Chapter 6
Simulation Results

Chapters 2 to 6 of this work present various techniques for embedding a message into a video's region of interest, exploring multiple approaches across different domains.

Chapter 2 delves into methods within the spatial domain, showcasing visible watermarking alongside the method employing a correlation-based approach. These methods emphasize simplicity and ease of implementation.

Chapter 3 shifts focus to the frequency domain, demonstrating that greater imperceptibility can be achieved by embedding the watermark in transform coefficients. This chapter utilizes two highly effective transforms, the Discrete Cosine Transform (DCT) and Discrete Wavelet Transform (DWT), for embedding messages, enhancing the robustness of the watermark against various attacks.

Chapter 4 introduces a powerful linear algebra-based technique known as Singular Value Decomposition (SVD). This approach is applied to embed binary and grayscale watermarks, highlighting its versatility and effectiveness in handling complex media formats.

Chapter 6 combines the strengths of DCT, DWT, and SVD to create a hybrid methodology capable of embedding both binary and grayscale watermarks. This integration aims to balance robustness, imperceptibility, and payload capacity, making it suitable for high-performance applications.

The current chapter presents simulation results for a comparative analysis of all six watermarking methods discussed in the thesis. The evaluation focuses on key performance metrics such as Peak Signal-to-Noise Ratio (PSNR), Mean Square Error (MSE), and Correlation, providing insights into the strengths and limitations of each technique. This comparative analysis offers a comprehensive understanding of the trade-offs involved in selecting an optimal watermarking approach.
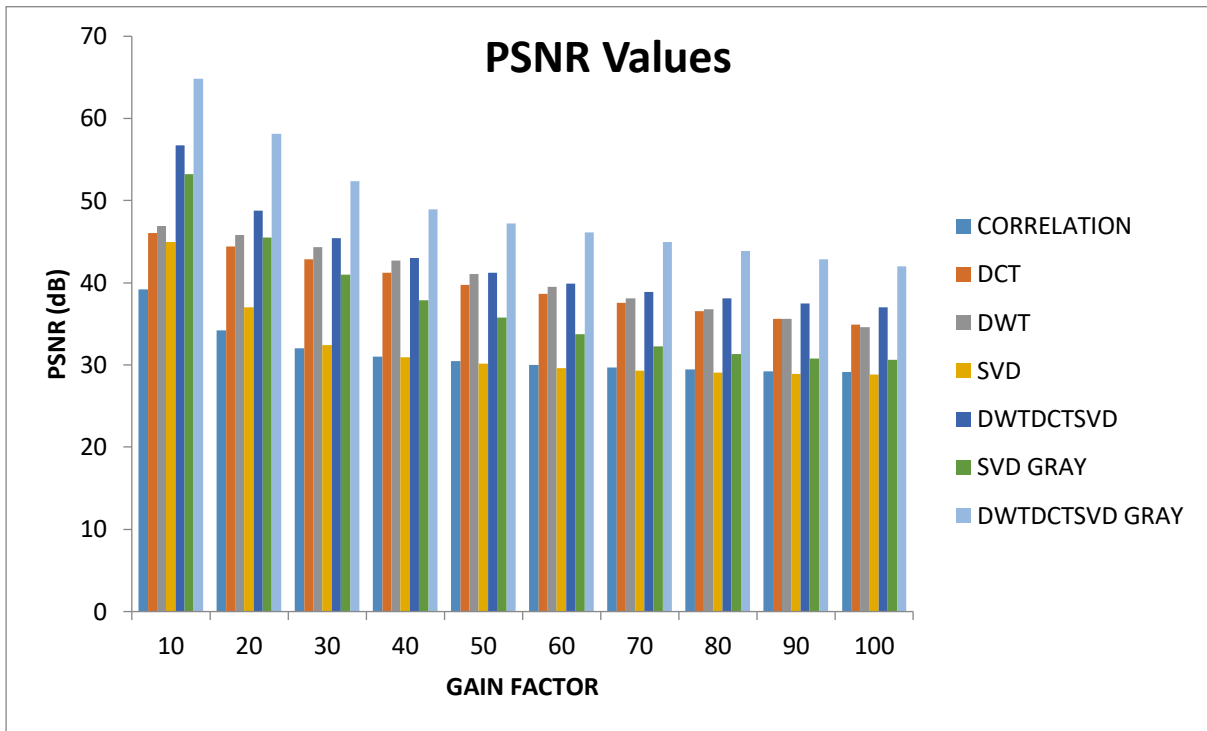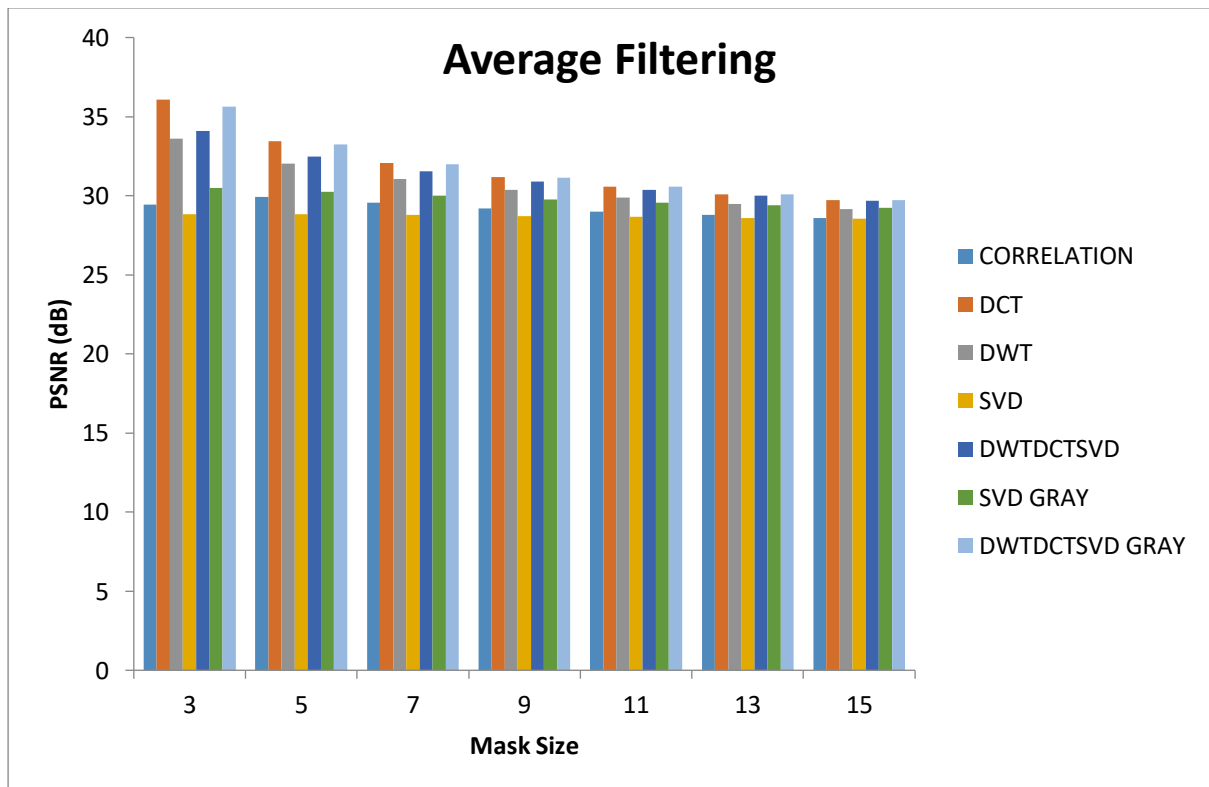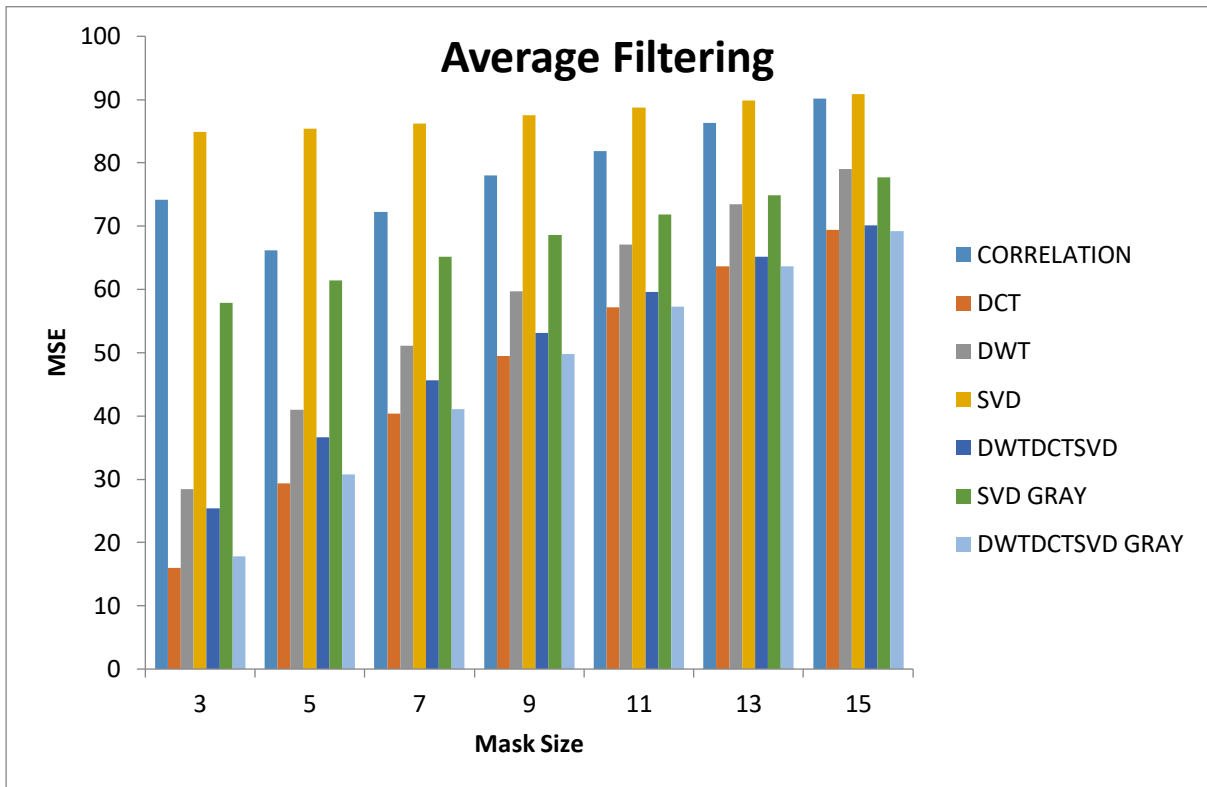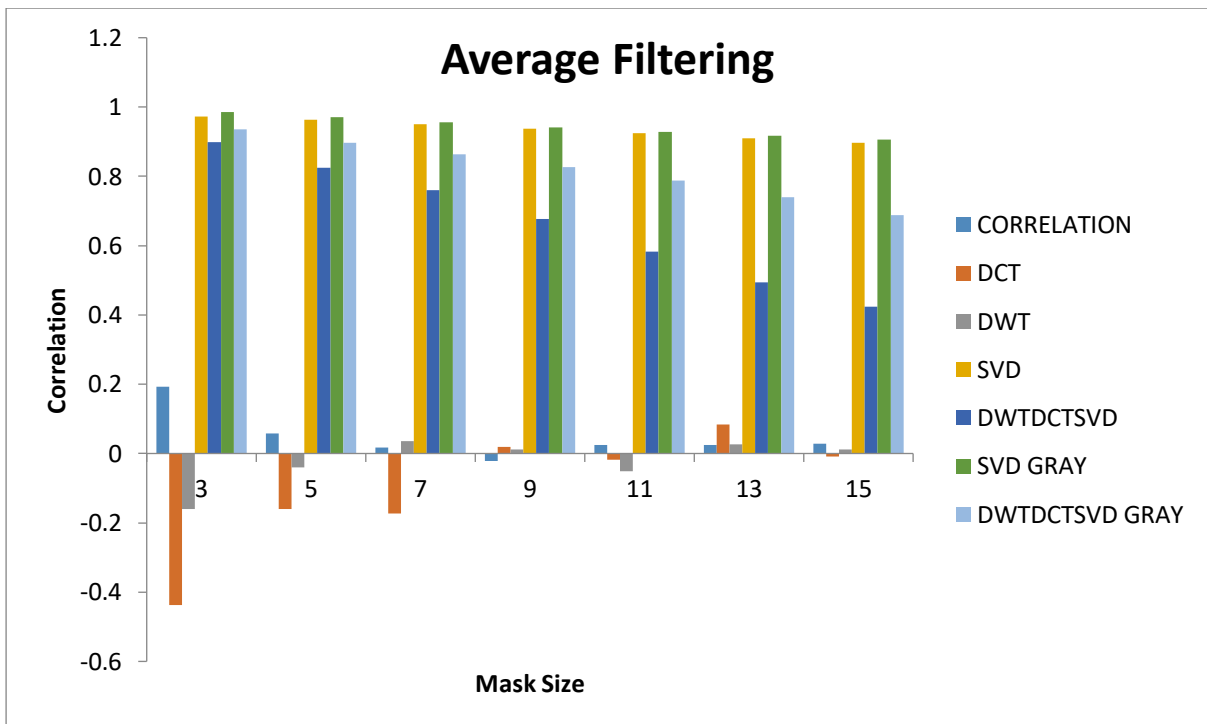
(a)
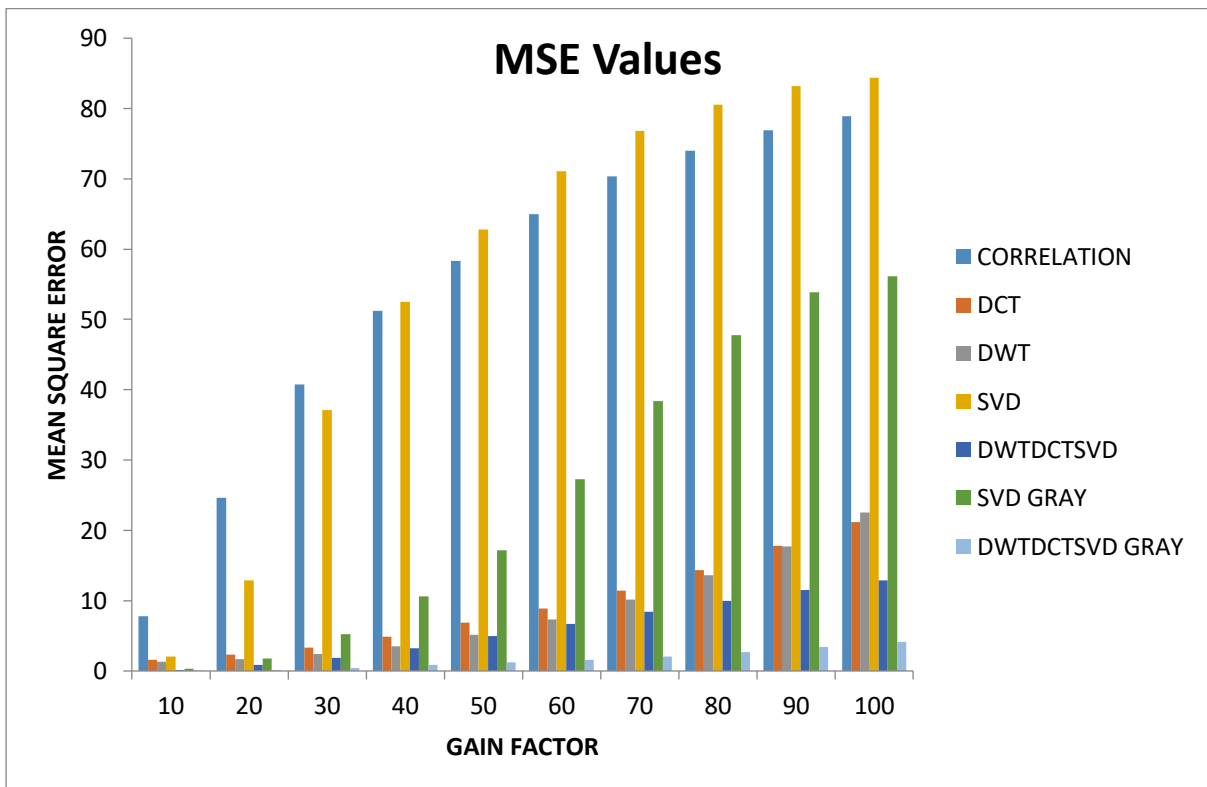
(b)
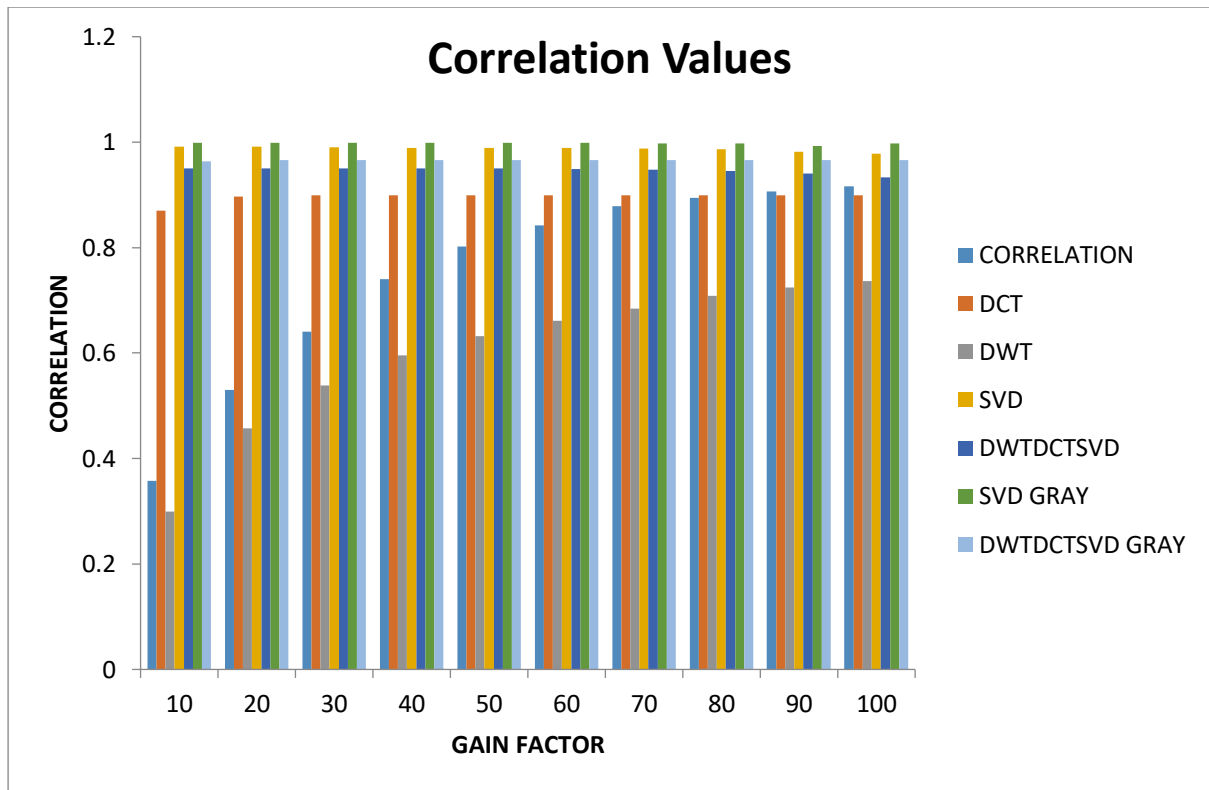
(c)

Figure 6.1: Comparison of all methods with various gain factors (a) PSNR (b) MSE (c)
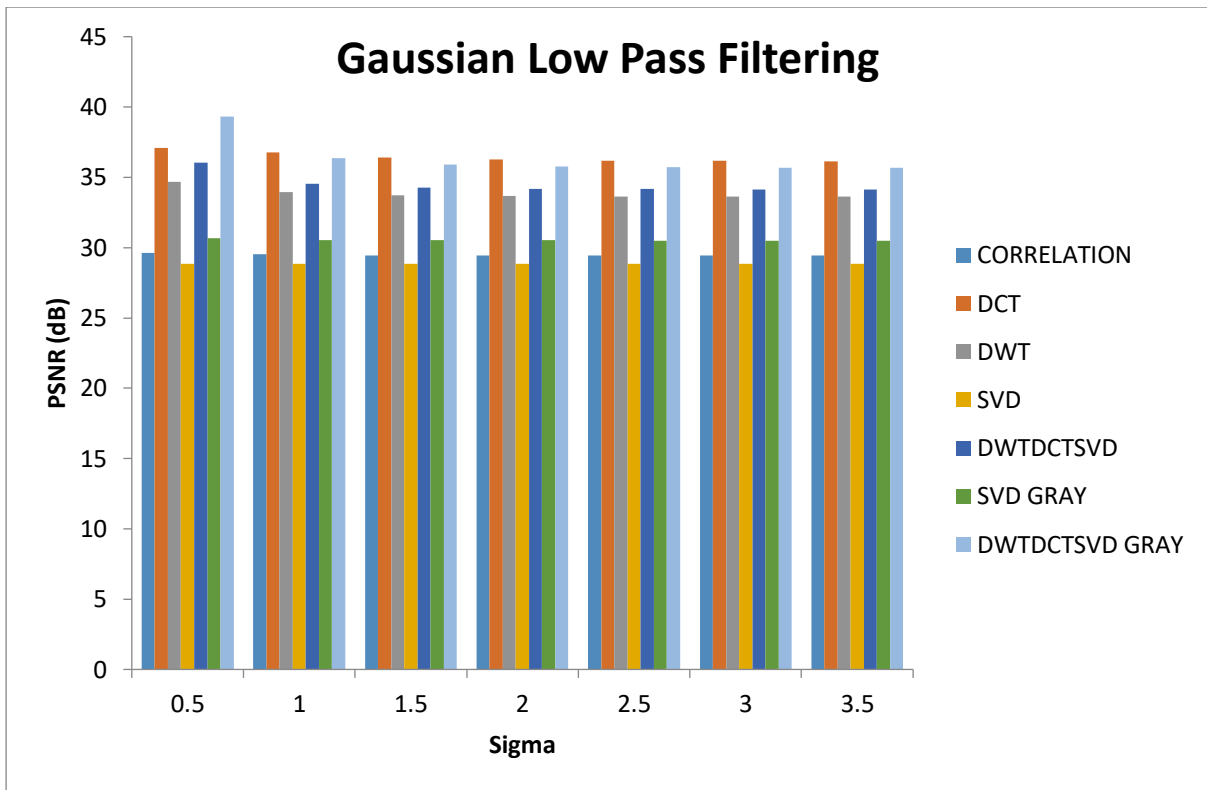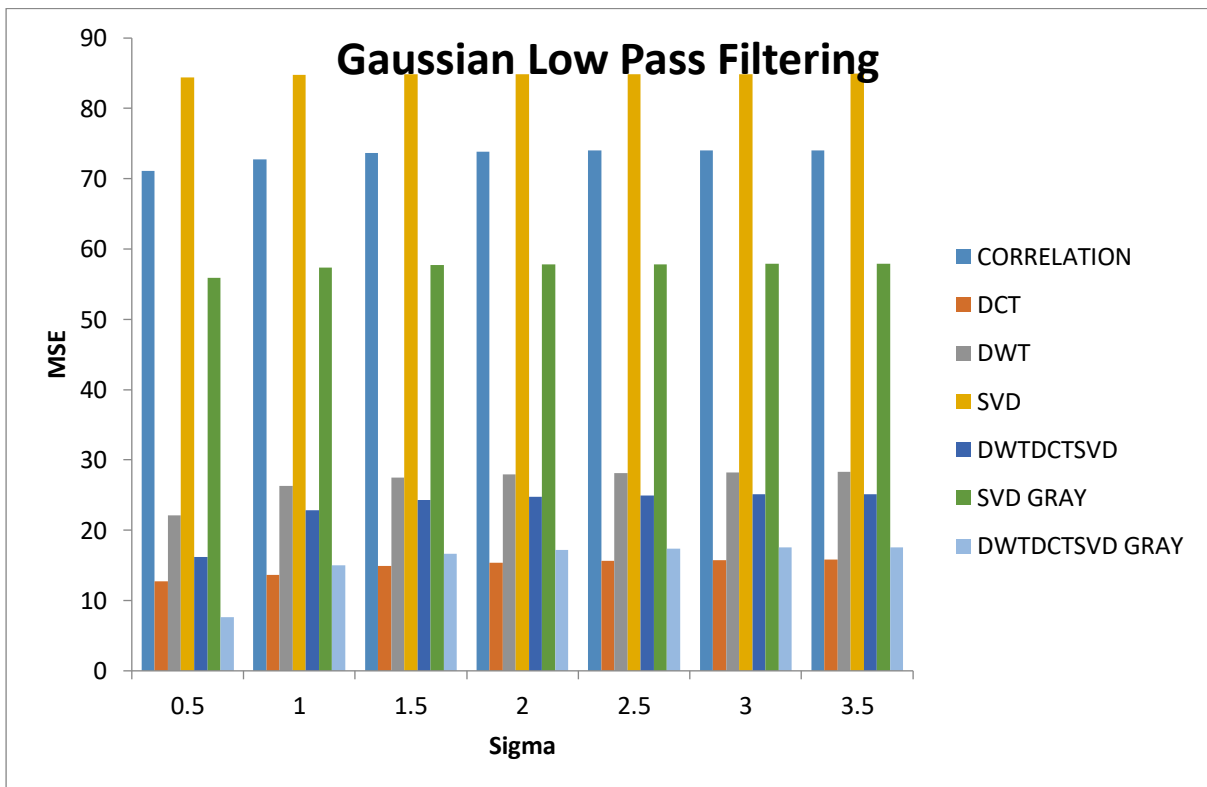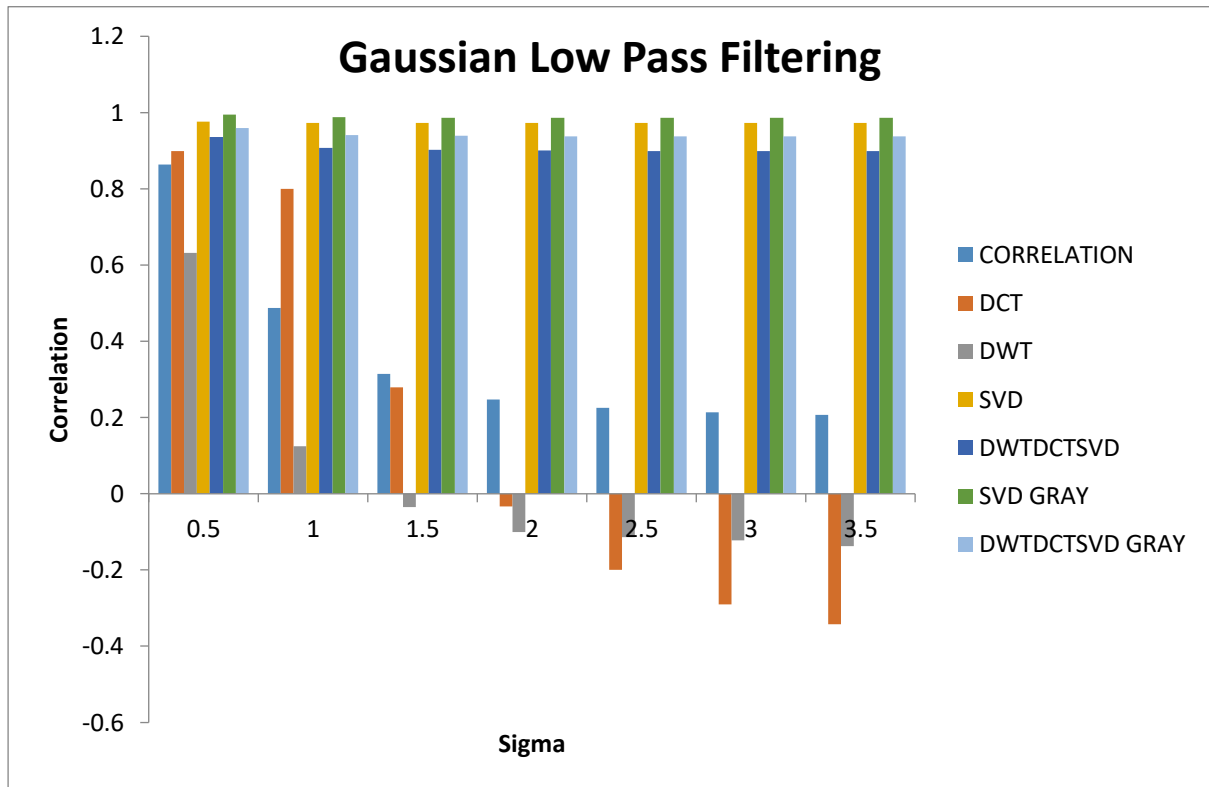Correlation

(a)

(b)

(c)

Figure 6.2: Comparison of all methods in average filtering attack (a) PSNR (b) MSE (c) Correlation
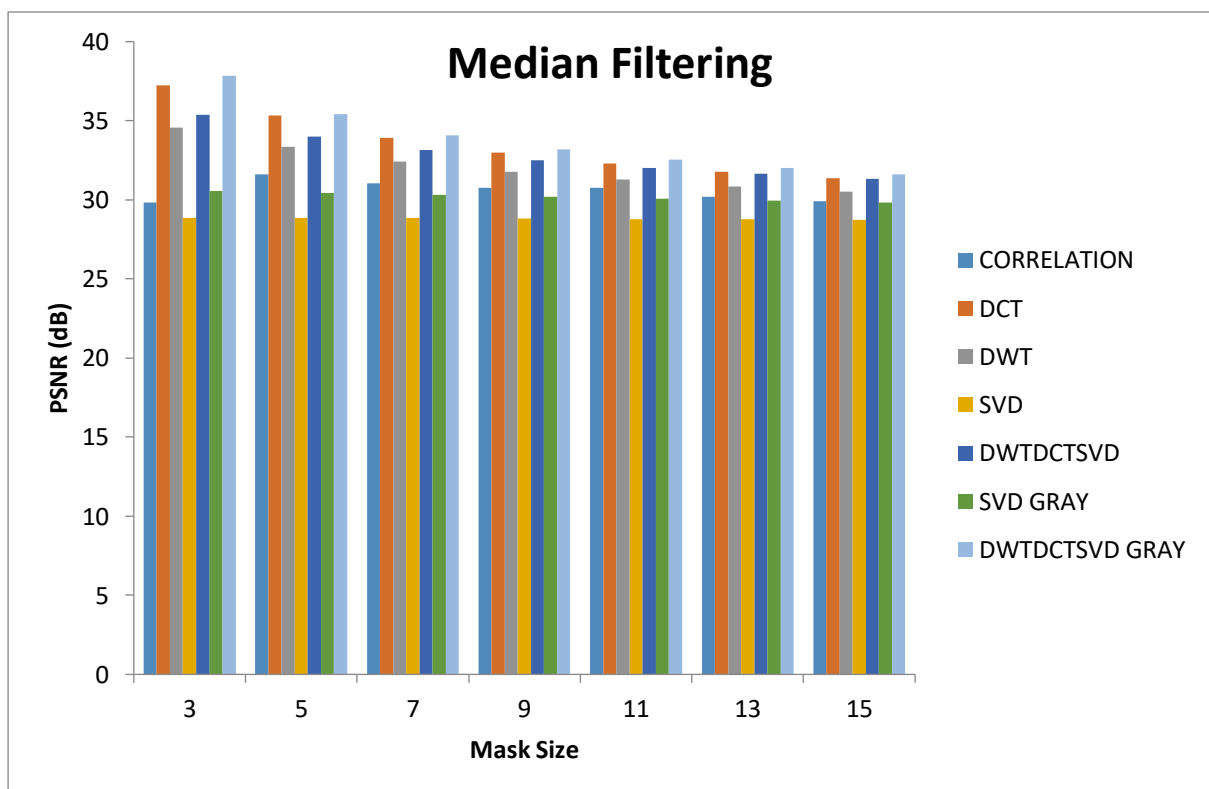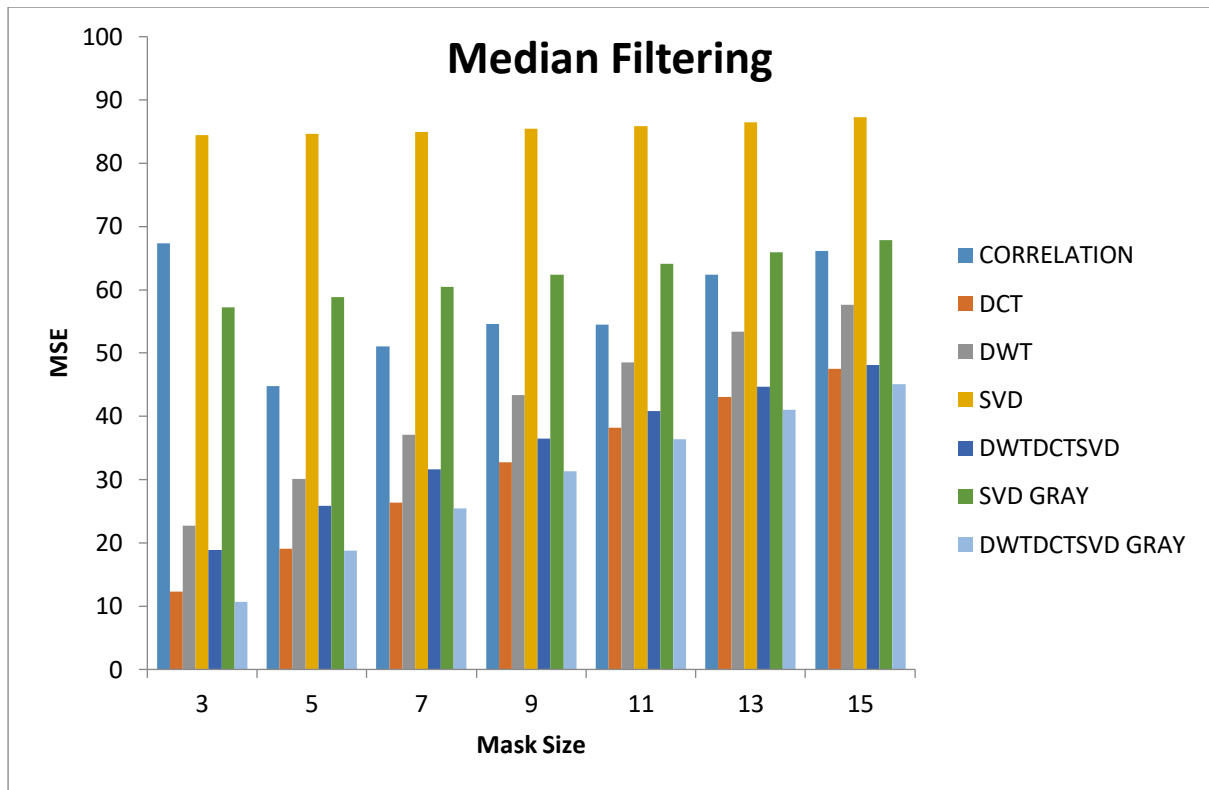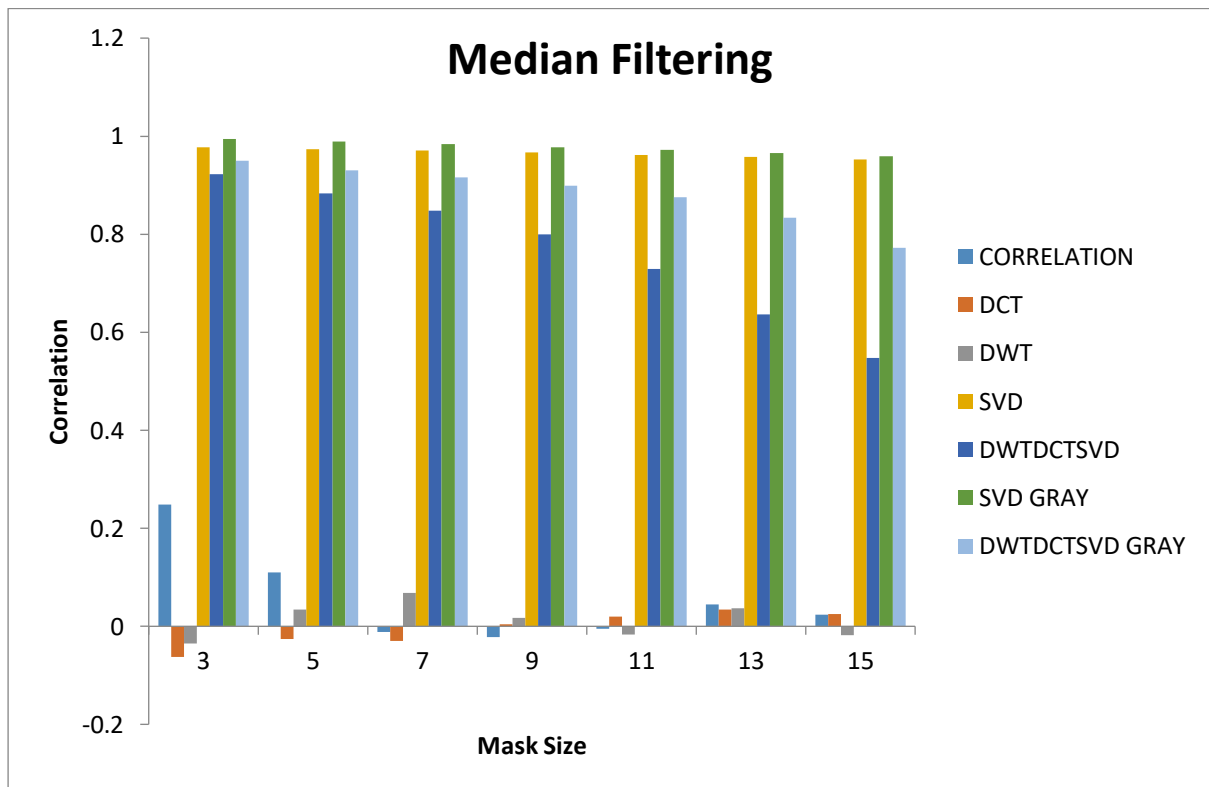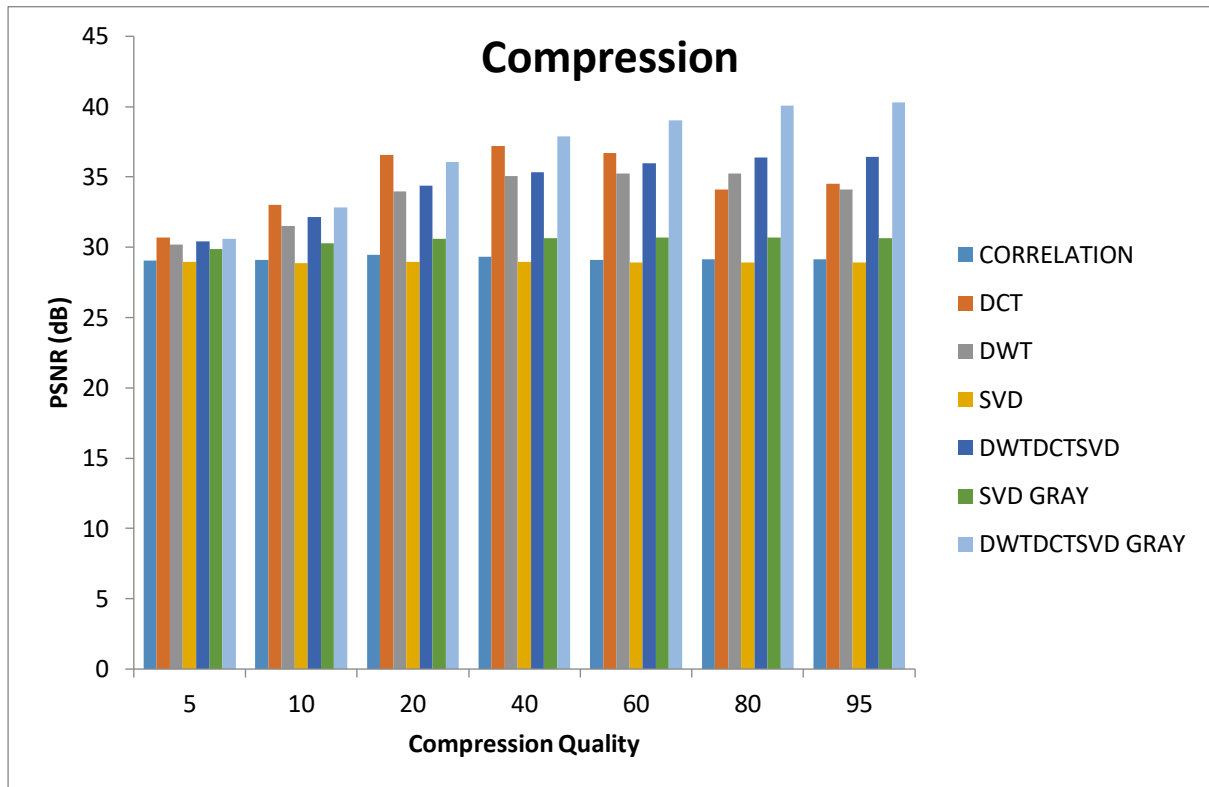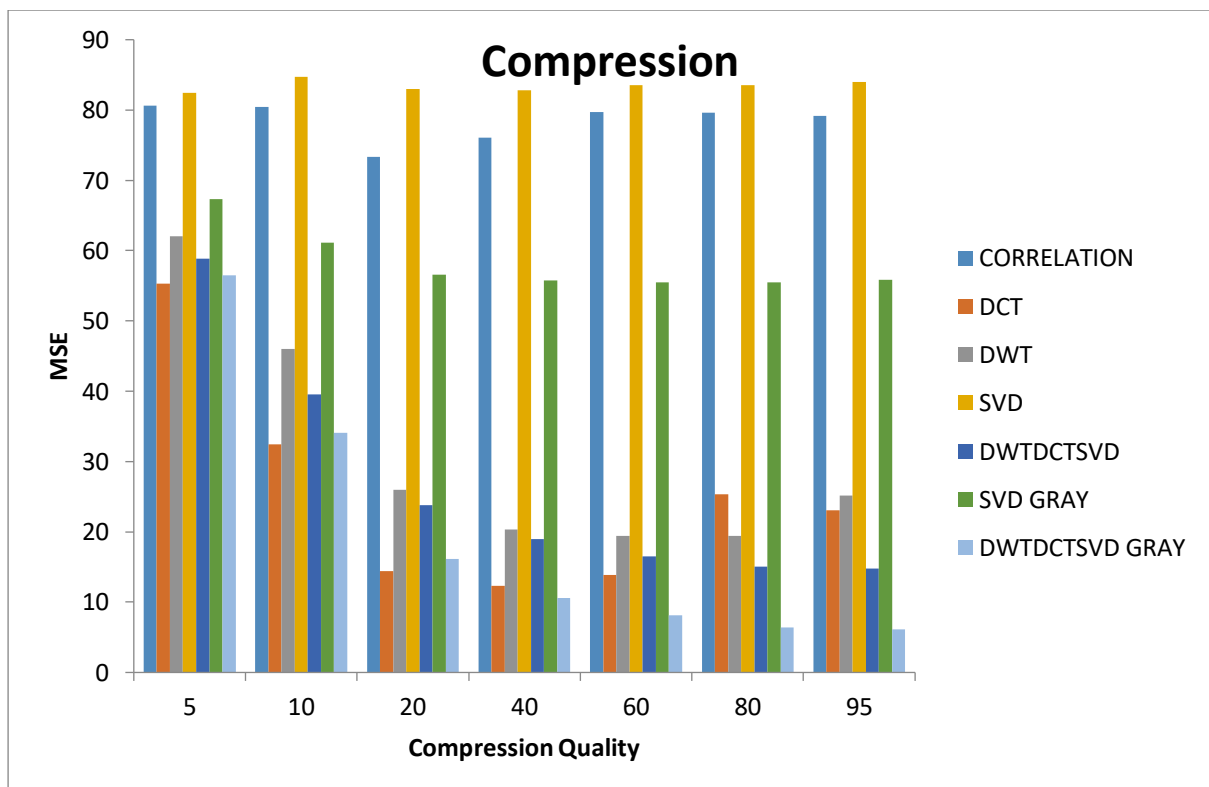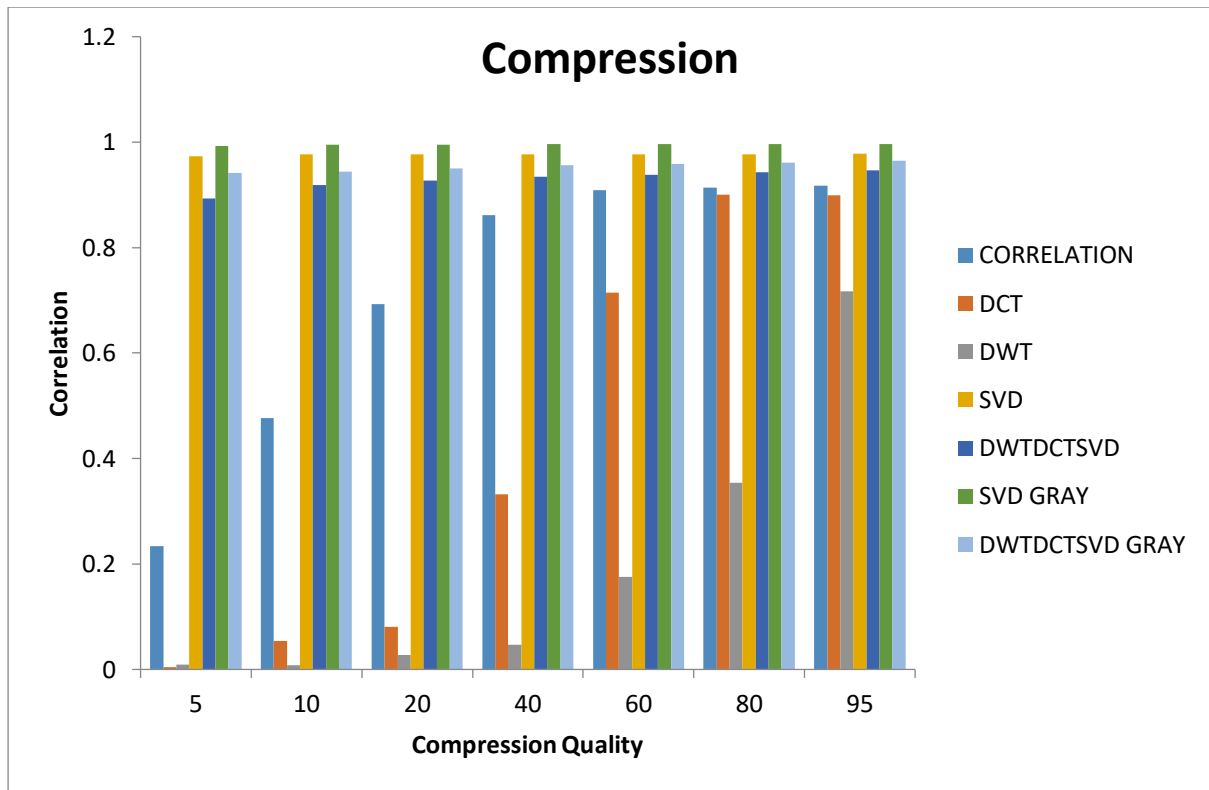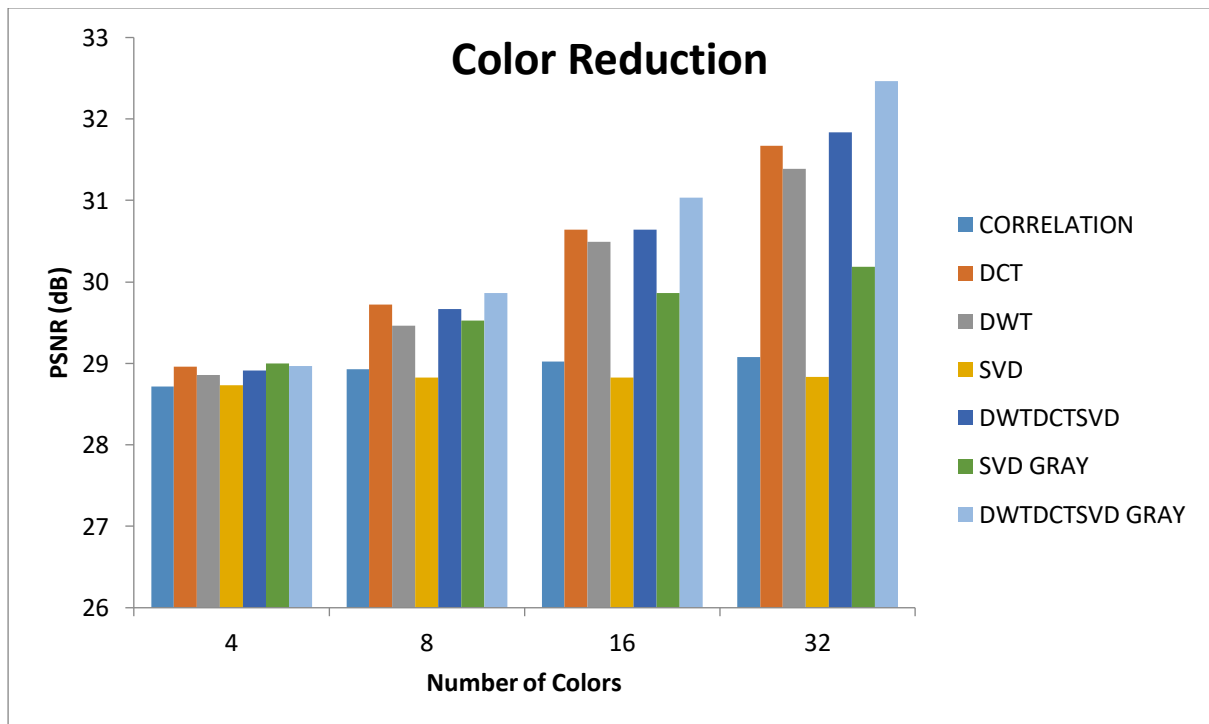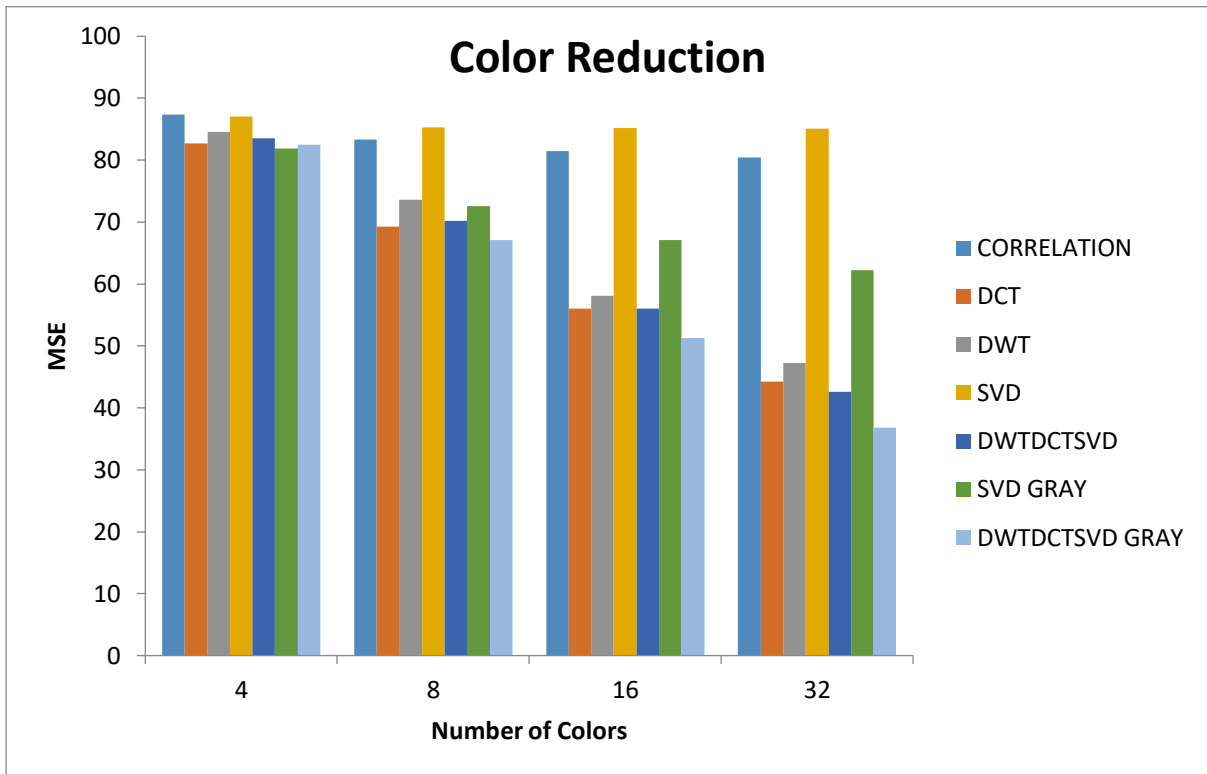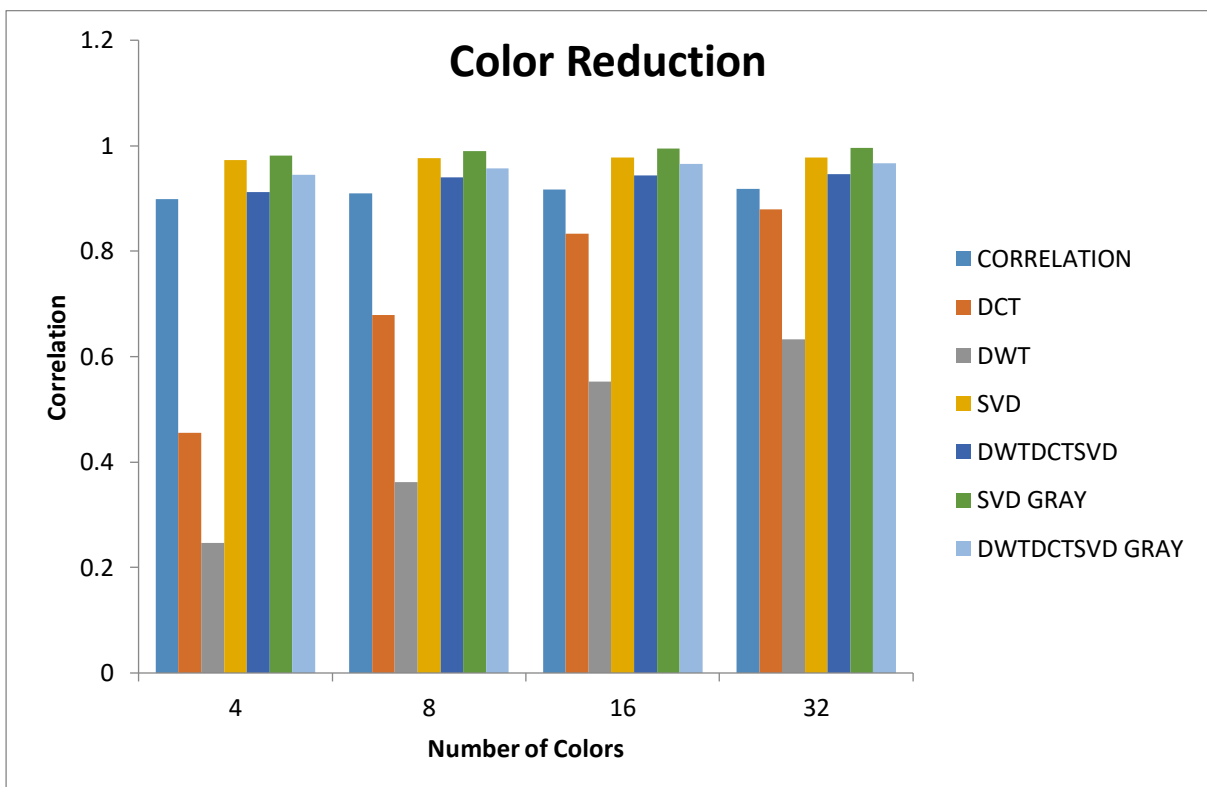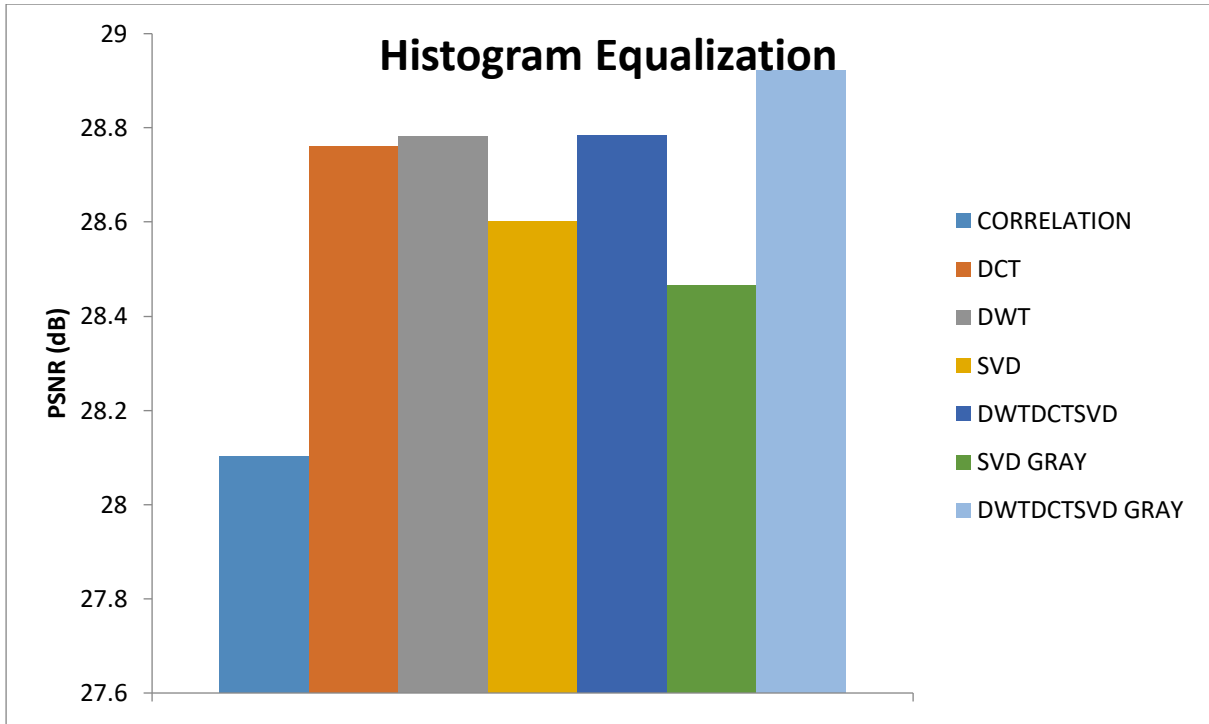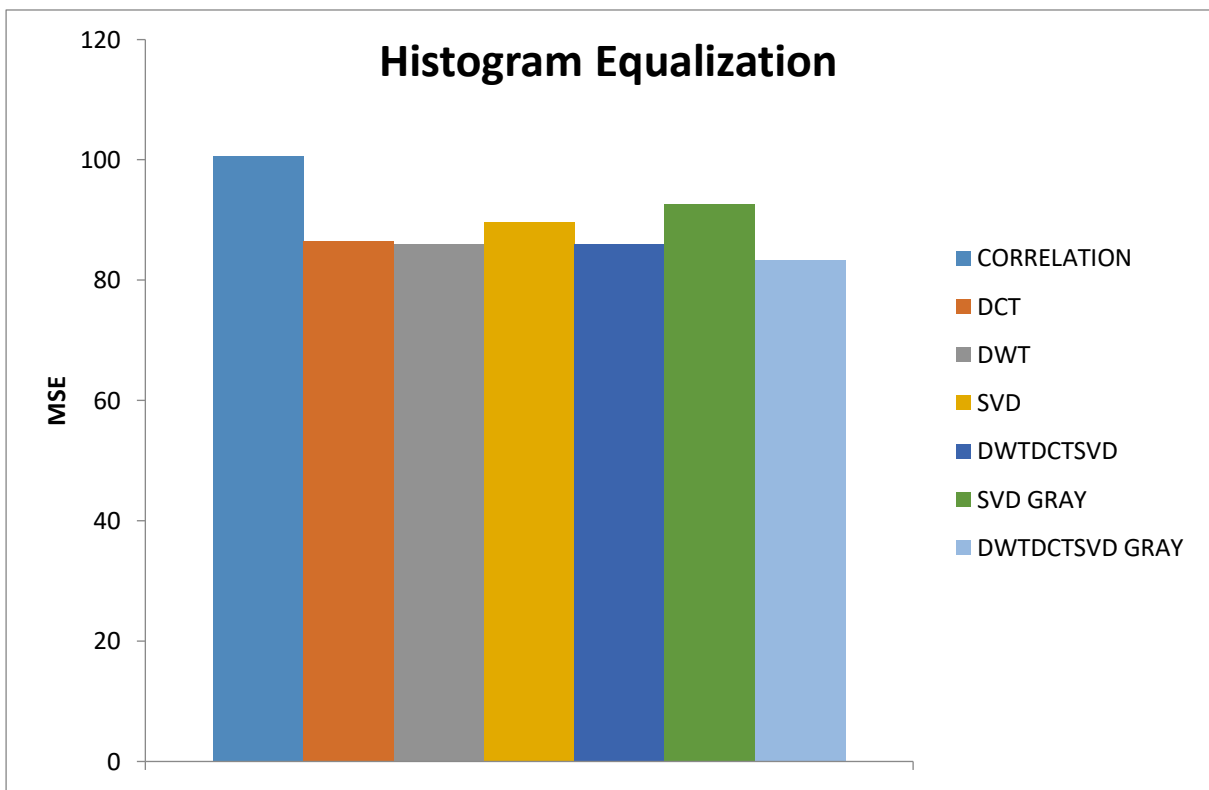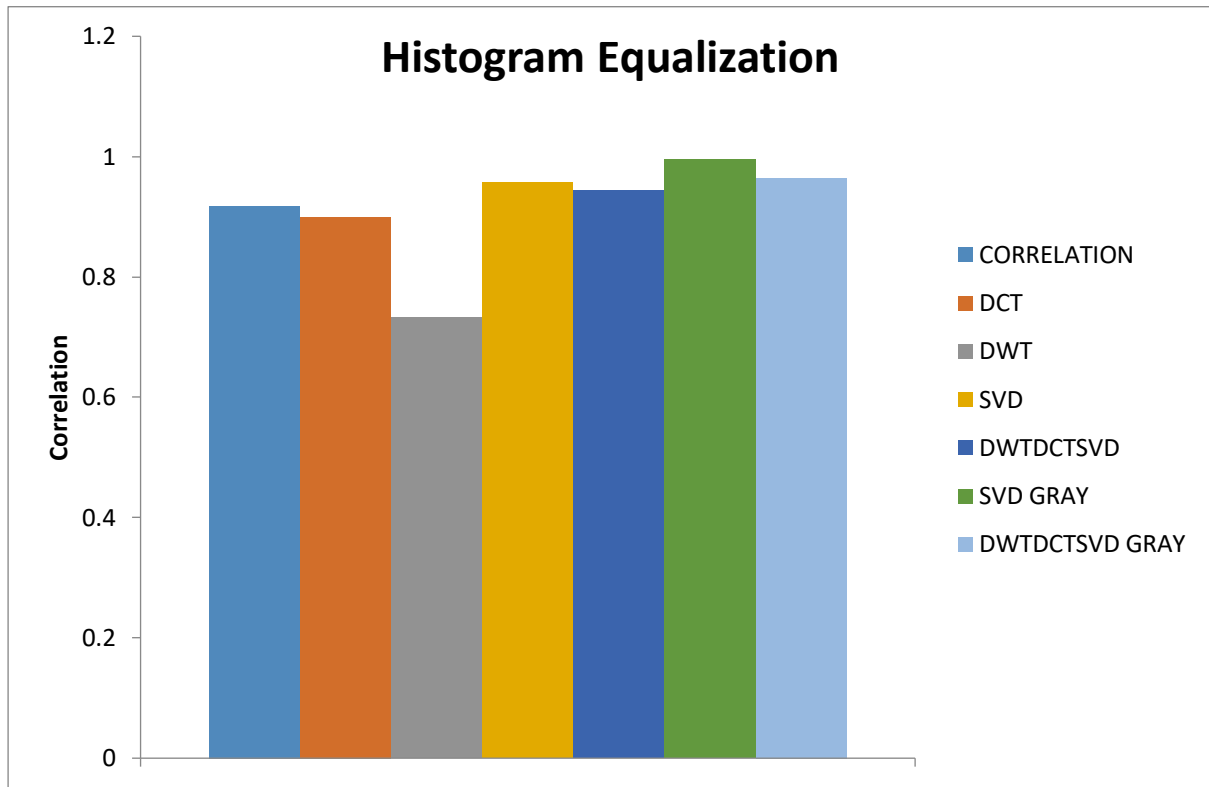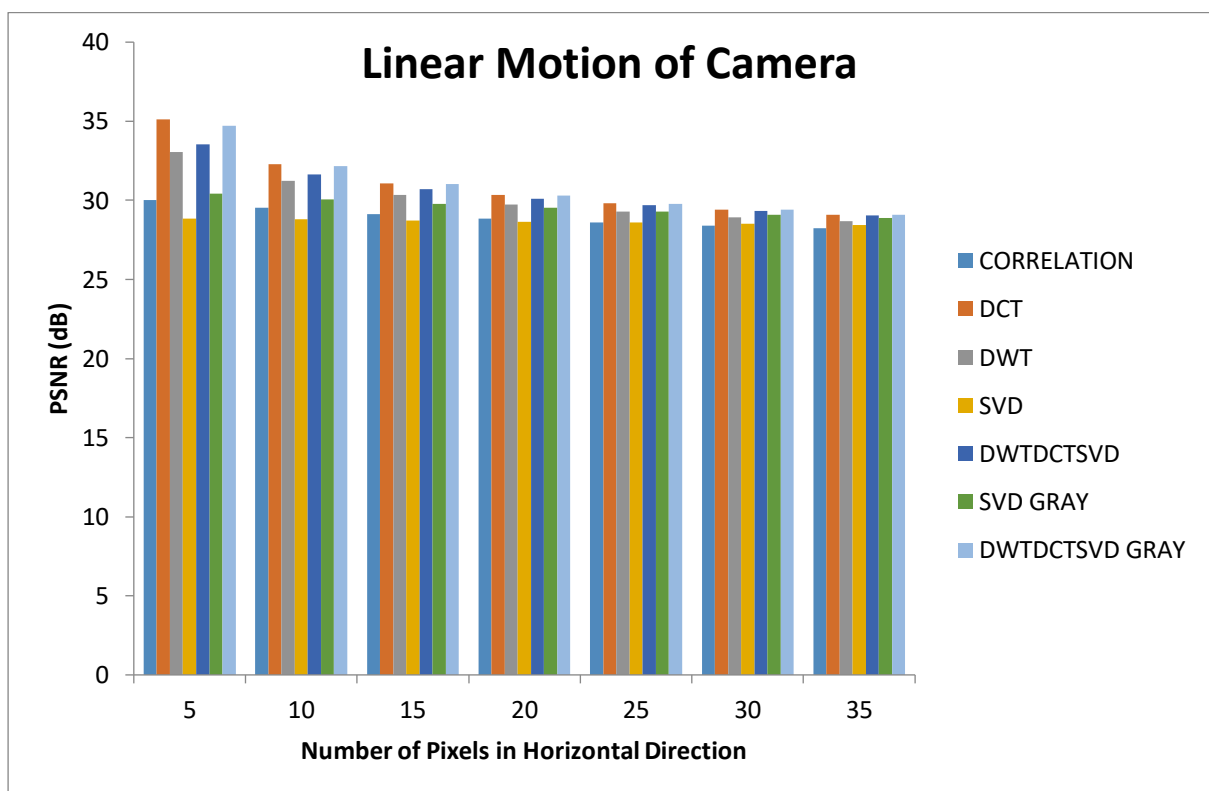
(a)

(b)

(c)

Figure 6.3: Comparison of all methods in Gaussian low pass filtering attack (a) PSNR (b) MSE (c) Correlation
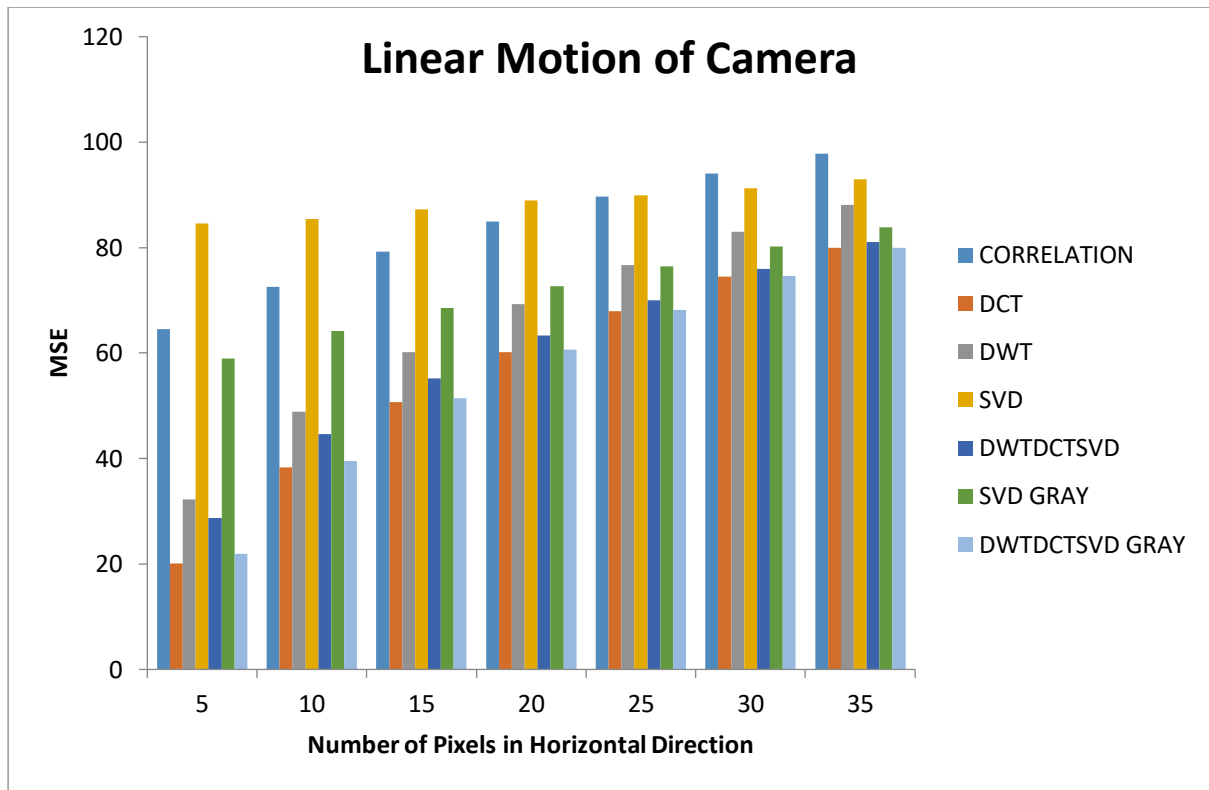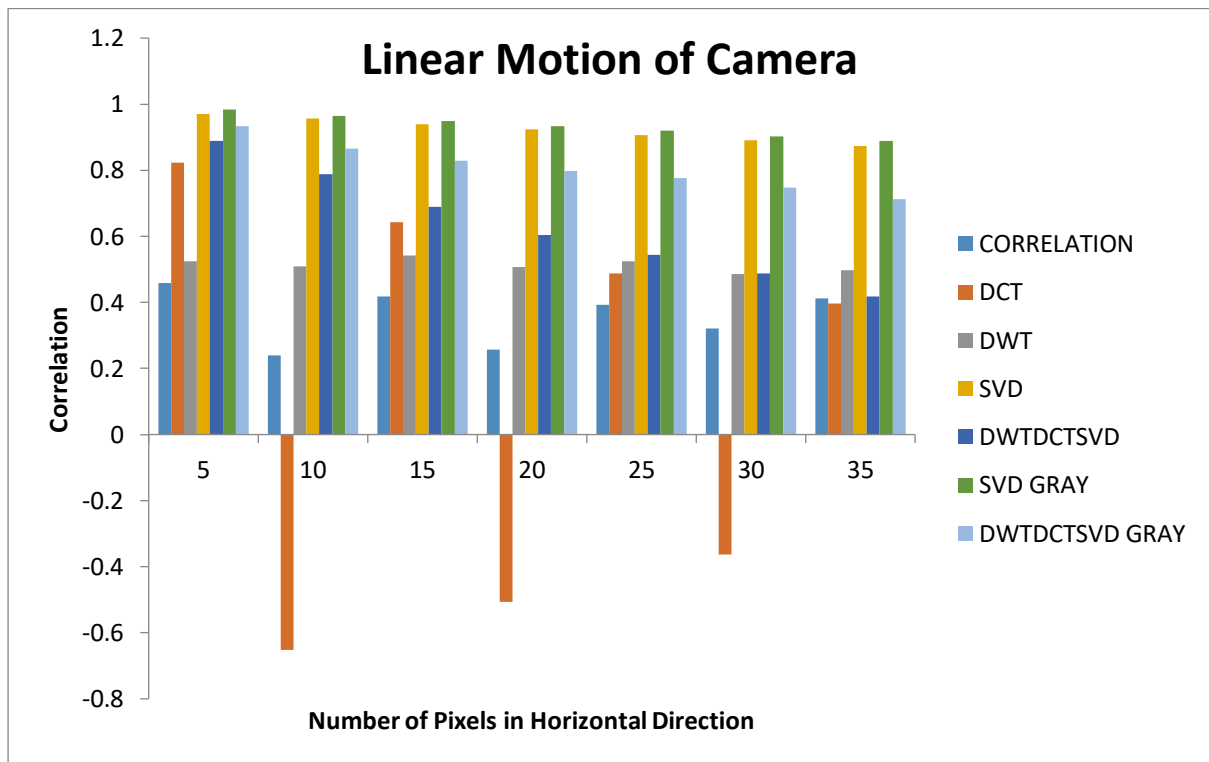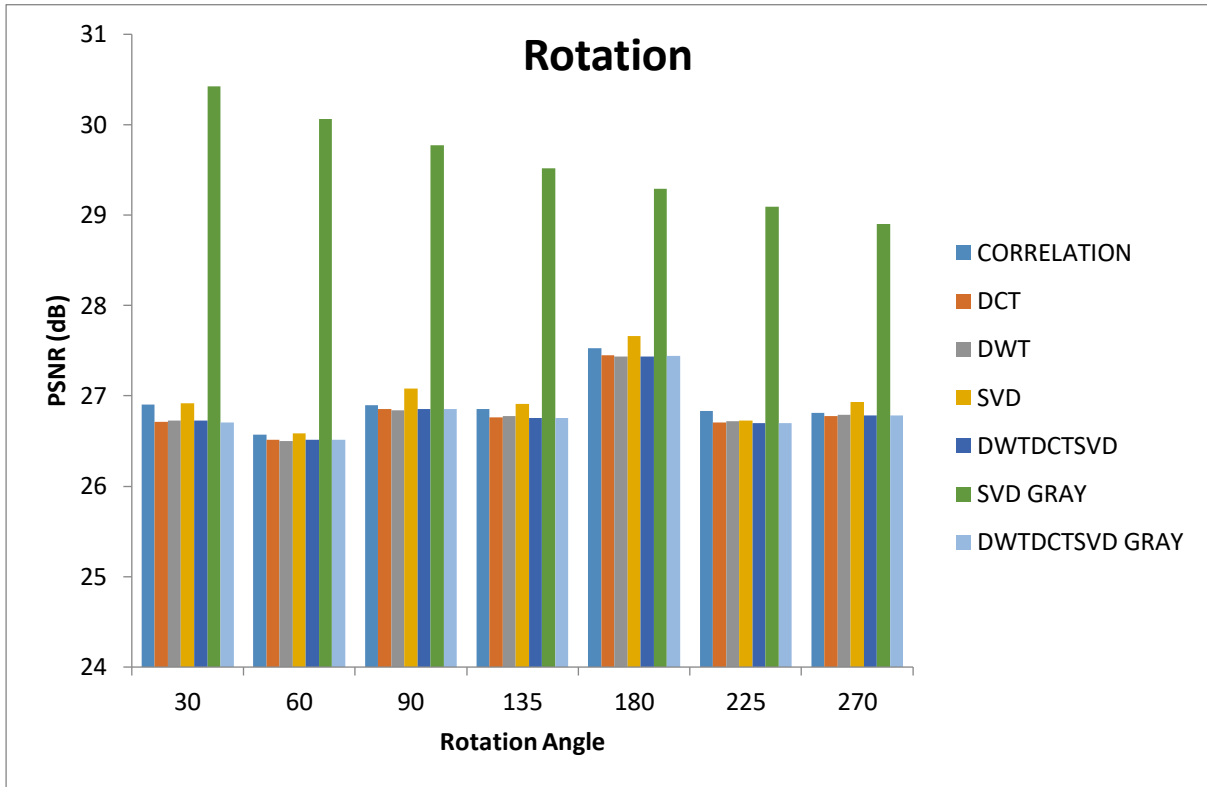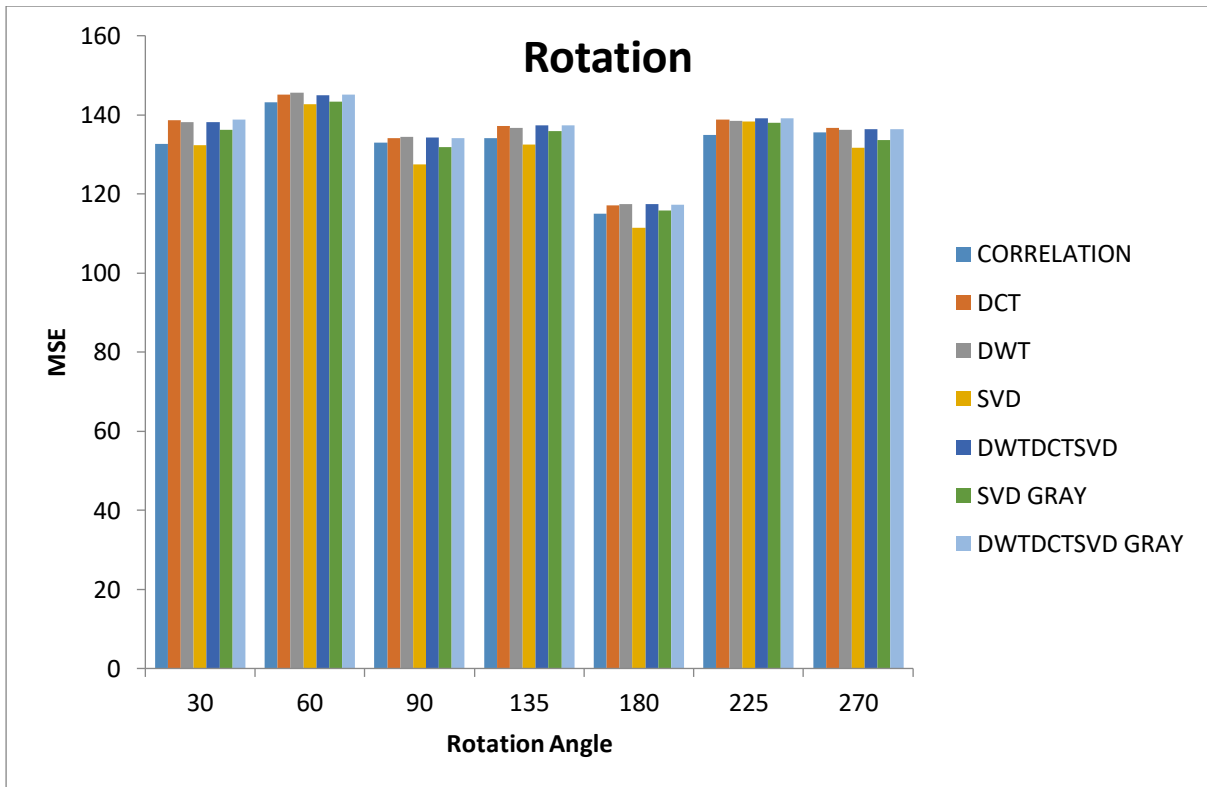

(a)

(b)

(c)

Figure 6.4: Comparison of all methods in median filtering attack (a) PSNR (b) MSE (c) Correlation

(a)

(b)

(c)

Figure 6.5: Comparison of all methods in compression attack (a) PSNR (b) MSE (c)
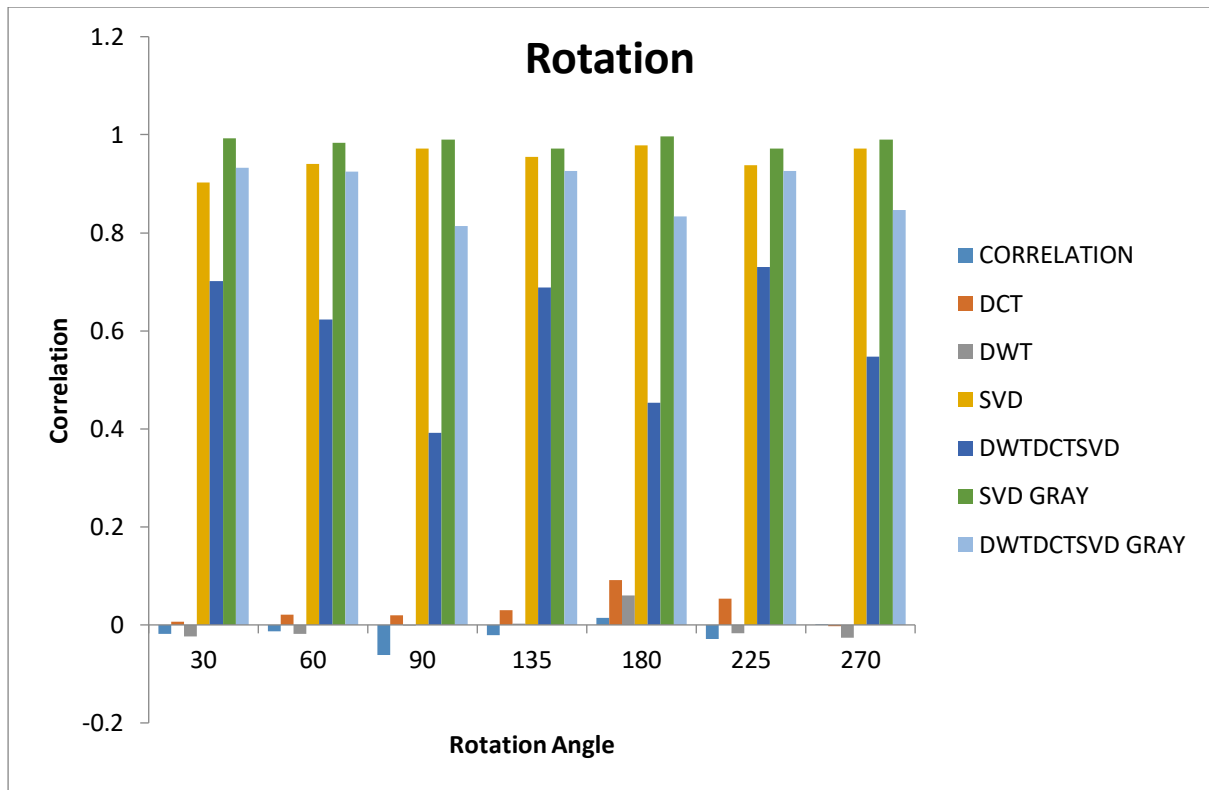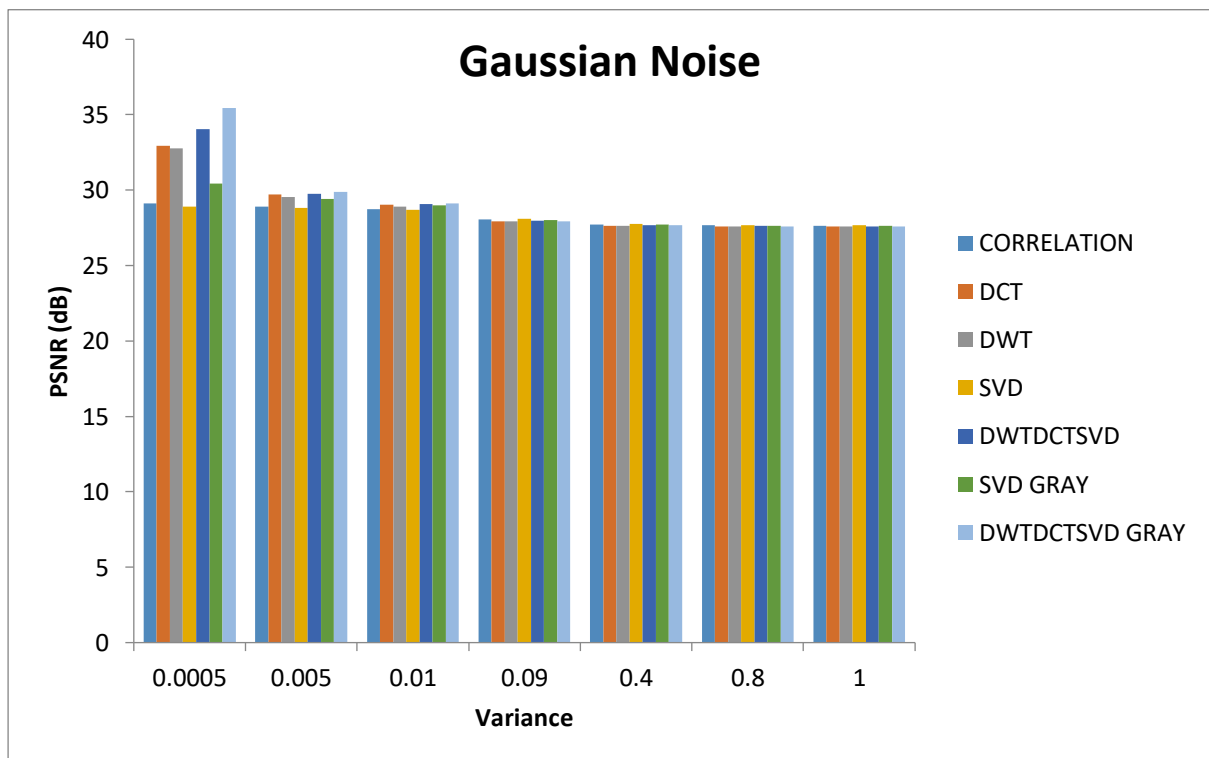
Correlation

(a)

(b)

(c)

Figure 6.6: Comparison of all methods in color reduction attack (a) PSNR (b) MSE (c) Correlation

(a)

(b)

(c)

Figure 6.7: Comparison of all methods in histogram equalization attack (a) PSNR (b) MSE

(c) Correlation

(a)

(b)

(c)

Figure 6.8: Comparison of all methods in linear motion of camera attack (a) PSNR (b) MSE
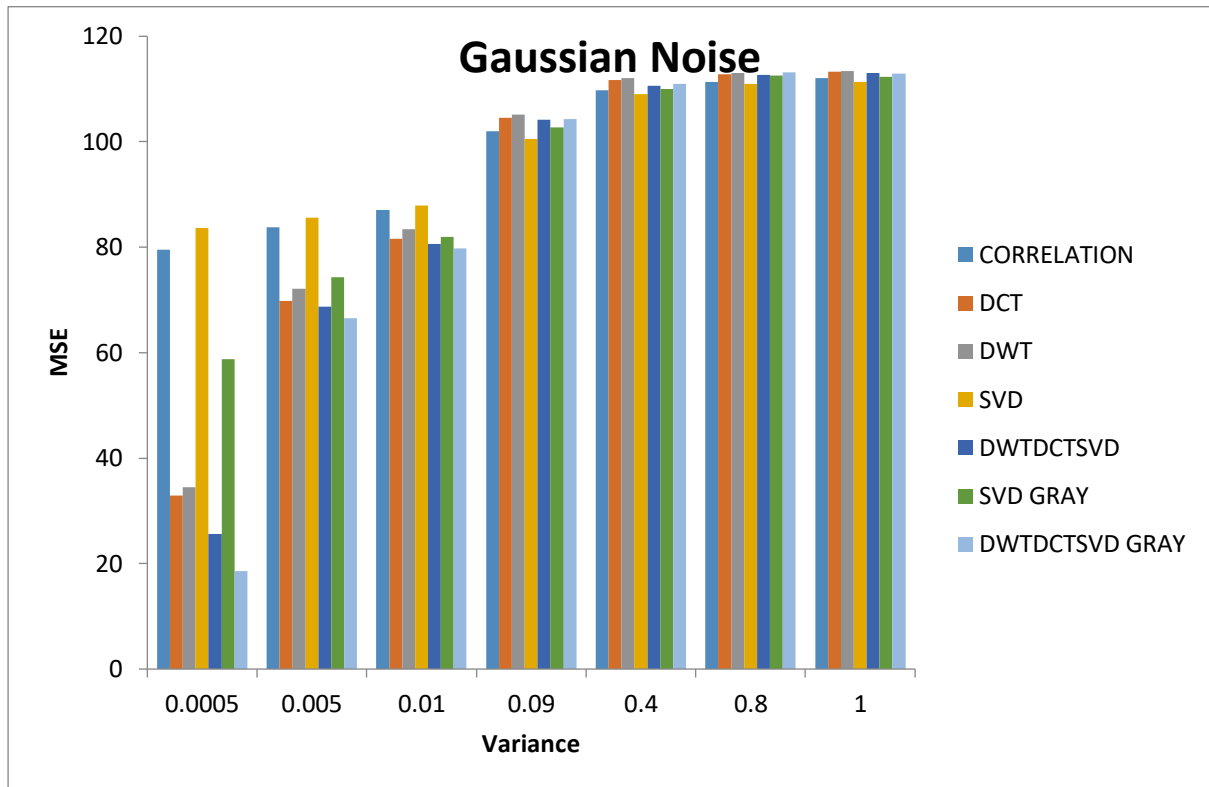
(c) Correlation
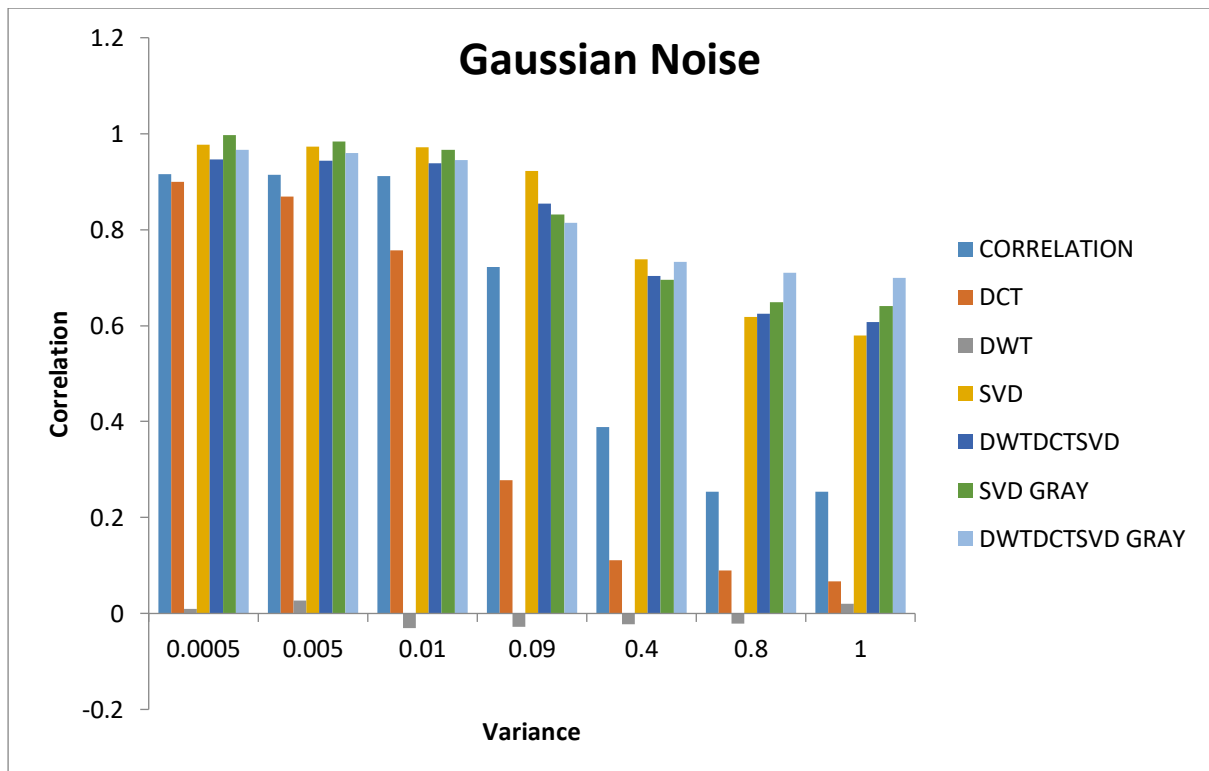
(a)

(b)

(c)

Figure 6.9: Comparison of all methods in rotation attack (a) PSNR (b) MSE (c) Correlation
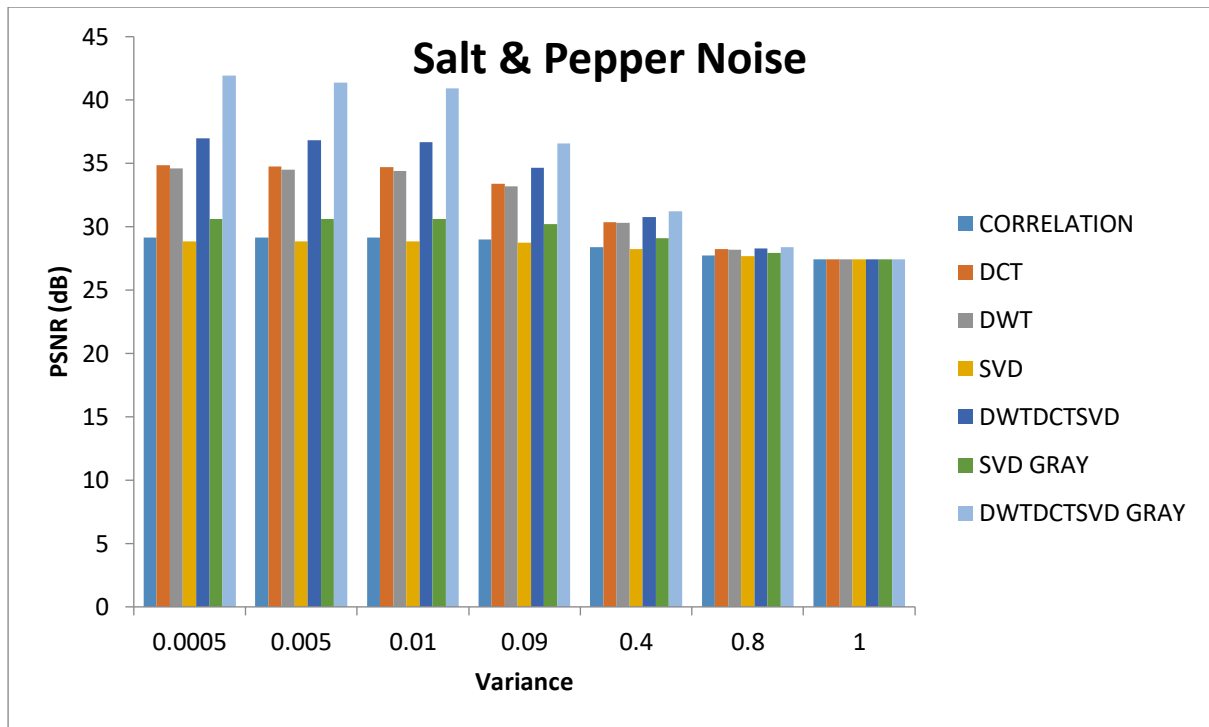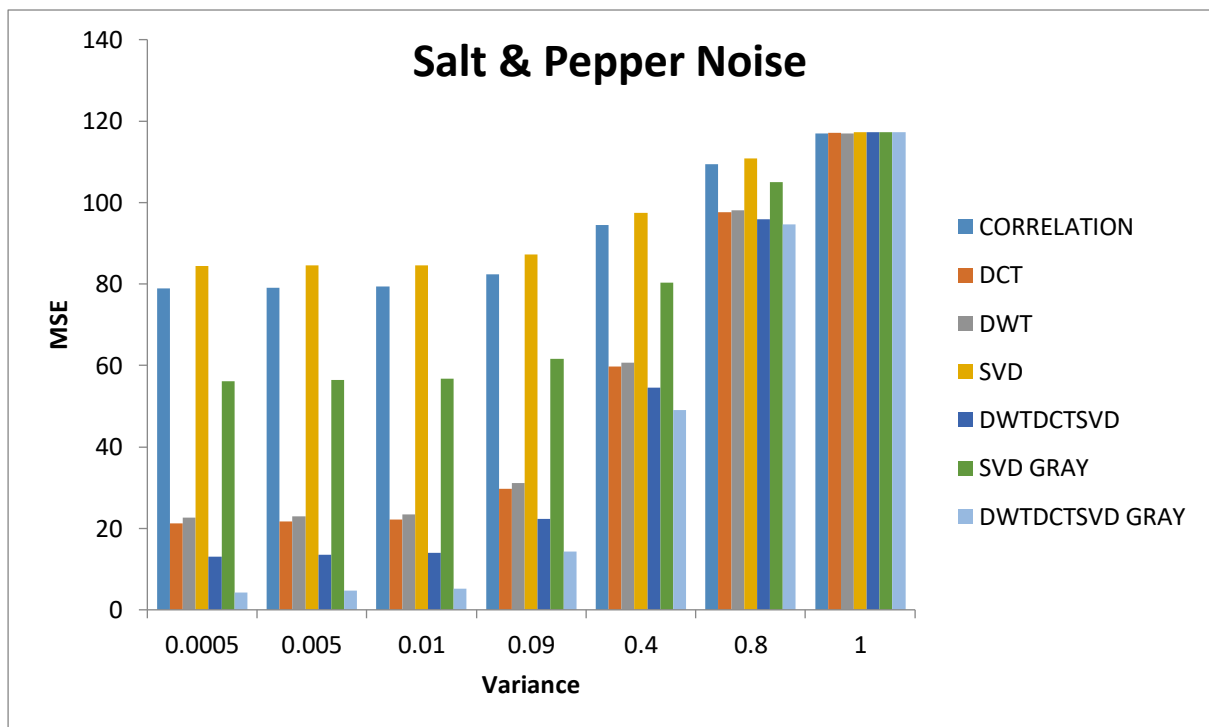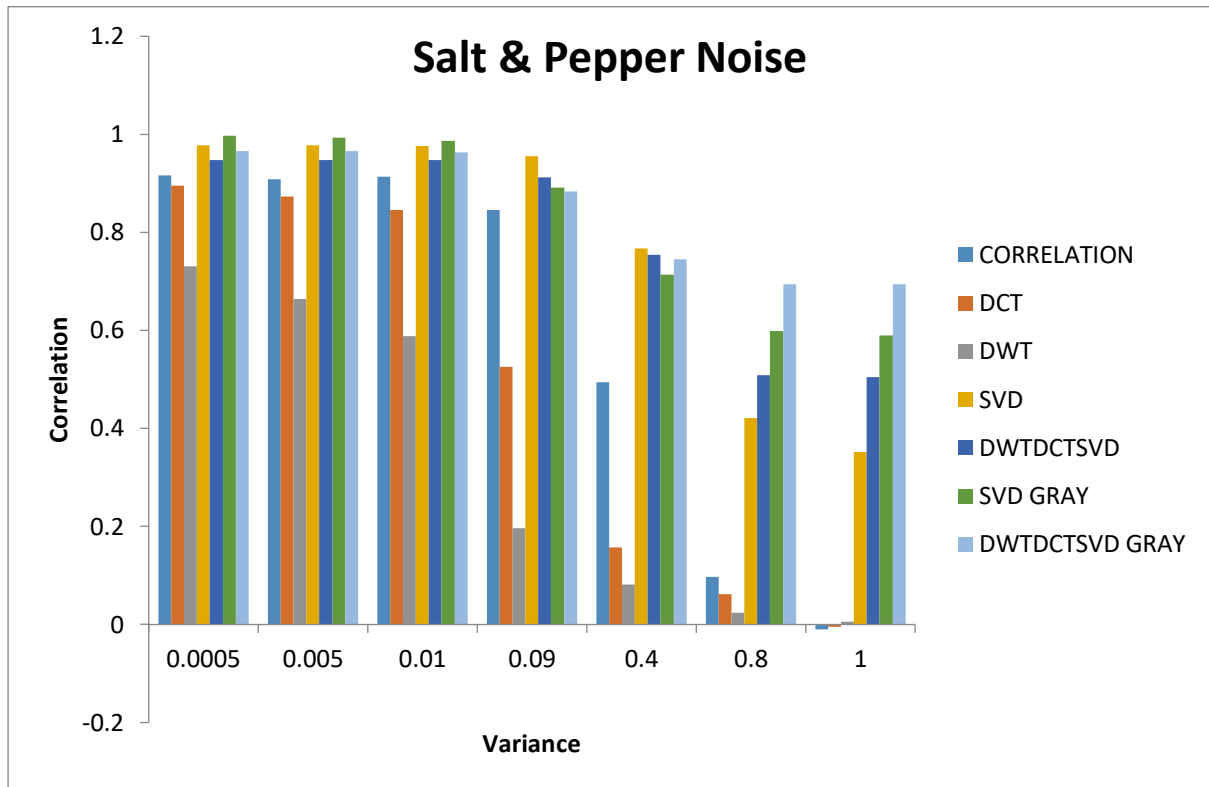

(a)

(b)

(c)

Figure 6.10: Comparison of all methods in Gaussian noise attack (a) PSNR (b) MSE (c) Correlation
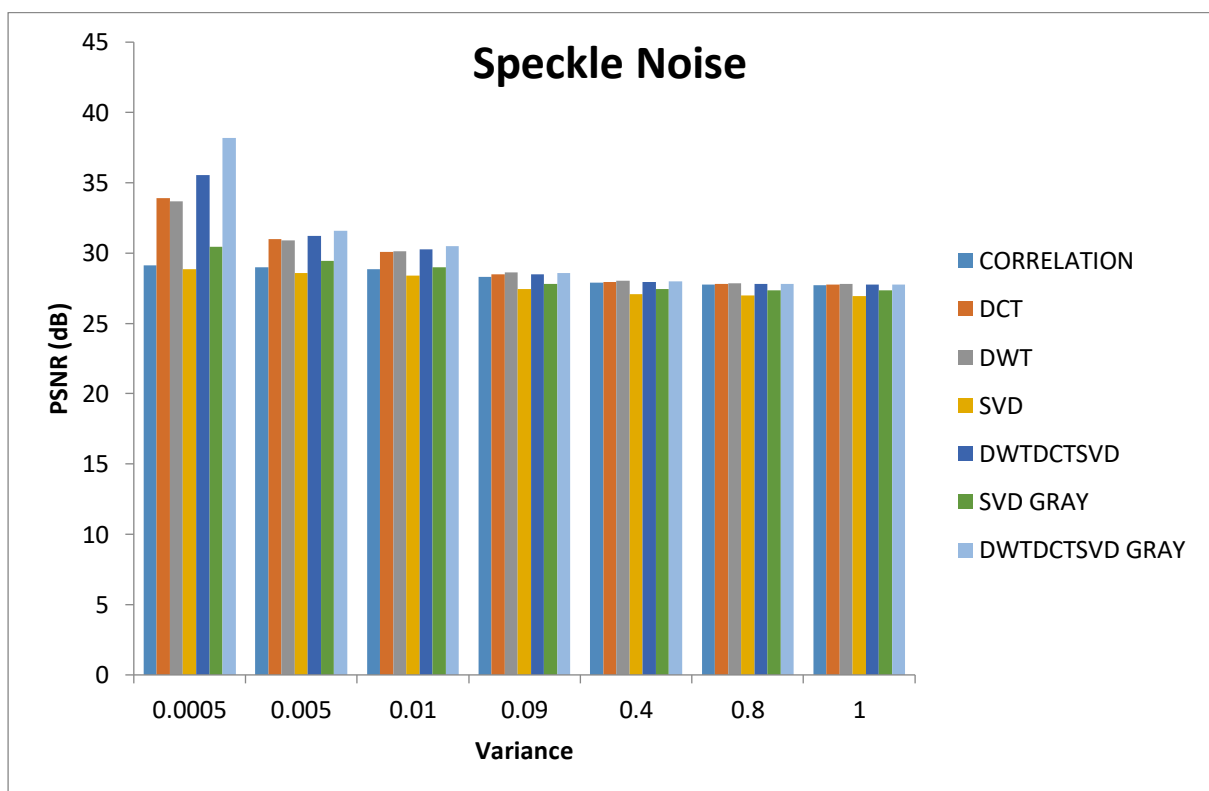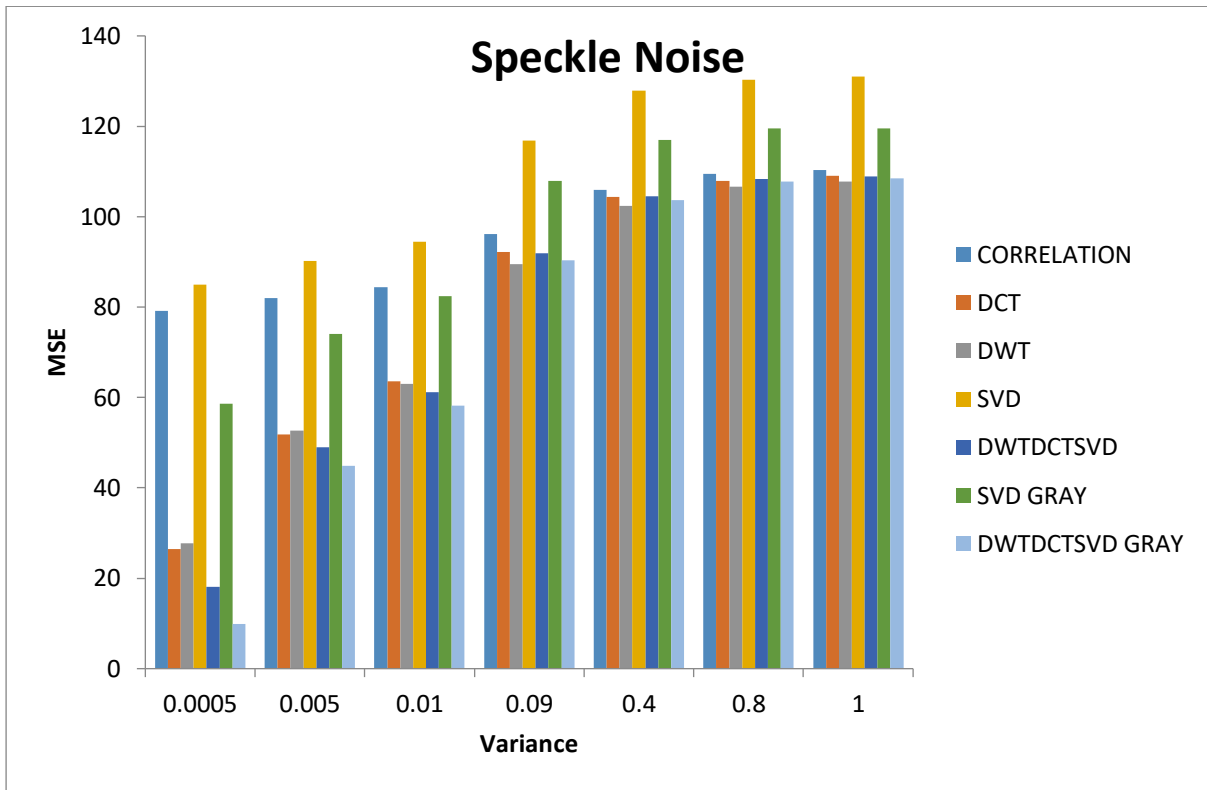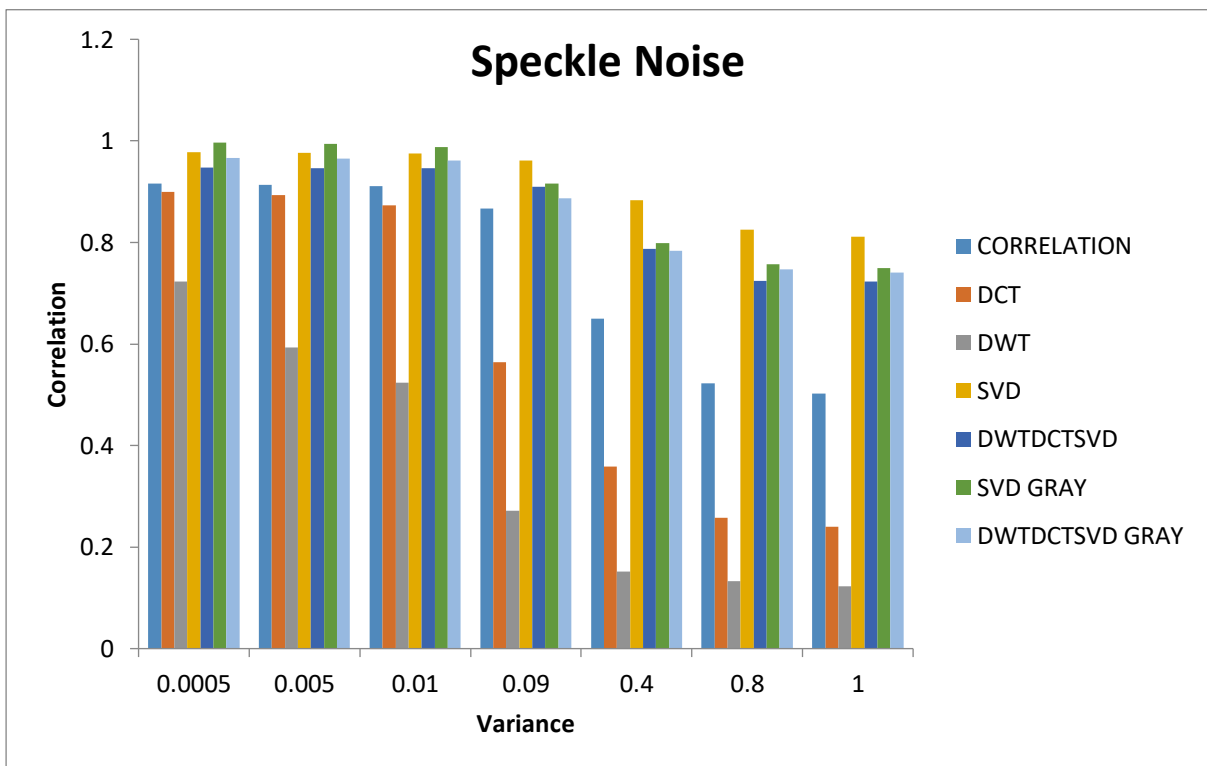
(a)

(b)

(c)

Figure 6.11: Comparison of all methods in salt & pepper noise attack (a) PSNR (b) MSE (c) Correlation
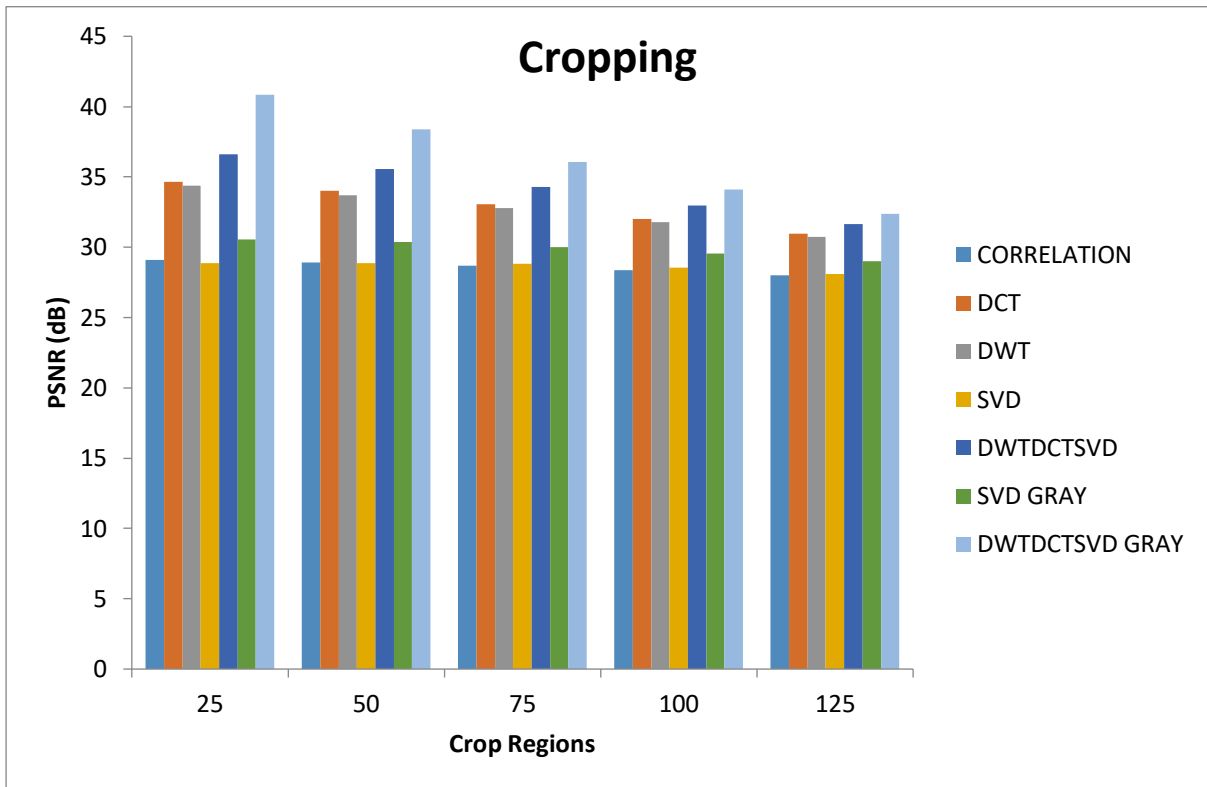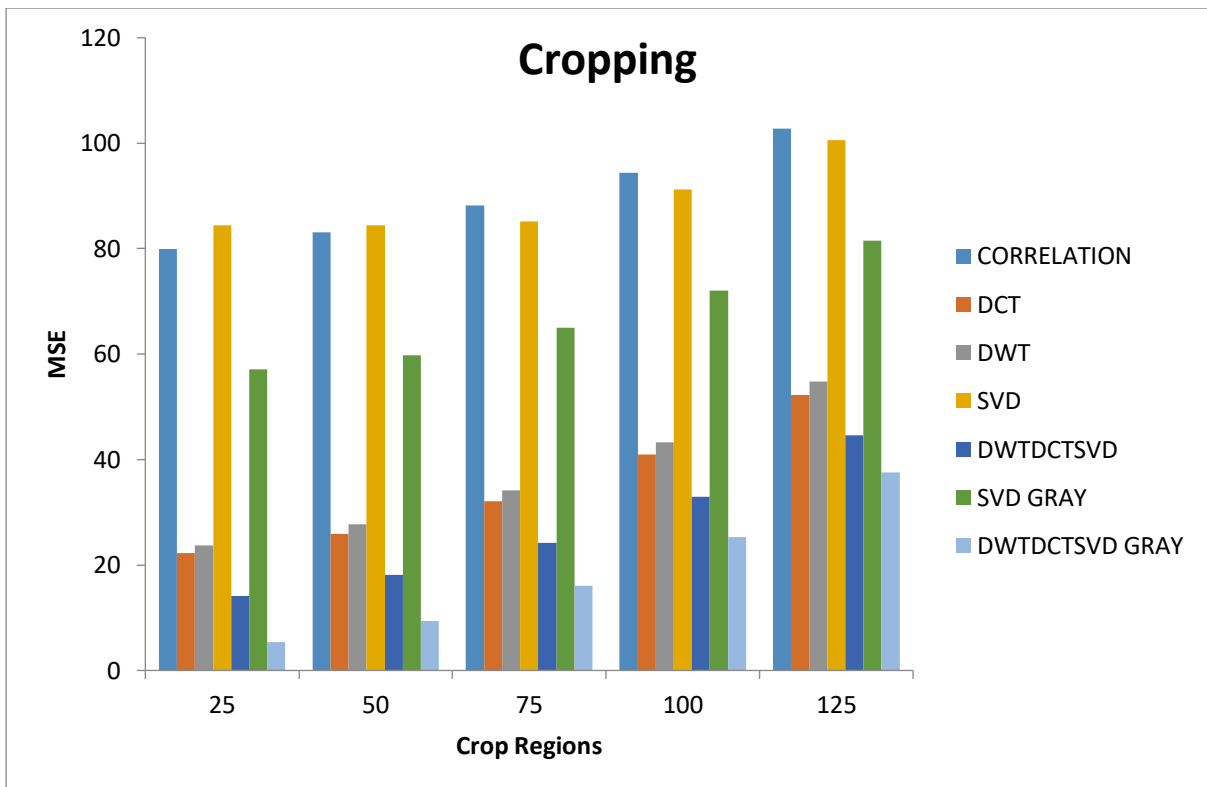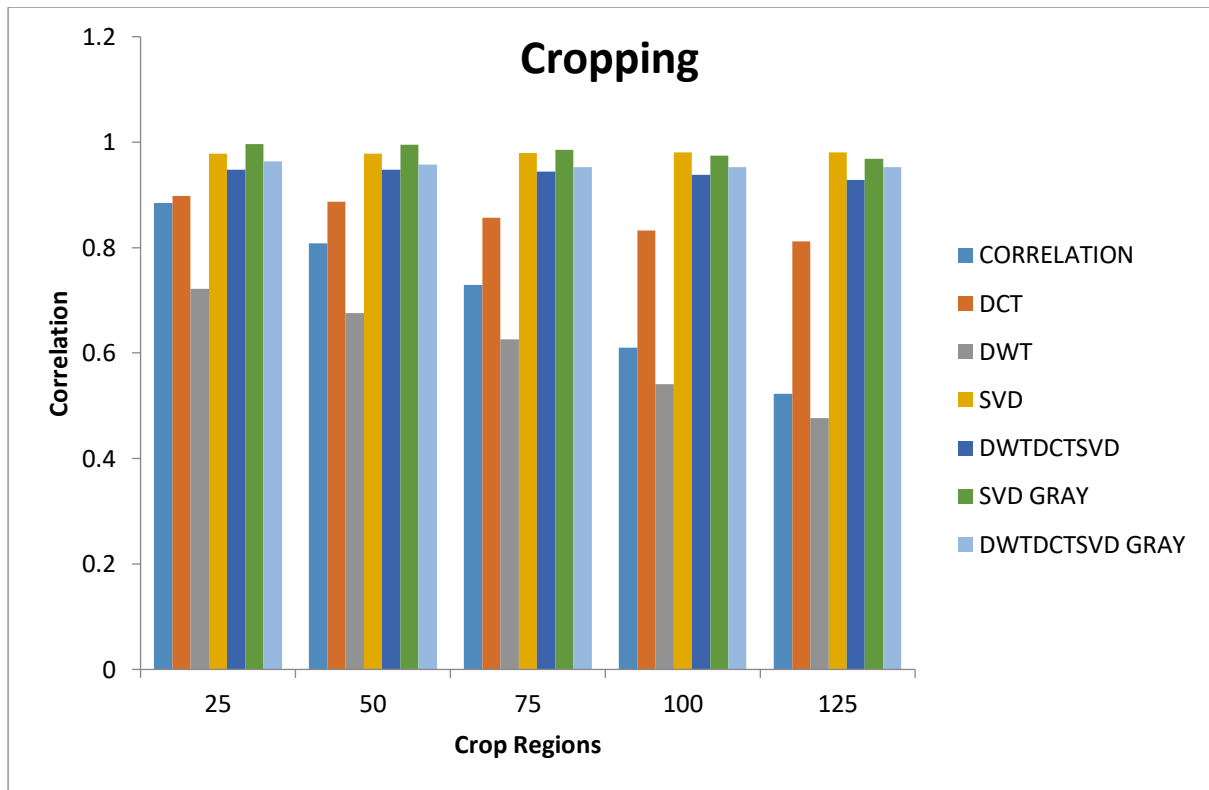

(a)

(b)

(c)

Figure 6.12: Comparison of all methods in speckle noise attack (a) PSNR (b) MSE (c) Correlation
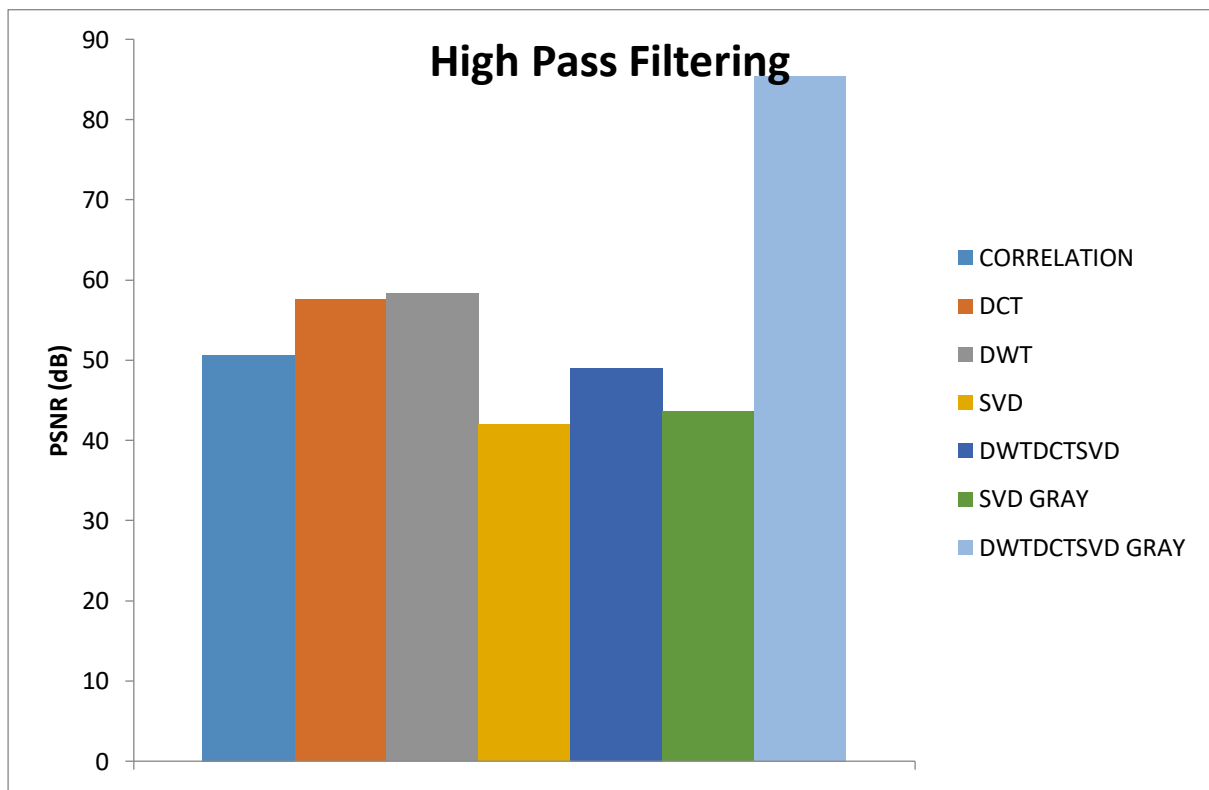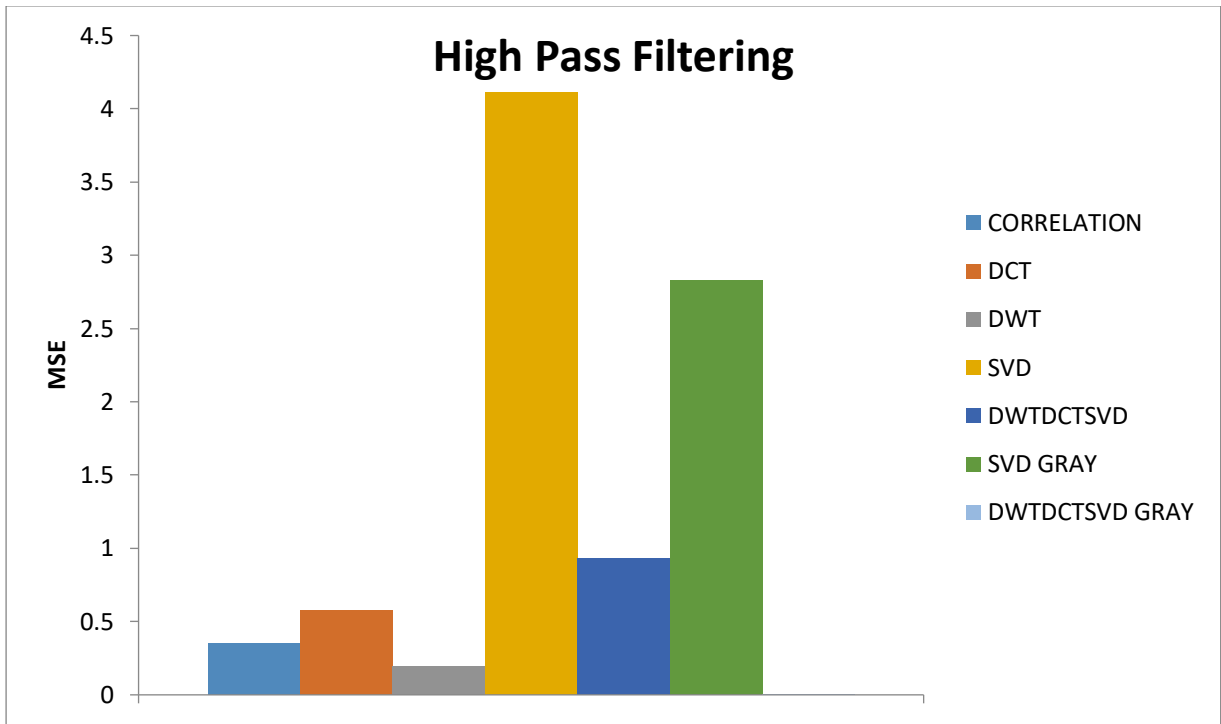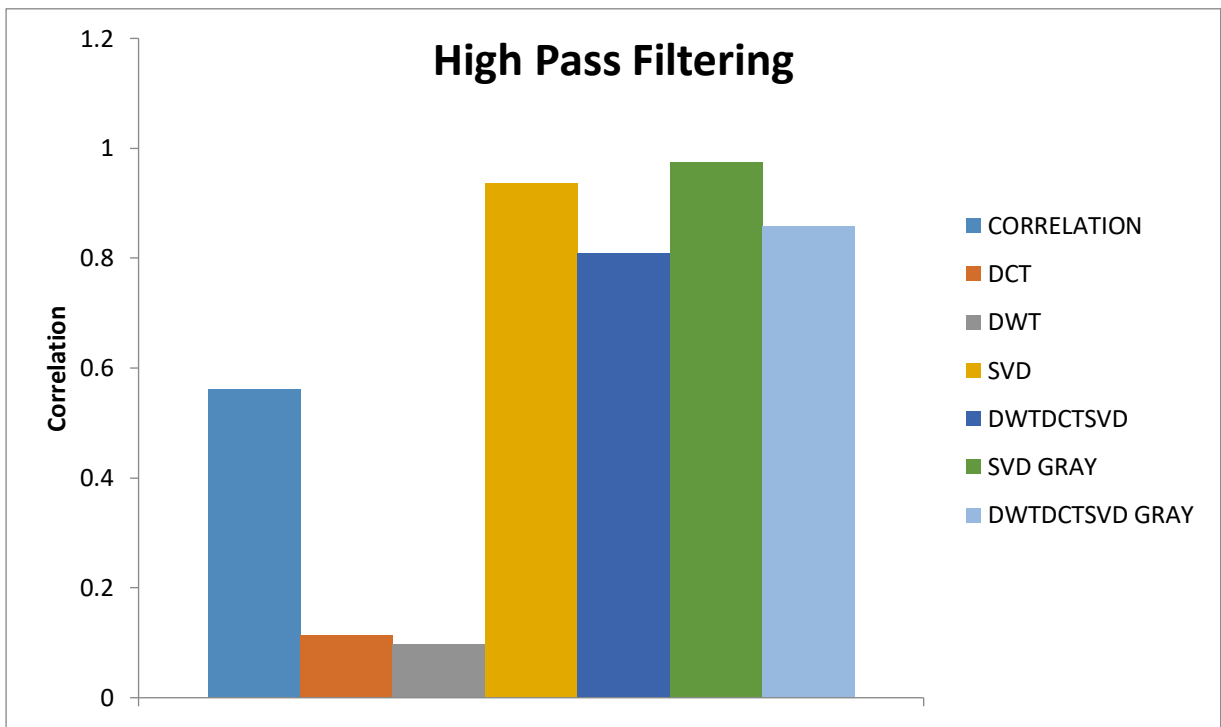
(a)

(b)

(c)

Figure 6.13: Comparison of all methods in cropping attack (a) PSNR (b) MSE (c) Correlation

(a)

(b)

(c)

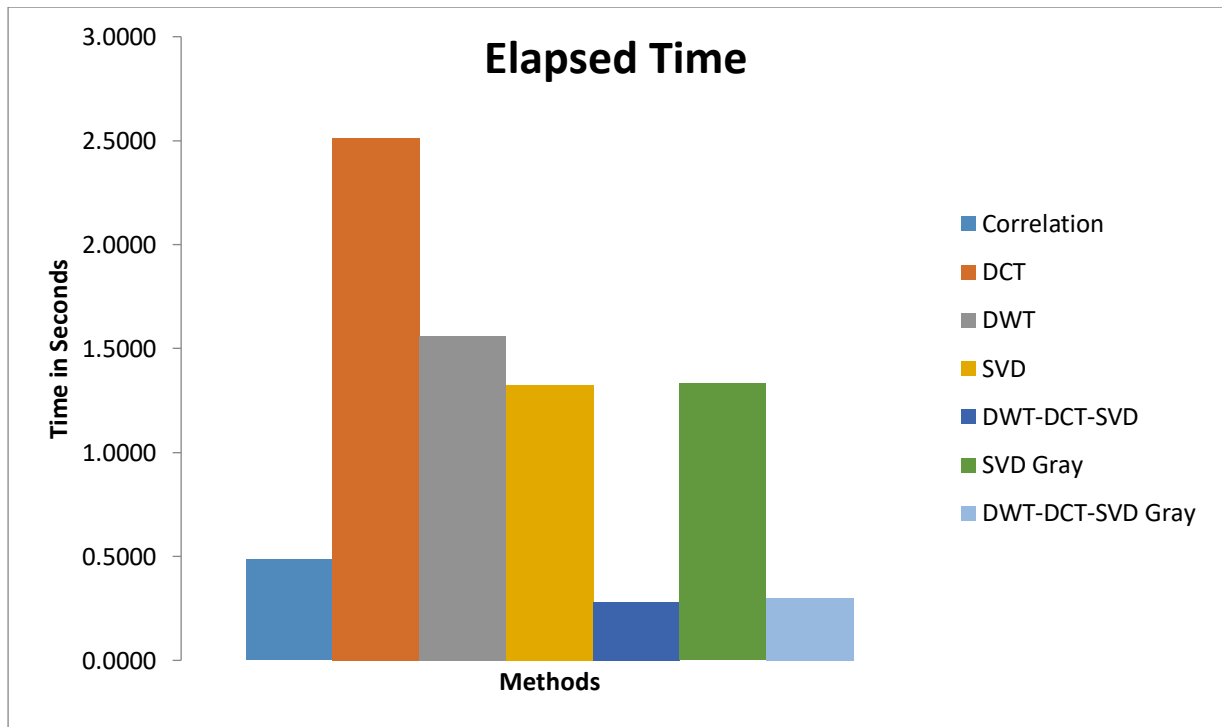Figure 6.14: Comparison of all methods in high pass filtering attack (a) PSNR (b) MSE (c) Correlation

Figure 6.15: Comparison of all methods in Elapsed Time