

CS5500 – Digital Image Processing
Cal Poly Pomona
Homework 3
Fall 2023

Description:
Image Restoration

Name: Fidelis Prasetyo

Email: (fprasetyo@cpp.edu)

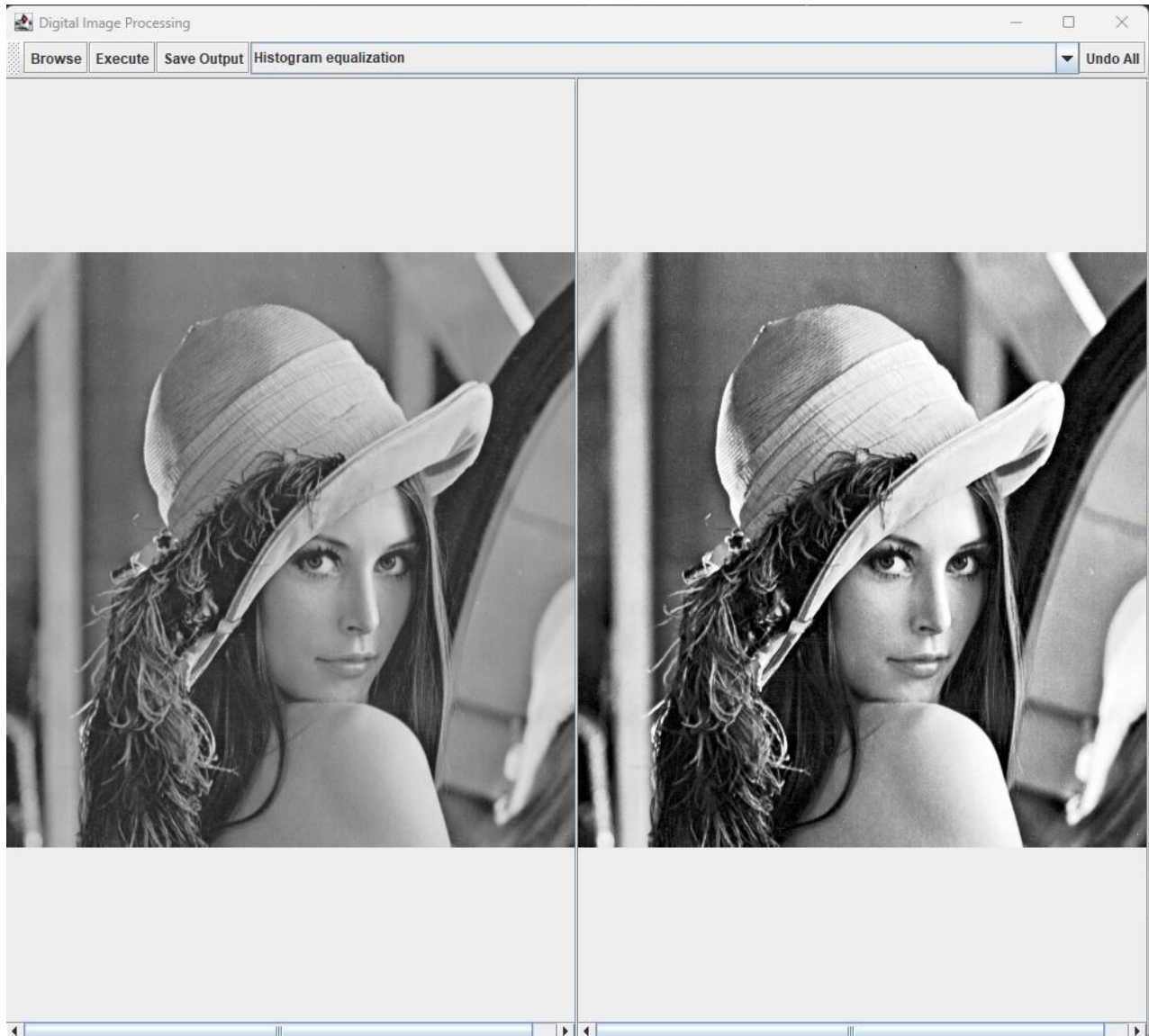
BroncoID: 015765555

Github & Source code:

<https://github.com/fidelisprasetyo/DigitalImageProcessing>

Program Description

Preview of GUI of the program:



Description:

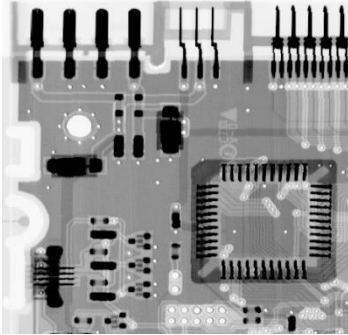
- Left image: the original image.
- Right image: the processed image.
- Browse button: to open the desired image file.
- Execute button: apply the chosen action.
- Save output: save the processed image (right image) to a file.
- Undo all: revert all changes to the original image.

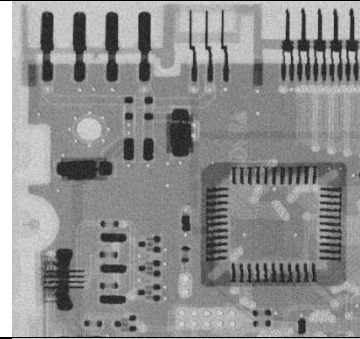
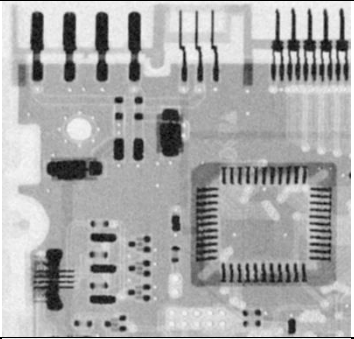
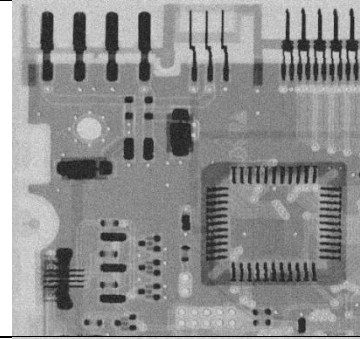
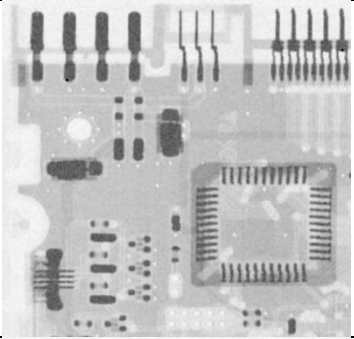
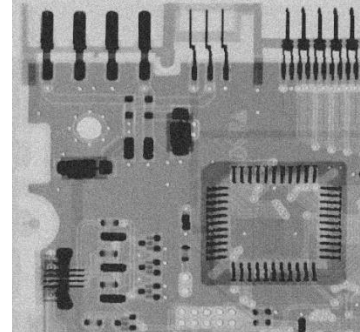
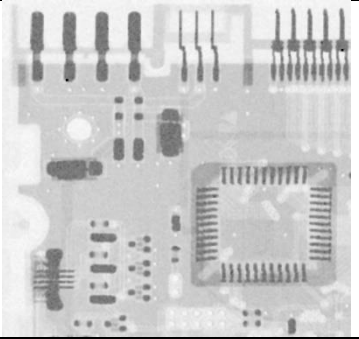
Implemented Features:

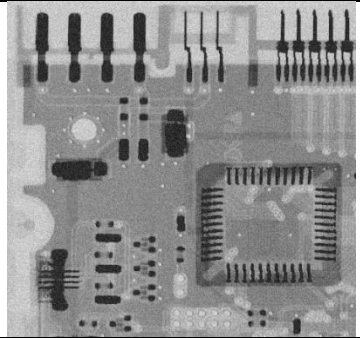
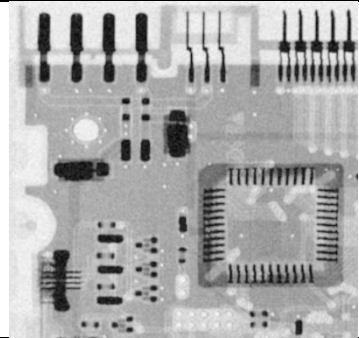
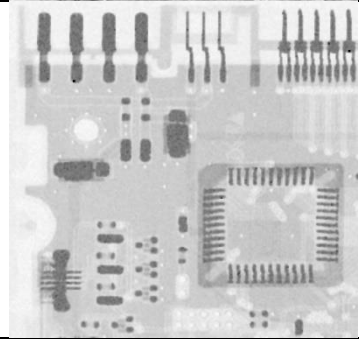
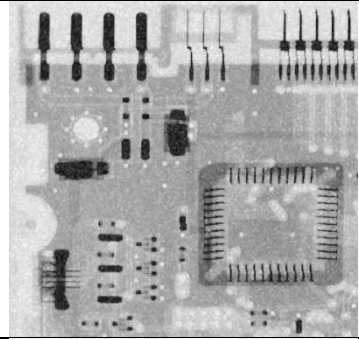
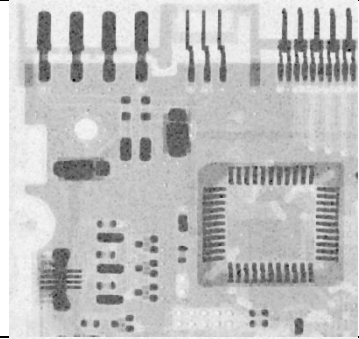
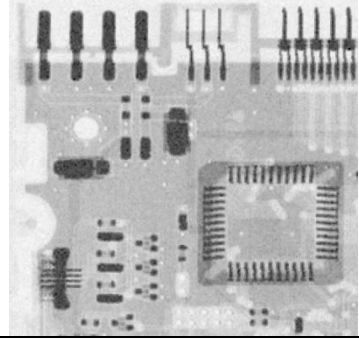
- Arithmetic mean filter
- Geometric mean filter
- Harmonic mean filter
- Contraharmonic mean filter
- Max filter
- Min filter
- Midpoint filter
- Alpha-trimmed mean filter

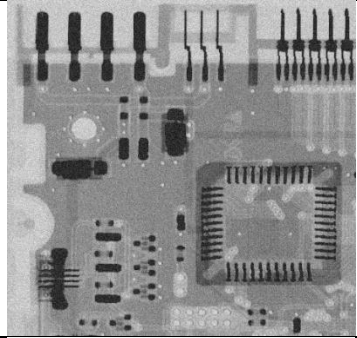
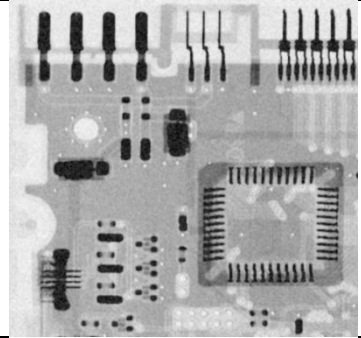
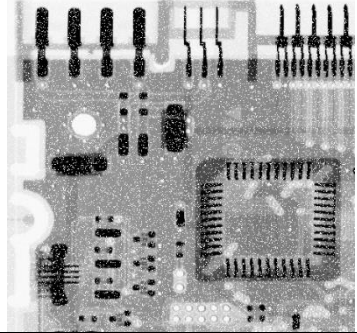
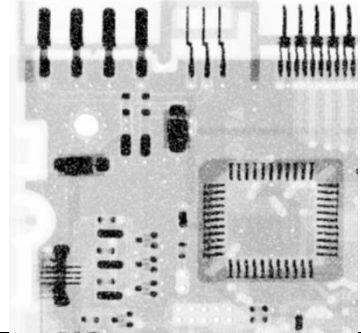
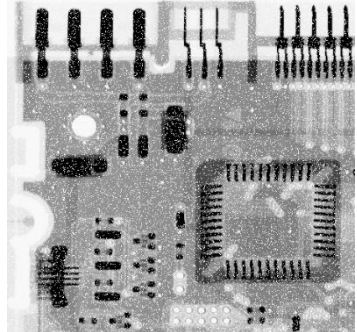
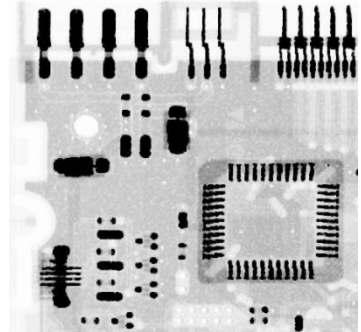
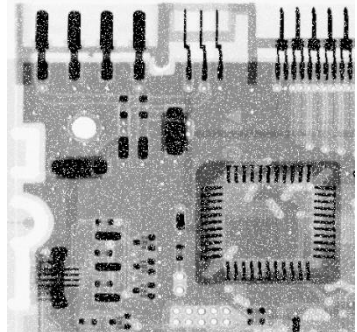
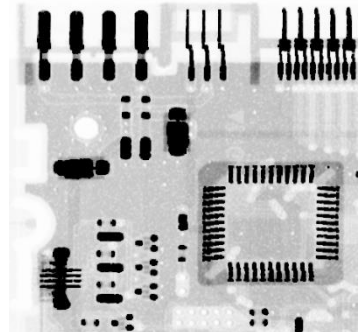
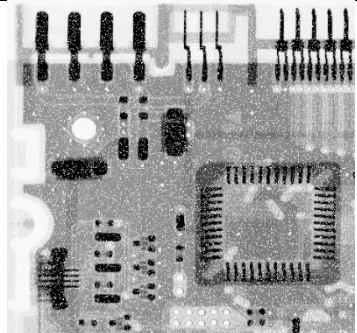
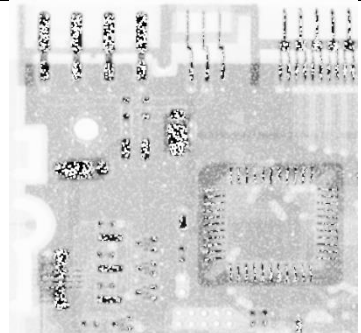
Program Demonstration

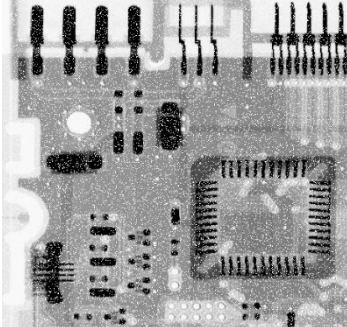
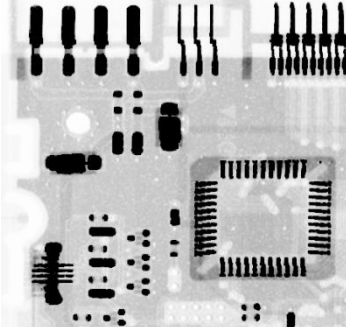
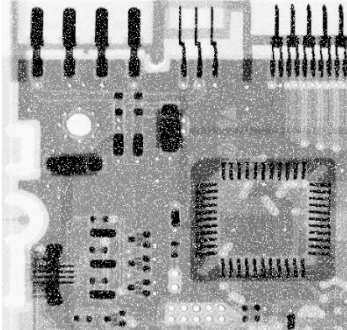

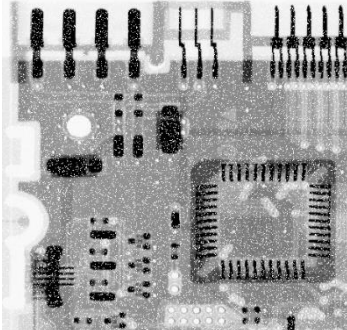
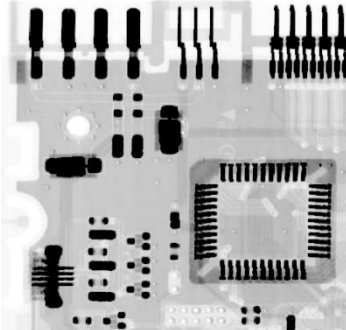
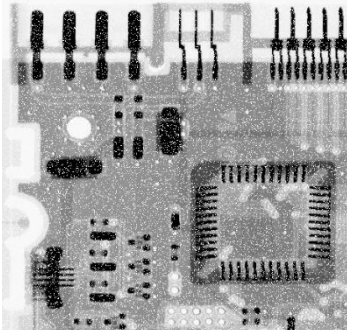
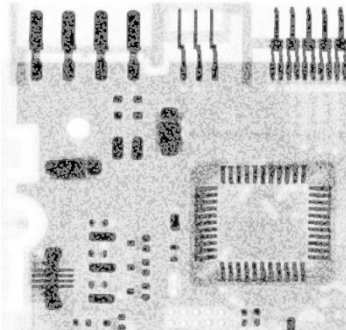
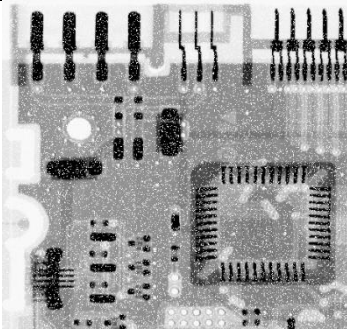
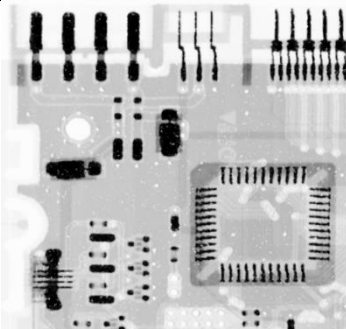
Original Image:

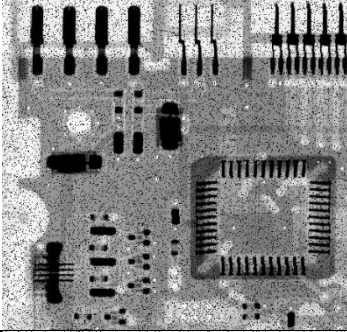
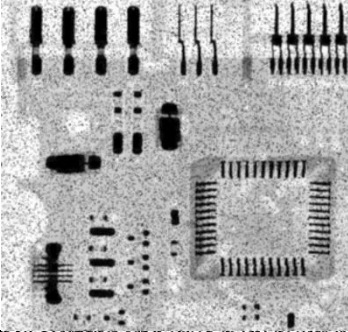
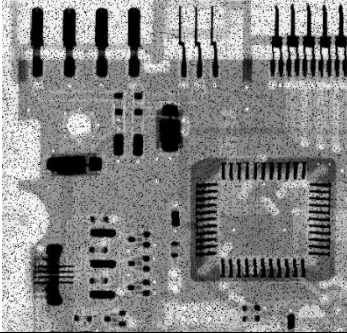
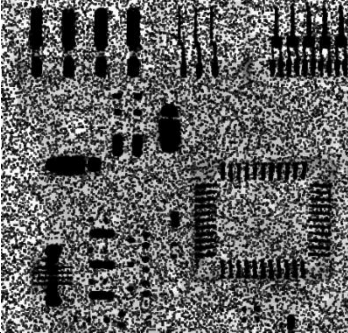
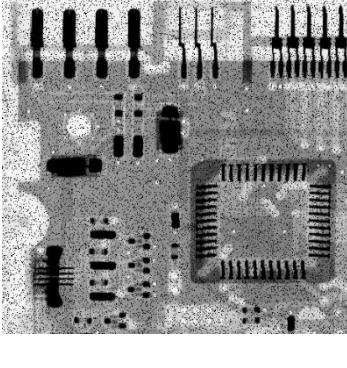
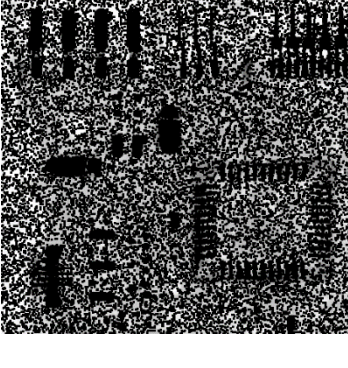
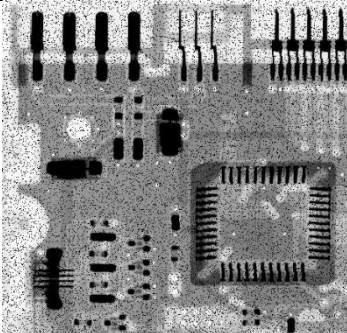
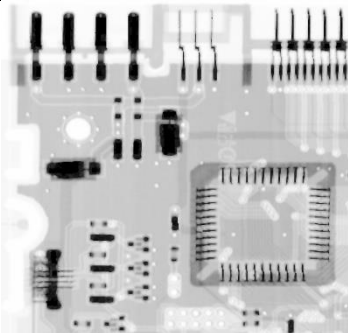
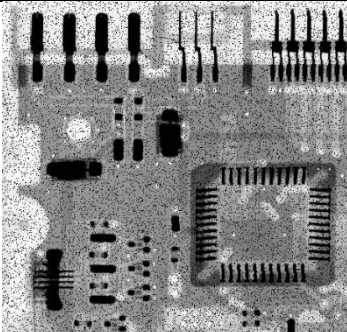
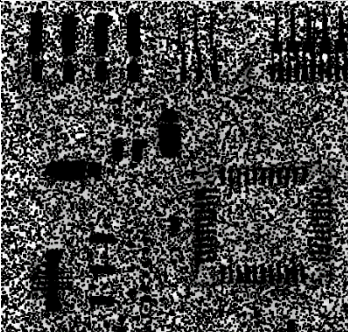


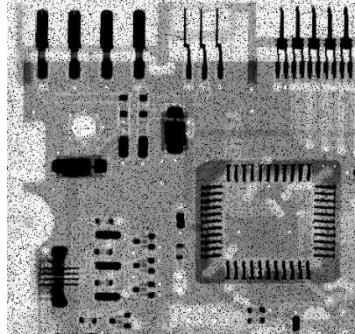
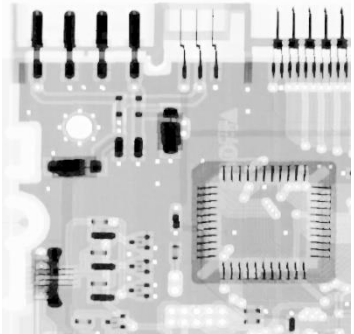
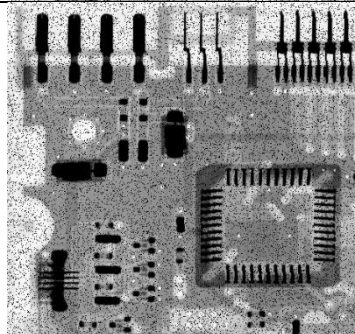
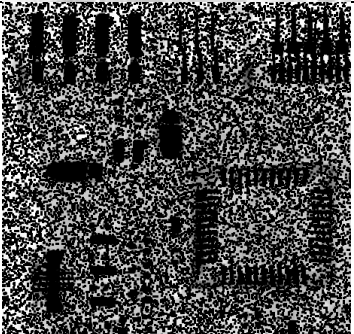
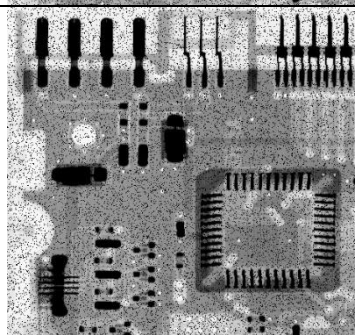
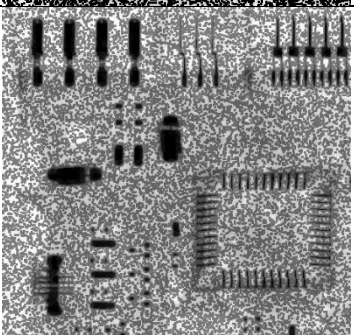
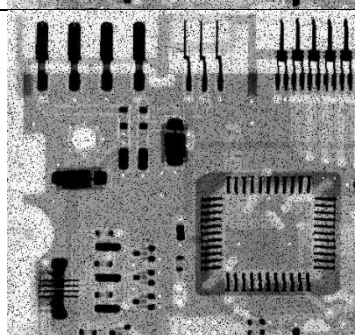
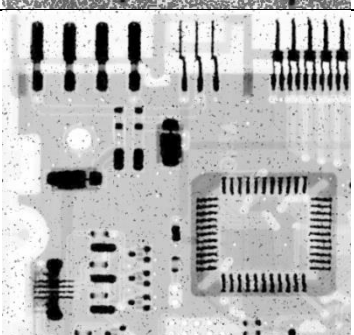
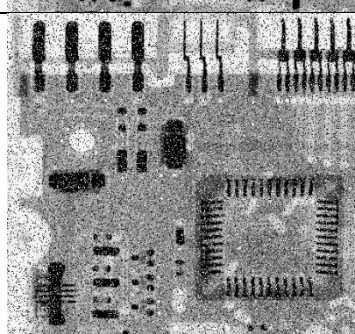
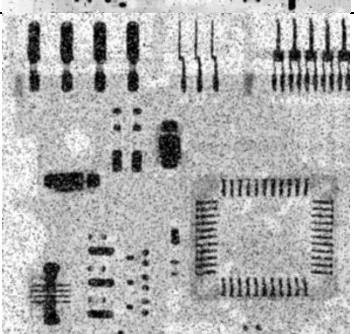
Noise	Noisy Image	Filter (filter size = 3x3)	Filtered Image
Gaussian noise		Arithmetic mean filter	
		Geometric mean filter	
		Harmonic filter	

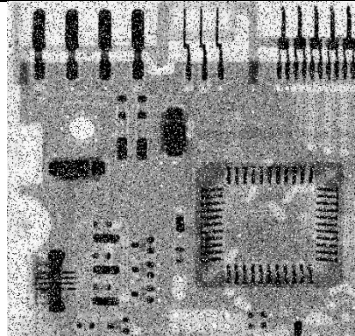
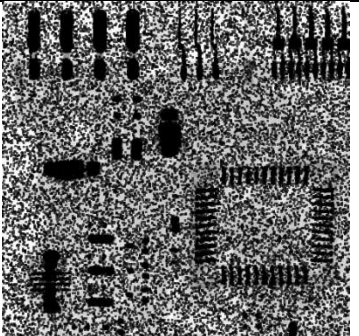

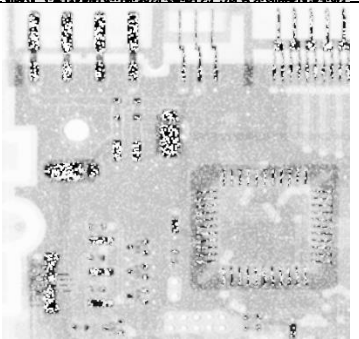
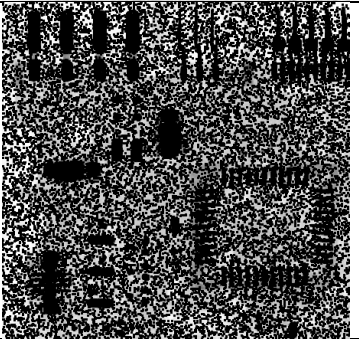
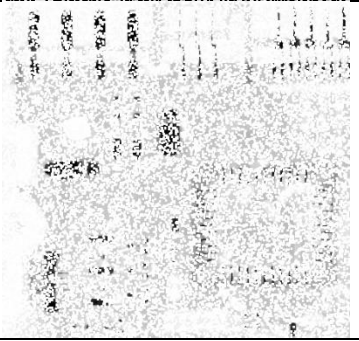
	Contraharmonic filter (order = 1.5)	
	Contraharmonic filter (order = -1.5)	
	Max filter	
	Min filter	
	Midpoint filter	

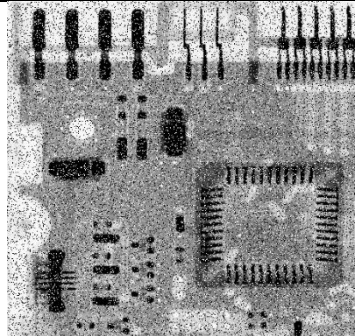
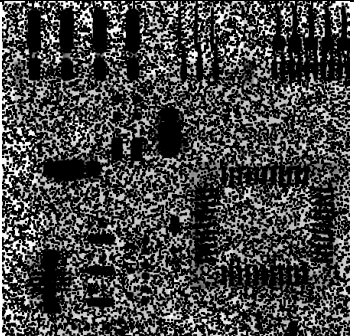
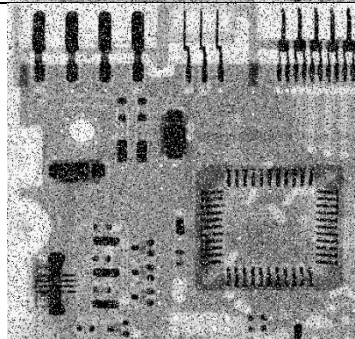
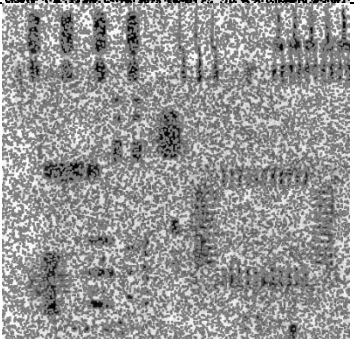
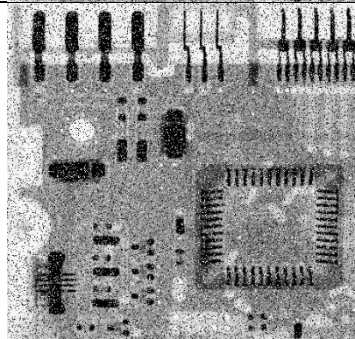
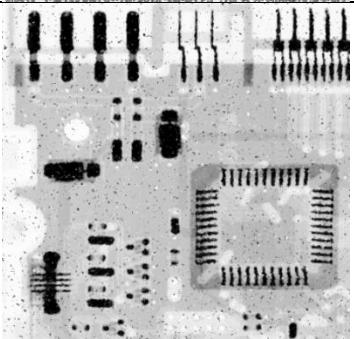
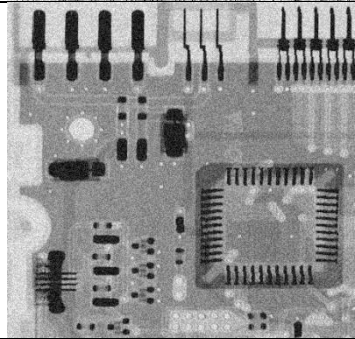
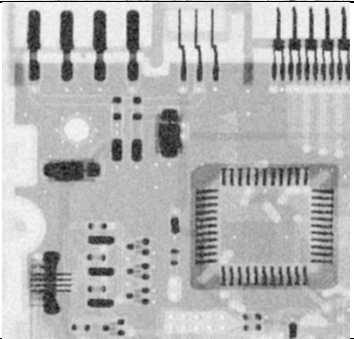
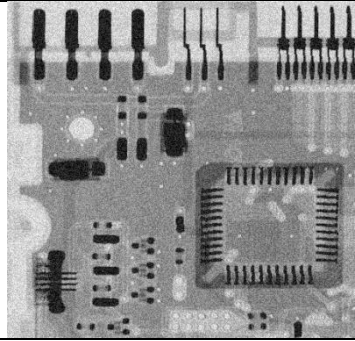
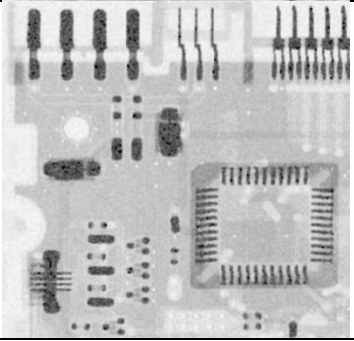
		Alpha-trimmed mean filter (d=5)	
Impulse Noise (Salt)		Arithmetic mean filter	
		Geometric mean filter	
		Harmonic filter	
		Contraharmonic filter (order = 1.5)	

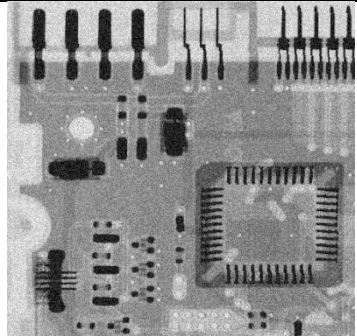
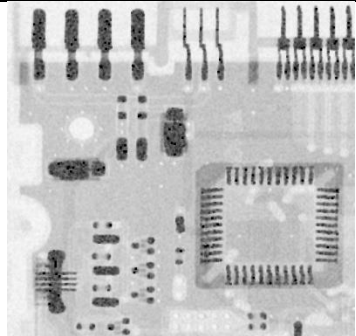
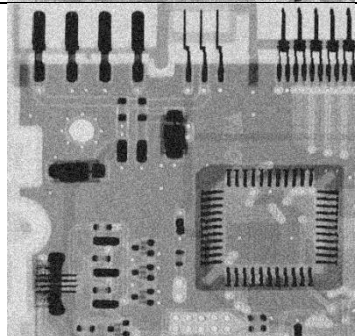
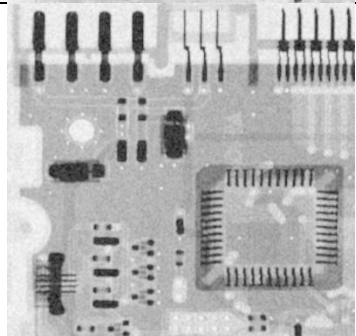
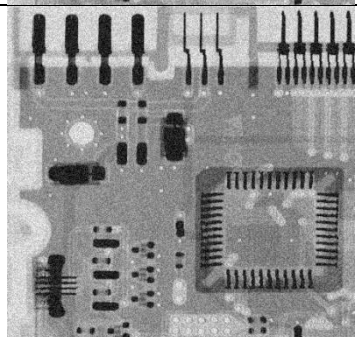
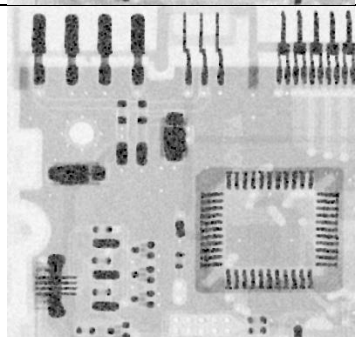
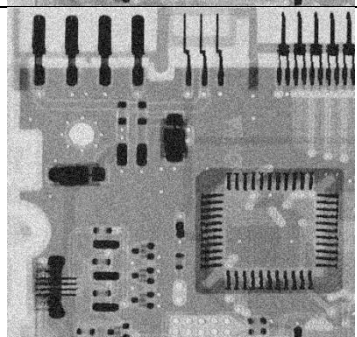
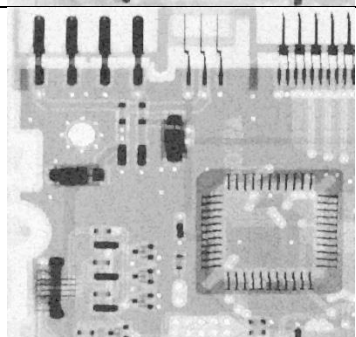
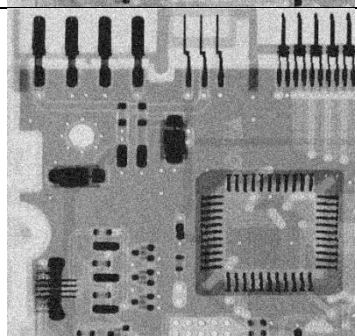
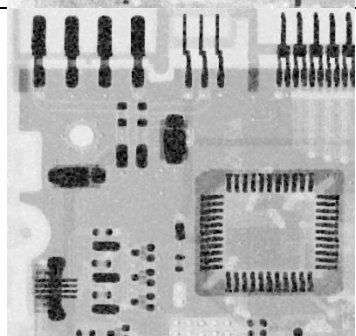
		Contraharmonic filter (order = -1.5)	
		Max filter	
		Min filter	
		Midpoint filter	
		Alpha-trimmed mean filter (d=5)	

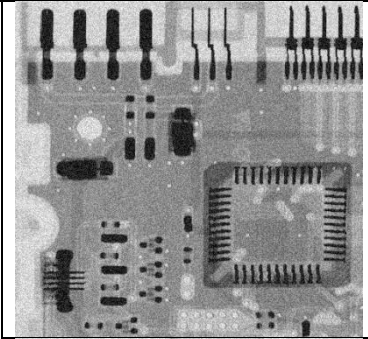
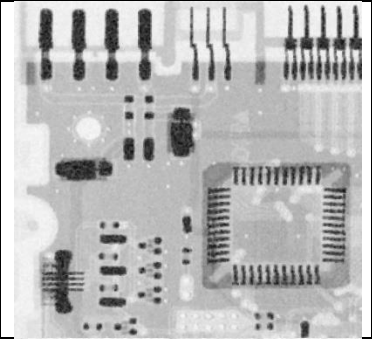
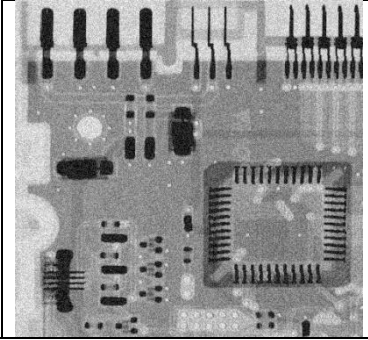
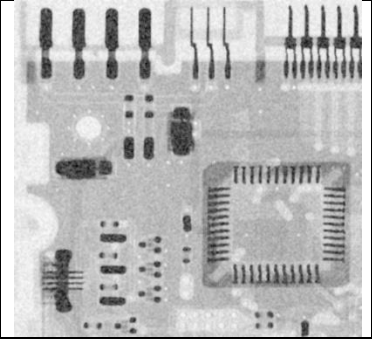
Impulse Noise (pepper)		Arithmetic mean filter	
		Geometric mean filter	
		Harmonic filter	
		Contraharmonic filter (order = 1.5)	
		Contraharmonic filter (order = -1.5)	

		Max filter	
		Min filter	
		Midpoint filter	
		Alpha-trimmed mean filter (d=5)	
Impulse Noise (salt and pepper)		Arithmetic mean filter	

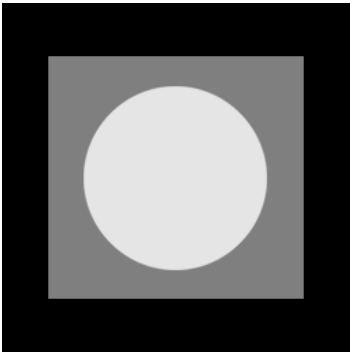
	Geometric mean filter	
	Harmonic filter	
	Contraharmonic filter (order = 1.5)	
	Contraharmonic filter (order = -1.5)	
	Max filter	

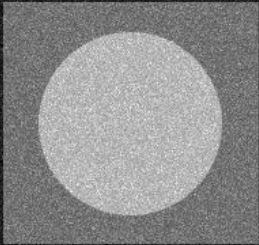
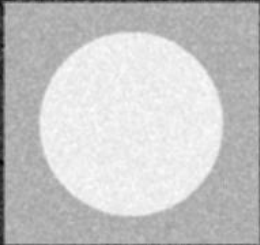
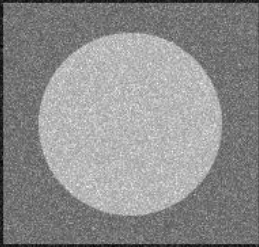
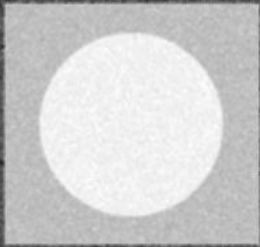
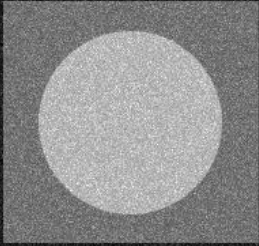
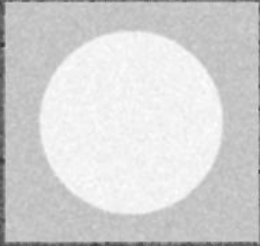
		Min filter	
		Midpoint filter	
		Alpha-trimmed mean filter (d=5)	
Uniform Noise		Arithmetic mean filter	
		Geometric mean filter	

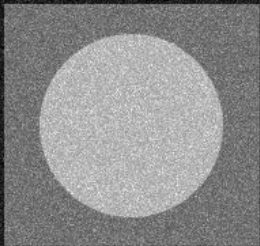
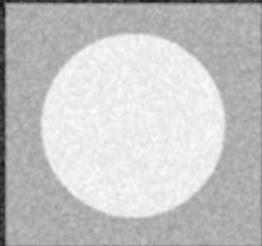
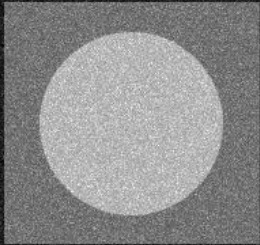
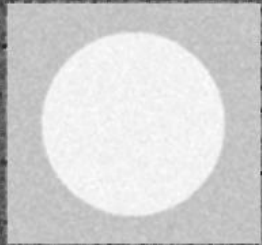
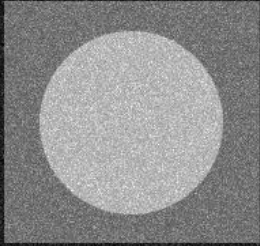
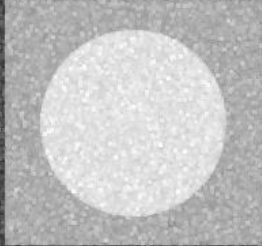
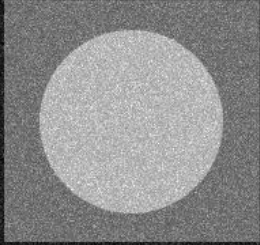
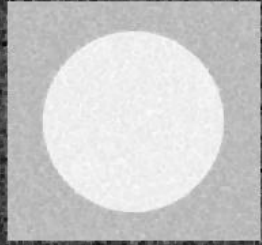
		Harmonic filter	
		Contraharmonic filter (order = 1.5)	
		Contraharmonic filter (order = -1.5)	
		Max filter	
		Min filter	

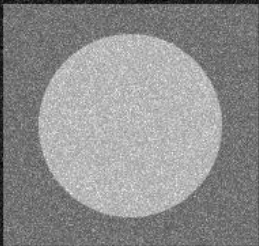
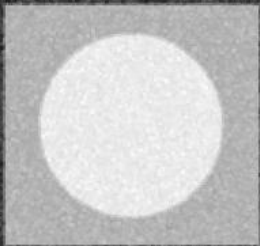
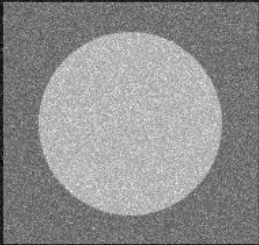
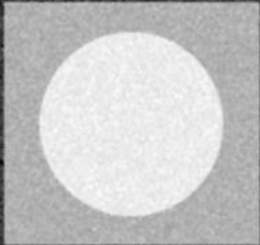
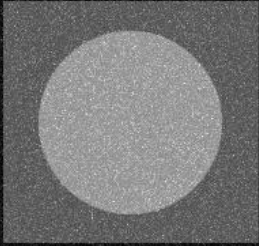
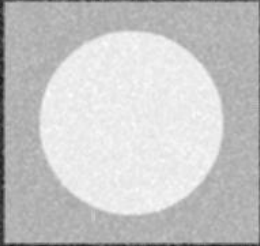
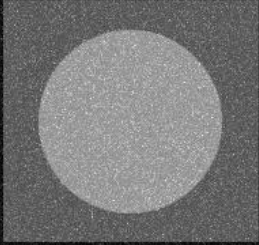
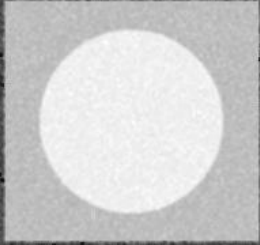
		Midpoint filter	
		Alpha-trimmed mean filter (d=5)	

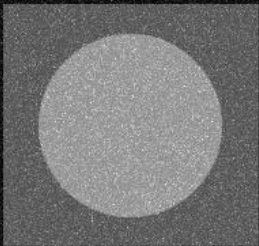
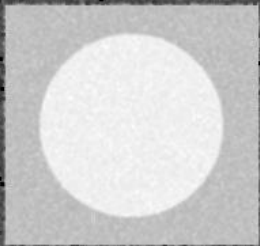
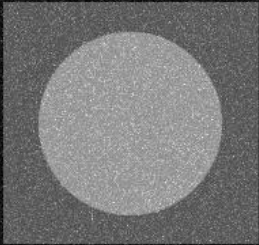
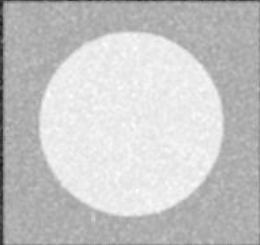
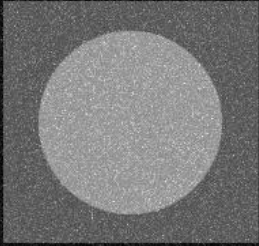
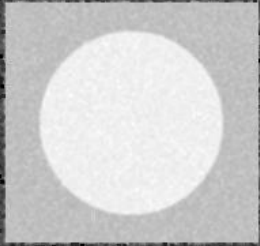
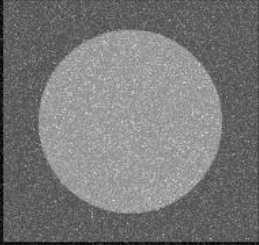
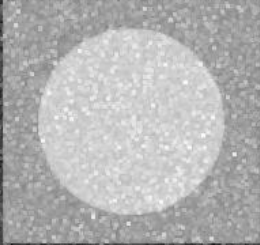
Original Image:

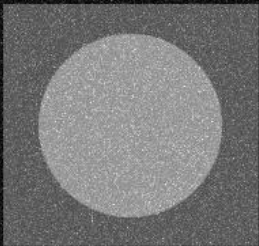
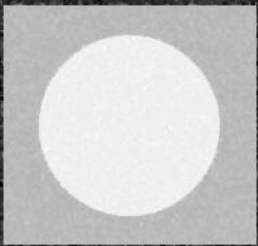
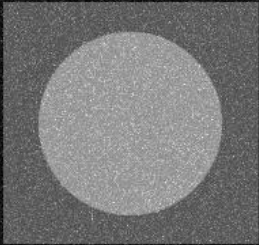
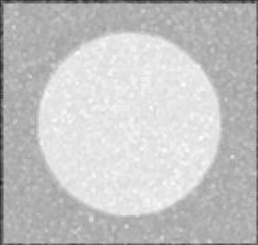
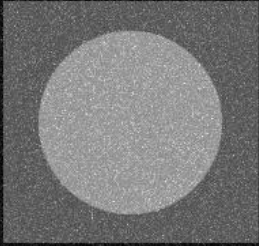
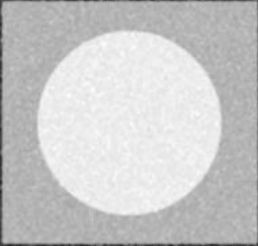
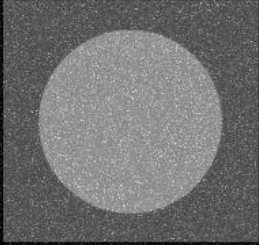
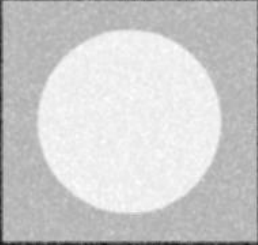


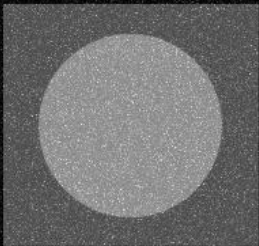
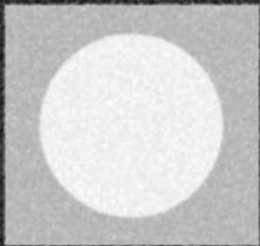
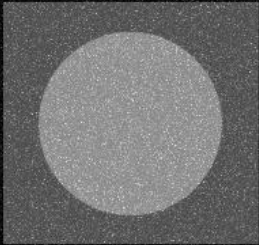
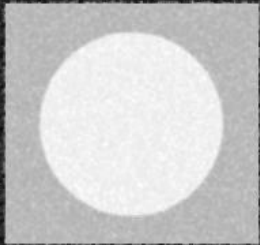
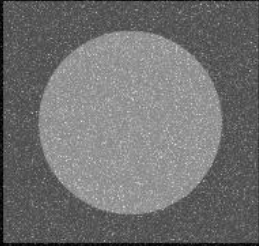
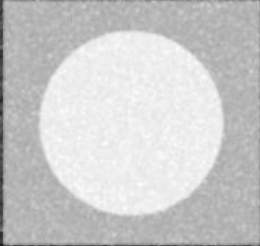
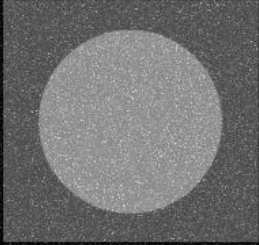
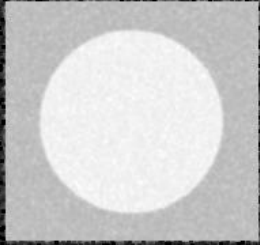
Noise	Noisy Image	Filter (filter size = 3x3)	Filtered Image
Rayleigh Noise		Arithmetic mean filter	
		Geometric mean filter	
		Harmonic filter	

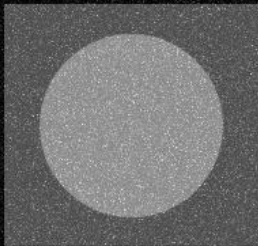

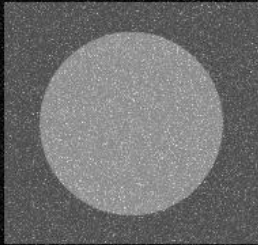
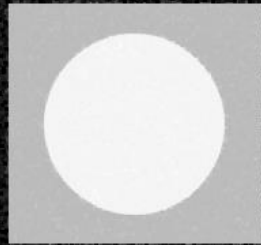
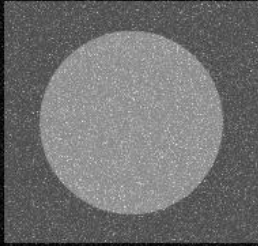

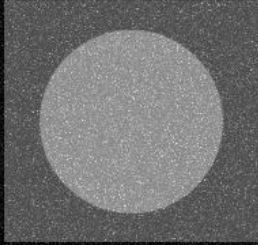
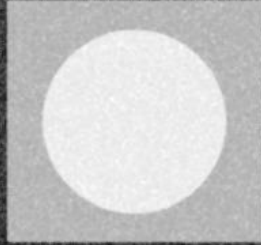
		Contraharmonic filter (order = 1.5)	
		Contraharmonic filter (order = -1.5)	
		Max filter	
		Min filter	

		Midpoint filter		
		Alpha-trimmed mean filter (d=5)		
Gamma Noise		Arithmetic mean filter		
		Geometric mean filter		

		Harmonic filter		
		Contraharmonic filter (order = 1.5)		
		Contraharmonic filter (order = -1.5)		
		Max filter		

		Min filter	
		Midpoint filter	
		Alpha-trimmed mean filter (d=5)	
Exponential Noise		Arithmetic mean filter	

		Geometric mean filter		
		Harmonic filter		
		Contraharmonic filter (order = 1.5)		
		Contraharmonic filter (order = -1.5)		

		Max filter	
		Min filter	
		Midpoint filter	
		Alpha-trimmed mean filter (d=5)	

Best for gaussian noise:

- Arithmetic Mean Filter
- Geometric Mean Filter
- Harmonic Mean Filter
- Contraharmonic filter (order = 1.5)
- Alpha-trimmed mean filter (d=5)

Best for impulse (salt) noise:

- Contraharmonic filter (order = -1.5)
- Min filter

Best for impulse (pepper) noise:

- Contraharmonic filter (order = 1.5)
- Max filter

Best for impulse (salt and pepper) noise:

- Alpha-trimmed mean filter (d=5)

Best for uniform noise:

- Arithmetic Mean Filter
- Geometric Mean Filter
- Harmonic Mean Filter
- Contraharmonic filter (order = 1.5)
- Alpha-trimmed mean filter (d=5)

Best for rayleigh noise:

- Arithmetic Mean Filter
- Contraharmonic filter (order = 1.5)
- Midpoint filter
- Alpha-trimmed mean filter (d=5)

Best for gamma noise:

- Min filter

Best for exponential noise:

- Min filter

Source Code & Supporting Files

The entire source code, this pdf file, and output images can be obtained from this GitHub repository:

<https://github.com/fidelisprasetyo/DigitalImageProcessing>