't turn the "Add Noise" switch to "On".

When you turn the switch to the "On" position, the noise image will automatically appear as below.
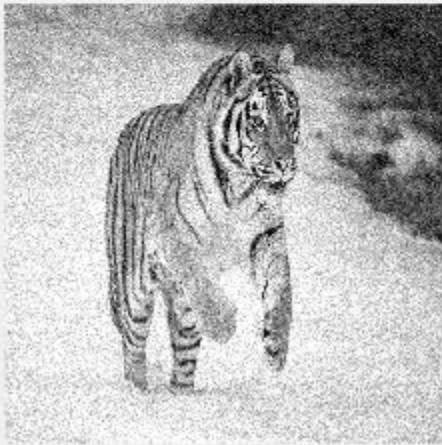
Then you can choose which two filters you want to compare from the section below.

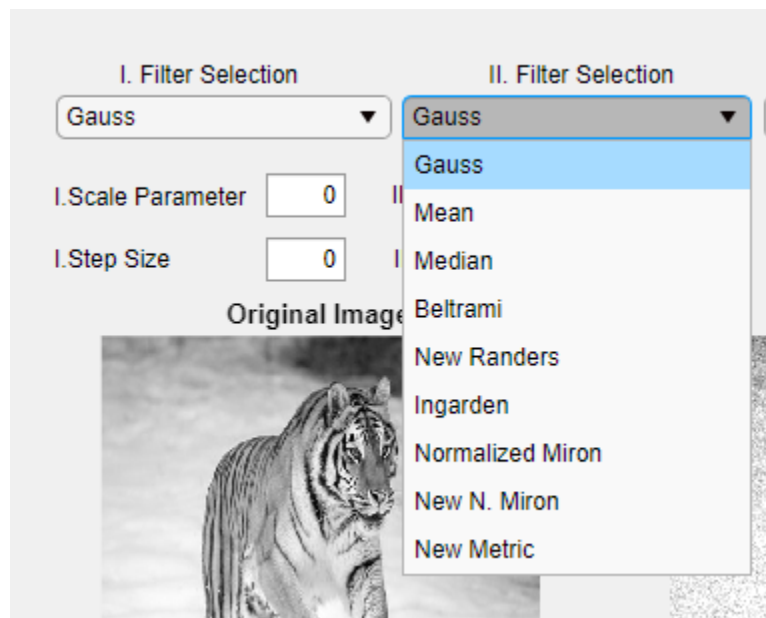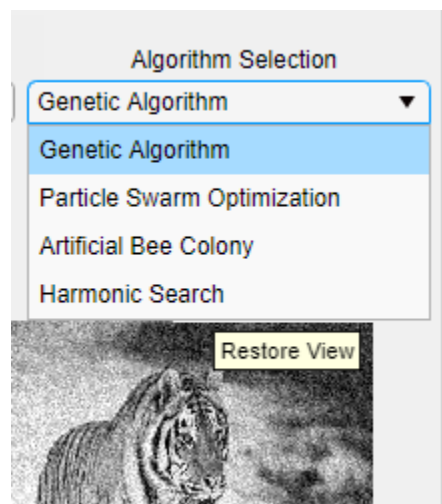If you want an optimization algorithm to calculate everything automatically, you should leave the "scale parameter" and "step size" fields blank and set the "Algorithm" switch to "On". However, if you do not want this, you should fill in the "scale parameter" and "step size" sections for each filter and set the "Algorithm" switch to "Off". You can choose the algorithm as follows.

After all that, if you fill in the "iteration number" and press the "Start Calculation" button, the calculations will start as follows.
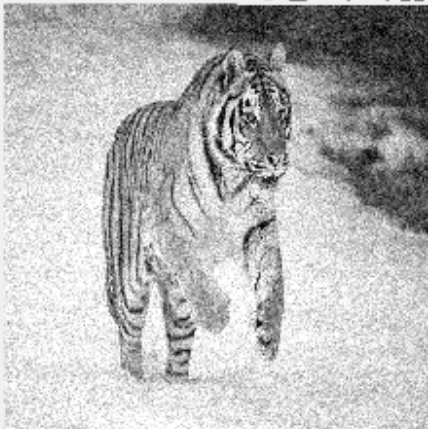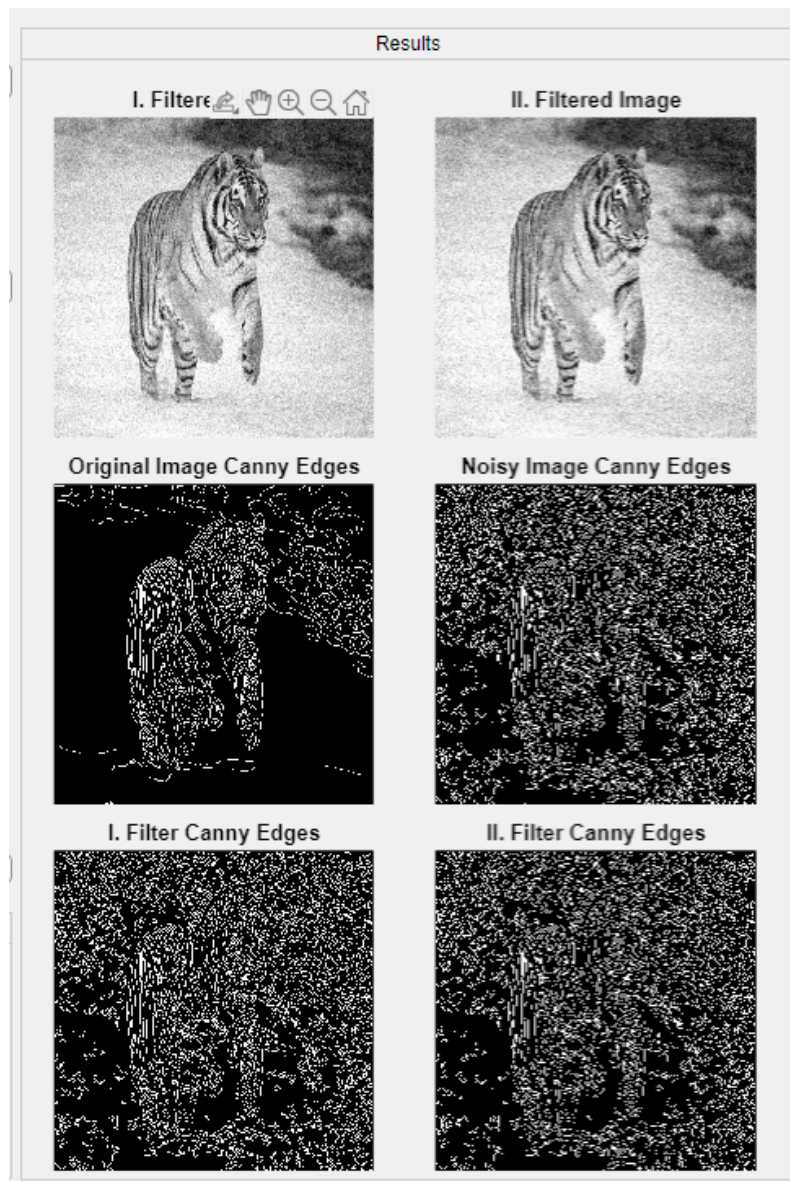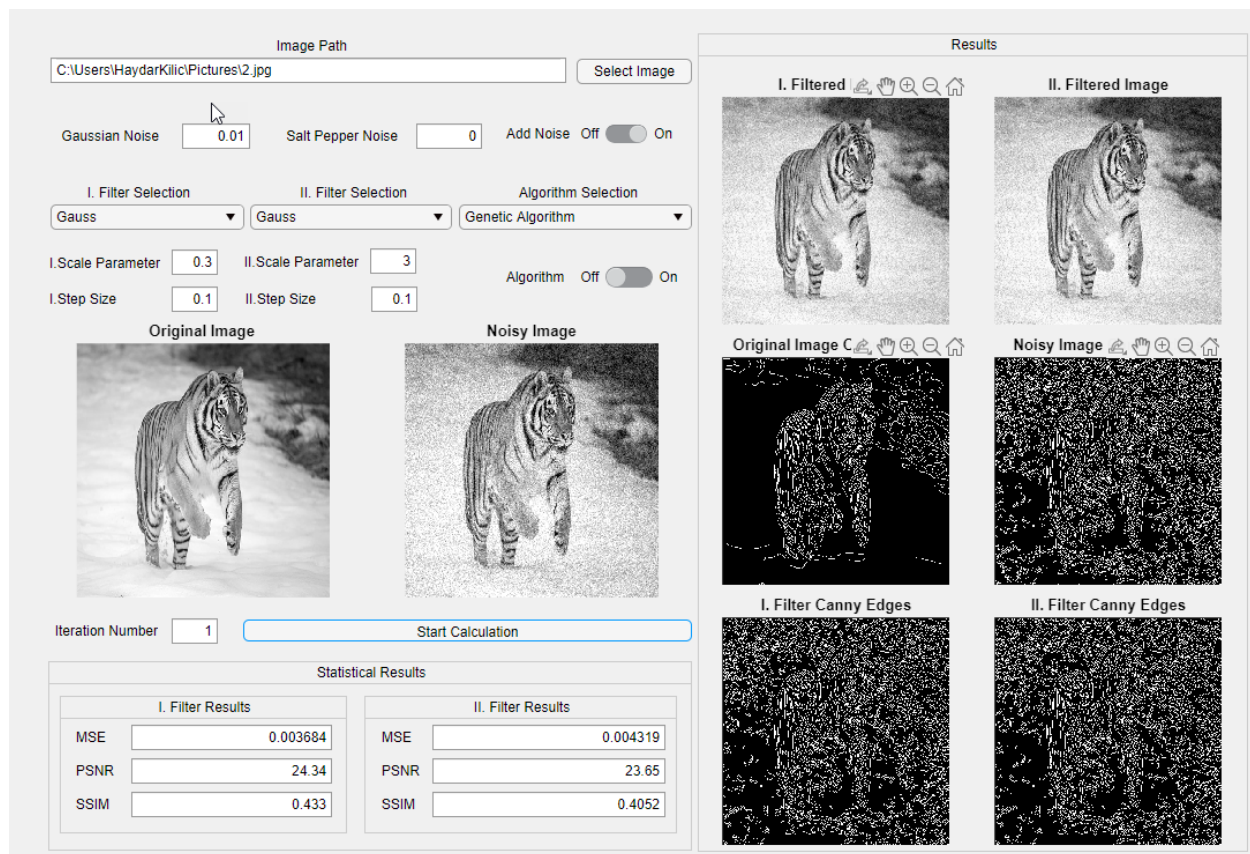
After the calculations are finished, the results will automatically appear in the "Statistical Results" section as follows.

Statistical Results

I. Filter Results		II. Filter Results	
MSE	0.003684	MSE	0.004319
PSNR	24.34	PSNR	23.65
SSIM	0.433	SSIM	0.4052

In addition, the images and edge results obtained as a result of the filtering will appear in the section below.

Results

I. Filtered Image

II. Filtered Image

Original Image Canny Edges

Noisy Image Canny Edges

I. Filter Canny Edges

II. Filter Canny Edges

After all these calculations, the final image of the main board will be as follows.

Thank you for your interest

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