

Instituto Federal do Ceará - Campus Maracanaú

Disciplina: Processamento Digital de Sinais (PDS)

Professor: Douglas de Araújo Rodrigues

Aluno: Rian Erick de Menezes Da Silva

Relatório: Aplicação de Filtros Espaciais e Detector de Bordas (Sobel) em Imagens com Ruído Sal e Pimenta

Introdução

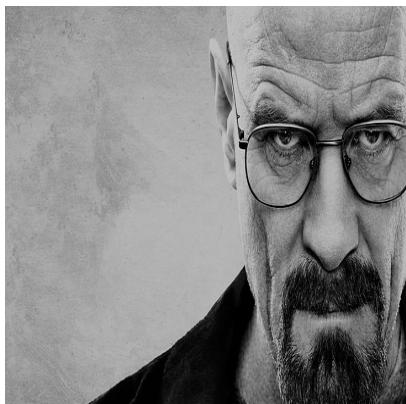
O processamento digital de imagens é fundamental para análise, manipulação e interpretação de informações visuais. Neste trabalho, investigamos a aplicação de ruído sal e pimenta, a filtragem espacial por Média, Mediana e Triangular em diferentes janelas, e o efeito do operador de Sobel na detecção de bordas em imagens originais, ruidosas e filtradas.

Metodologia

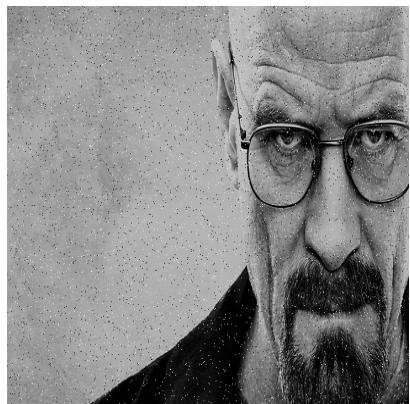
1. Duas imagens de entrada foram convertidas para escala de cinza. 2. Foi adicionado ruído sal e pimenta (probabilidade 0,02). 3. Aplicaram-se filtros de Média, Mediana e Triangular em janelas 3x3, 5x5 e 7x7. 4. Aplicou-se o operador de Sobel em imagens originais, ruidosas e filtradas.

Resultados - Imagem 1 (Walter)

Imagens Originais

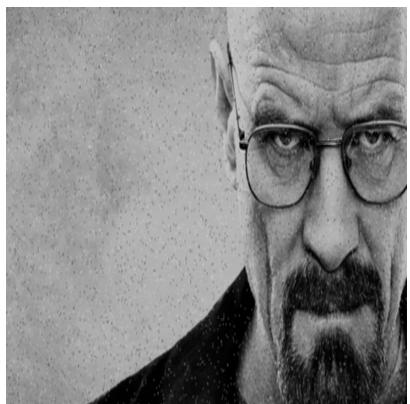


Original

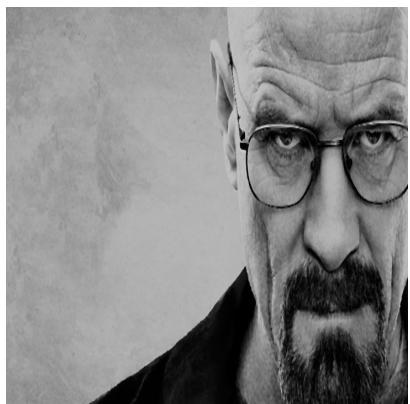


Com Ruído

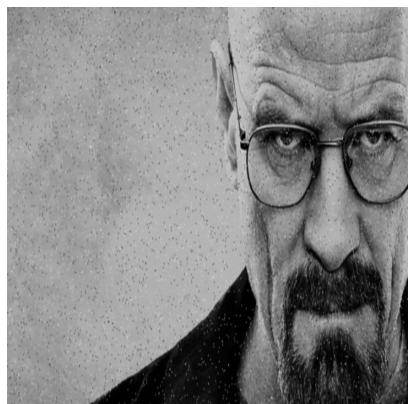
Filtros



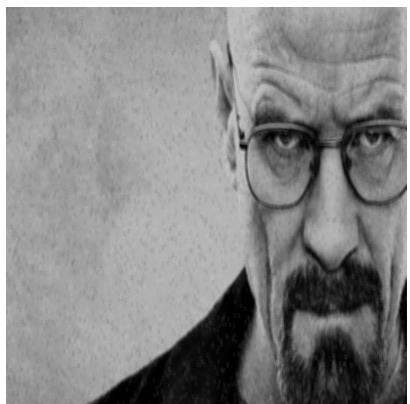
Média 3x3



Mediana 3x3



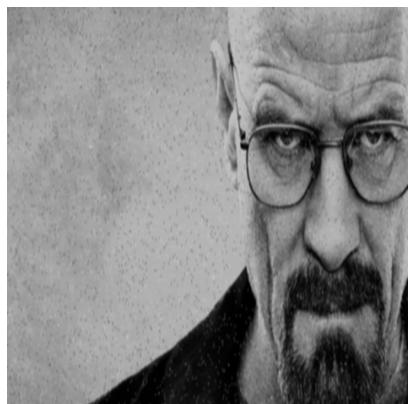
Triangular 3x3



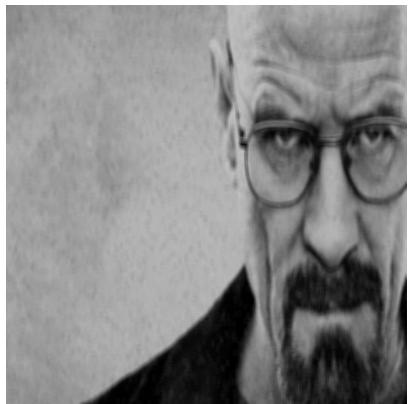
Média 5x5



Mediana 5x5



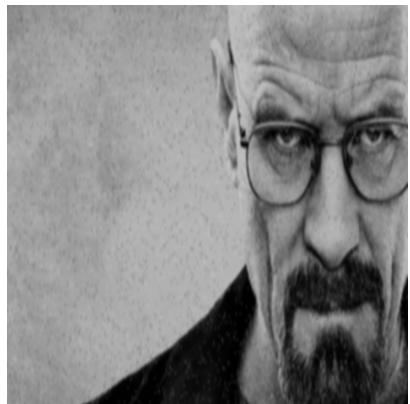
Triangular 5x5



Média 7x7

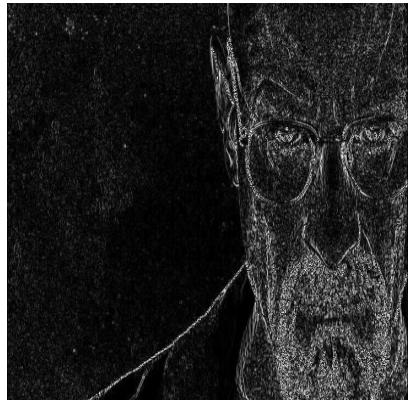


Mediana 7x7



Triangular 7x7

Sobel (Original)



Sobel X



Sobel Y



Magnitude

Sobel (Ruído)



Sobel X



Sobel Y



Magnitude

Sobel (Filtros)



Sobel X Média 3x3



Sobel Y Média 3x3



Magnitude Média 3x3



Sobel X Mediana 3x3



Sobel Y Mediana 3x3



Magnitude Mediana 3x3



Sobel X Triangular 3x3



Sobel Y Triangular 3x3



Magnitude Triangular 3x3



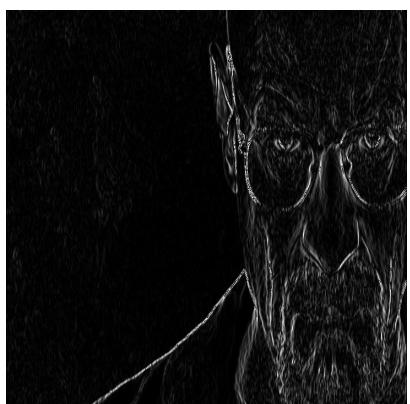
Sobel X Média 5x5



Sobel Y Média 5x5



Magnitude Média 5x5



Sobel X Mediana 5x5



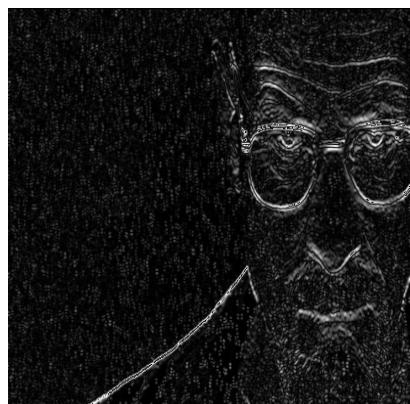
Sobel Y Mediana 5x5



Magnitude Mediana 5x5



Sobel X Triangular 5x5



Sobel Y Triangular 5x5



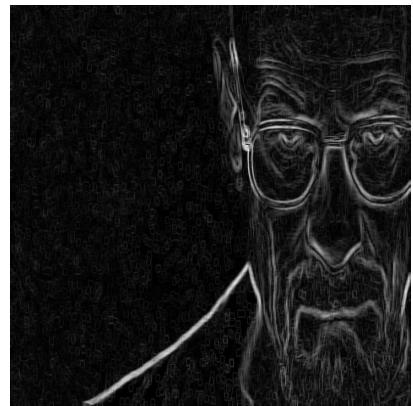
Magnitude Triangular 5x5



Sobel X Média 7x7



Sobel Y Média 7x7



Magnitude Média 7x7



Sobel X Mediana 7x7



Sobel Y Mediana 7x7



Magnitude Mediana 7x7



Sobel X Triangular 7x7



Sobel Y Triangular 7x7



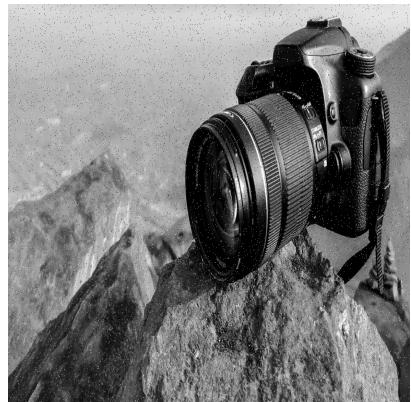
Magnitude Triangular 7x7

Resultados - Imagem 2 (Black & White)

Imagens Originais

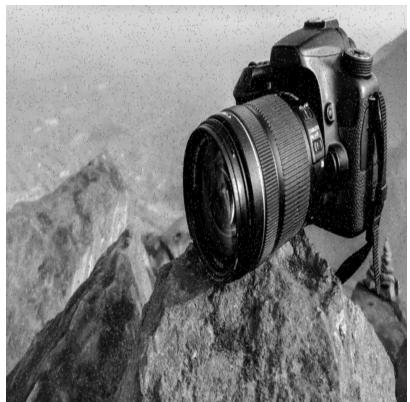


Original



Com Ruído

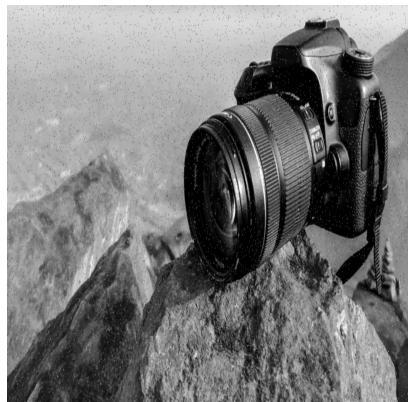
Filtros



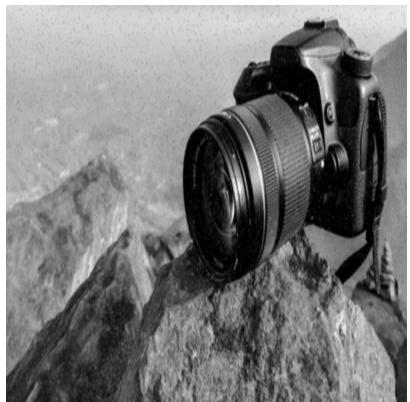
Média 3x3



Mediana 3x3



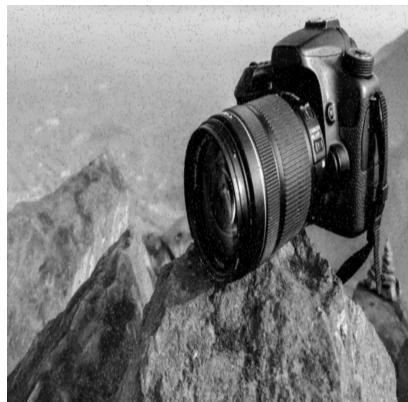
Triangular 3x3



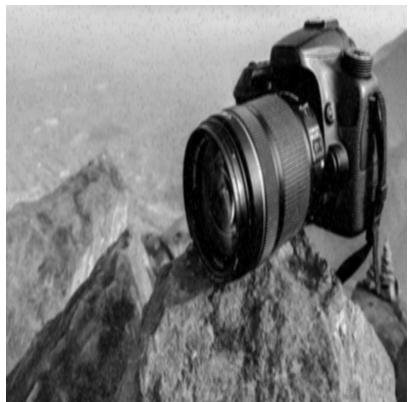
Média 5x5



Mediana 5x5



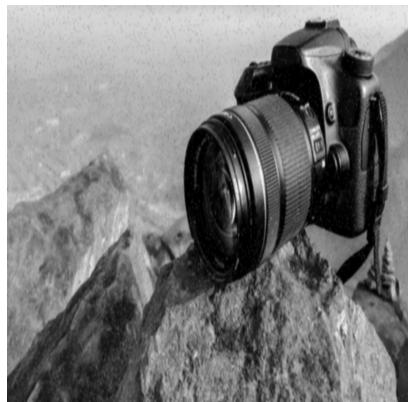
Triangular 5x5



Média 7x7

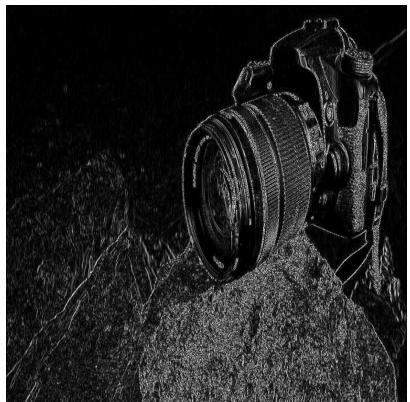


Mediana 7x7

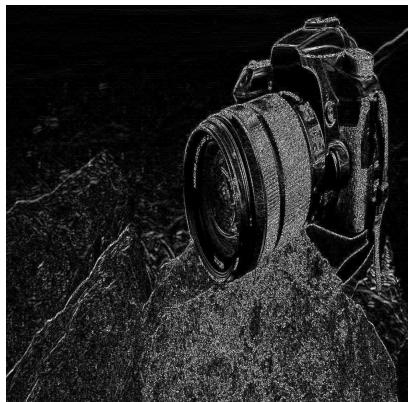


Triangular 7x7

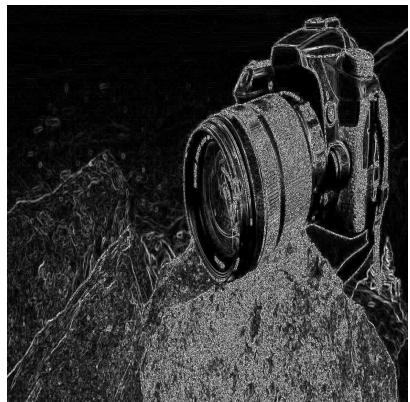
Sobel (Original)



Sobel X

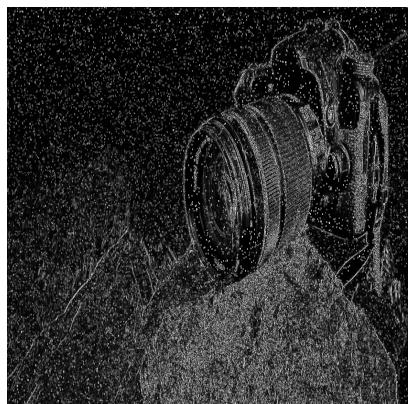


Sobel Y

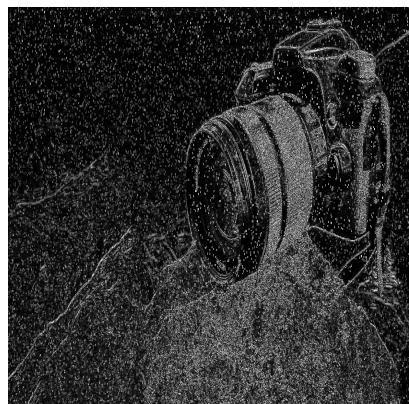


Magnitude

Sobel (Ruído)



Sobel X

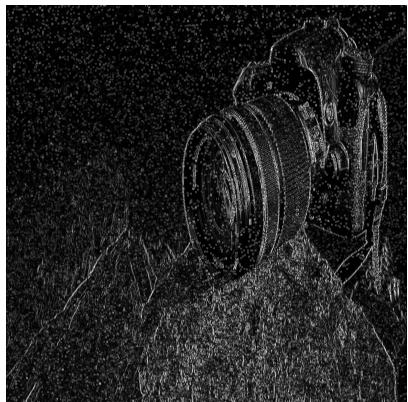


Sobel Y

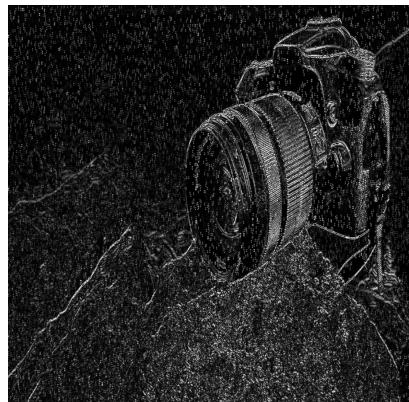


Magnitude

Sobel (Filtros)



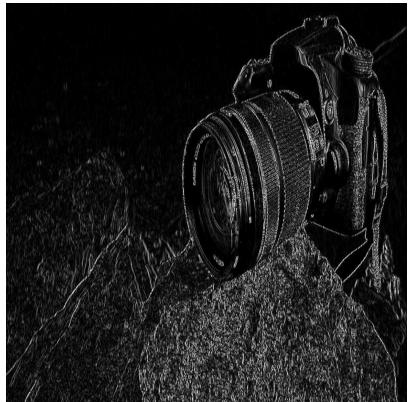
Sobel X Média 3x3



Sobel Y Média 3x3



Magnitude Média 3x3



Sobel X Mediana 3x3



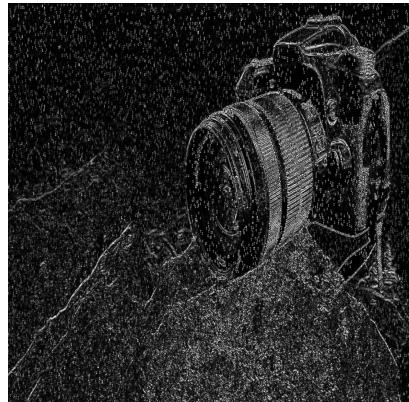
Sobel Y Mediana 3x3



Magnitude Mediana 3x3



Sobel X Triangular 3x3



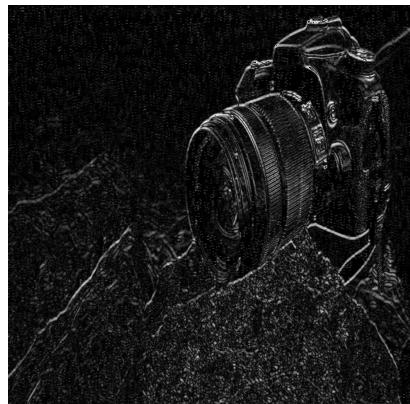
Sobel Y Triangular 3x3



Magnitude Triangular 3x3



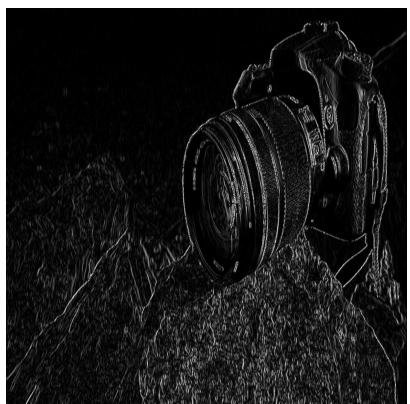
Sobel X Média 5x5



Sobel Y Média 5x5



Magnitude Média 5x5



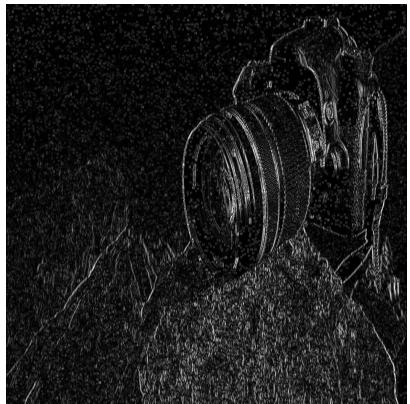
Sobel X Mediana 5x5



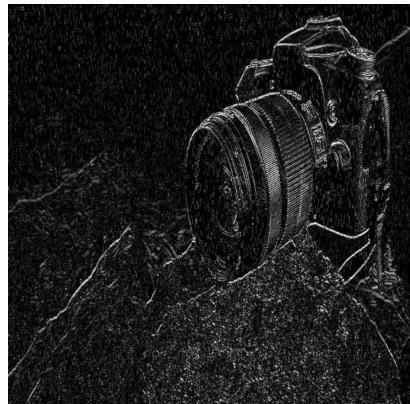
Sobel Y Mediana 5x5



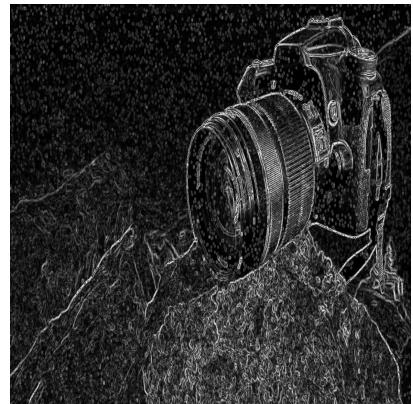
Magnitude Mediana 5x5



Sobel X Triangular 5x5



Sobel Y Triangular 5x5



Magnitude Triangular 5x5



Sobel X Média 7x7



Sobel Y Média 7x7



Magnitude Média 7x7



Sobel X Mediana 7x7



Sobel Y Mediana 7x7



Magnitude Mediana 7x7



Sobel X Triangular 7x7



Sobel Y Triangular 7x7



Magnitude Triangular 7x7

Conclusão

O filtro da média suaviza o ruído, mas causa borramento. A mediana foi o mais eficaz para remover ruído sal e pimenta preservando bordas. O triangular teve desempenho intermediário. O operador de Sobel mostrou-se muito sensível ao ruído, reforçando a importância da filtragem prévia. A combinação Mediana + Sobel produziu os melhores resultados.