

## Edge Preserving Filters

*Edge-preserving smoothing or filtering is an image processing technique that smooths away noise or textures while retaining sharp edges. Examples are the median, bilateral, guided, anisotropic diffusion, and Kuwahara filters. (Wikipedia: [https://en.wikipedia.org/wiki/Edge-preserving\\_smoothing](https://en.wikipedia.org/wiki/Edge-preserving_smoothing))*

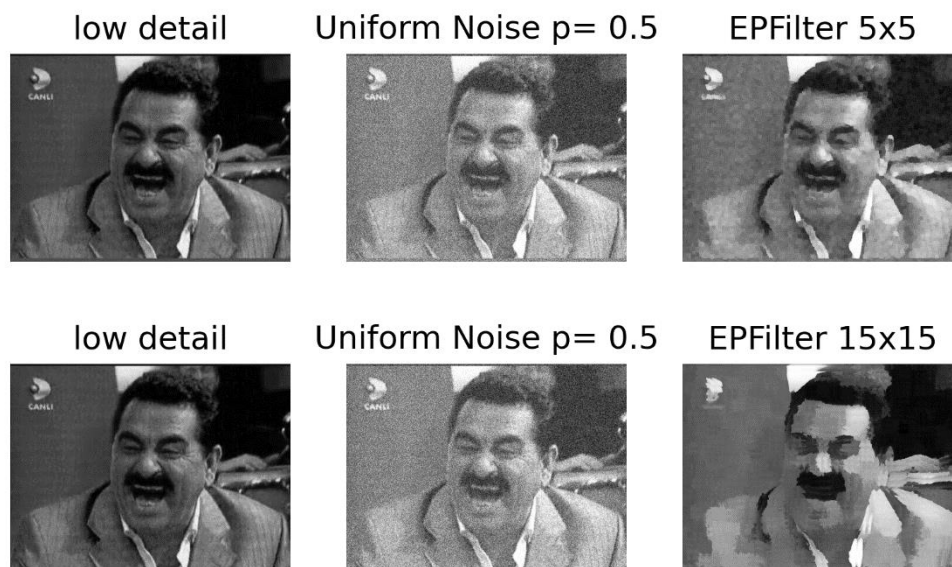
In this experiment, you will analyze and discuss the effectiveness of edge-preserving filters in some special conditions.

### Preparation

First, you'll choose **three** filters (**two** if you are a single-person group) You may implement or find the implementation of these filters. You can use any environment (python, OpenCV, Matlab, etc.)

I'll provide two image sets containing low, medium and high details (medical and Mahmut Tuncer images).

You'll add two types of noise to these images. (Gaussian noise, uniform noise)



(Quote: When you said, "They applied me uniform noise İbrahim abi", I came and applied the edge-preserving filter.)

## Experiment

You have three edge-preserving filters (A,B and C).

- You have two filter sizes 5x5 15x15. If filter sizes do not apply to your choices, change and state the situation in your report.

You have two types of noises ((G)aussian, (U)niform)

- Gaussian noise should be distributed in mean= 128 and variance = 10
- Uniform noise should be distributed between 0 and 255
- Apply all noises in 0.1, 0.5, and 0.8 probability. (0.1 prob means % 10 of the pixels will be distorted)

You have two sets of images (S1 – medical, S2 – Mahmut).

- Change images to grayscale.

### Experiment Flow

Image set S1

- Apply G noise
  - 0.1 probability
    - Apply filters (A,B,C)
      - For 5x5
      - For 15x15
  - 0.5 probability
    - Apply filters (A,B,C)
      - For 5x5
      - For 15x15
  - 0.8 probability
    - Apply filters (A,B,C)
      - For 5x5
      - For 15x15
- Apply U noise
  - 0.1 probability
    - Apply filters (A,B,C)
      - For 5x5
      - For 15x15
  - 0.5 probability
    - Apply filters (A,B,C)
      - For 5x5
      - For 15x15
  - 0.8 probability
    - Apply filters (A,B,C)
      - For 5x5
      - For 15x15

Do the same for S2 images.

## **Submission**

### **Codes**

Submit the codes for your experiment.

### **Report**

Introduction:

- Briefly (in one or two paragraphs) describe the filters and noise types in the introduction part.

Tools:

- Which environment and preparations need to run your experiment?

Results:

- Necessary code samples to create the images and the outcomes(images) with proper description.

Discussion:

- What are your observations about different filter types? Different filter sizes?
- Which filter is better in different noise and detail cases? Provide your opinions and observations.

References:

- List all references you've used in the experiment.