FCIS
Ain Shams University

Algorithms Analysis and Design

Image Processing

TA. Amira Fekry

ID	Student Name	Official Email	Level	Department
20201701512	Salwa Mahmoud Abdelmaksoud Makhlouf	20201701512@cis.asu.edu.eg	Third	BIO
				CSEC
20201701829	Wasfy Mohammed El-baz	20201701829@cis.asu.edu.eg		CSEC
20201701825	Mariam Osama Ahmed Ali	20201701825@cis.asu.edu.eg		BIO
20201701519	Maram Khairy Soliman Ali Thabet	20201701519@cis.asu.edu.eg		CSEC
20201701813	Salma Mahmoud Mahmoud Amine	20201701813@cis.asu.edu.eg		

Prior to carrying out higher-level processing stages in image processing, a filter is typically required to accomplish a high level of noise reduction in an image. A non-linear digital filter method called the order statistics filter is frequently used to remove noise (also known as salt and pepper noise) from images. In this project, we focus on two popular filters:

The adaptive median filter with the alpha-trim filter

The fundamental principle of both filters is to first sort the pixel values in a neighborhood region with a specified window size, after which a single value is selected or calculated from the group and placed in the window's center in a new image. Each pixel in the original image goes through this procedure once again.

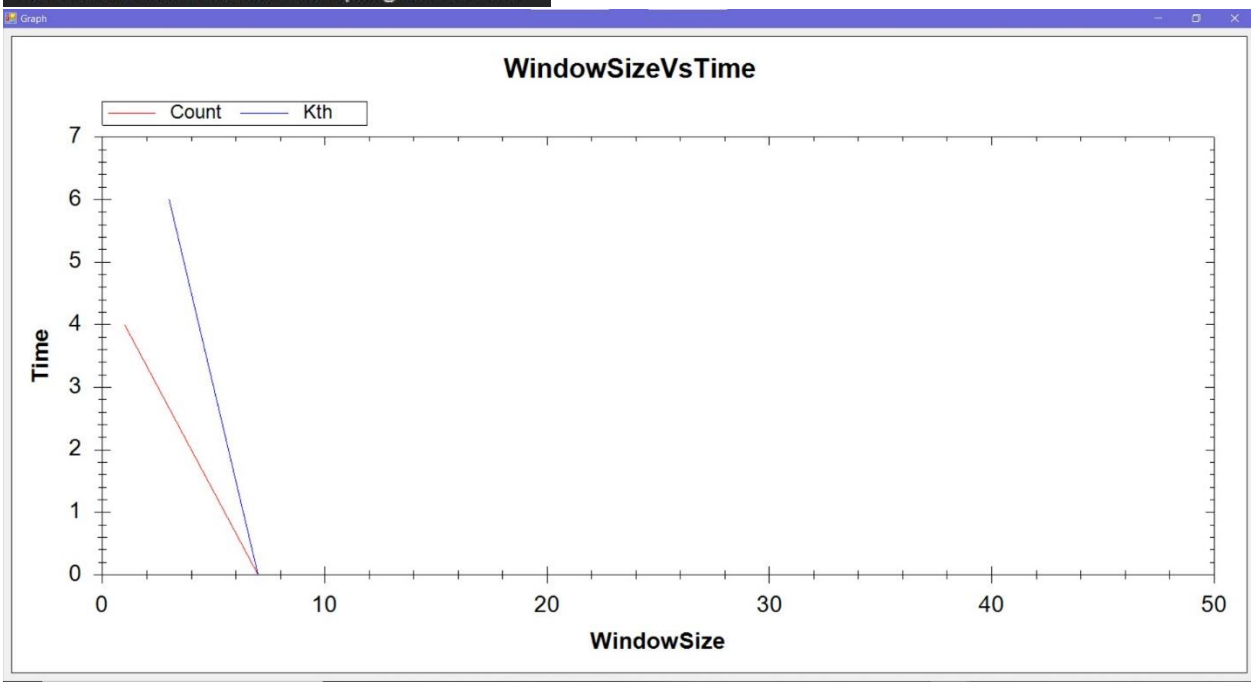
The filter's effect increased with the size of the window.

After implementing the two algorithms (Alpha-Trim Filter, Adaptive Med Filter) using their assigned sorting techniques (Counting sort, Select Kth smallest/largest element) for the Alpha-Trim Filter and (Counting sort, Quick sort) for the Adaptive Med Filter, we came to the conclusion that: (the testing was done while maintaining the window size)

- In terms of the time complexity the Alpha Trim filter took less time than the adaptive with 2ms for the count sort and 5 for the Kth element

```
The Execution time of the program is 2ms
```

```
The Execution time of the program is 5ms
```

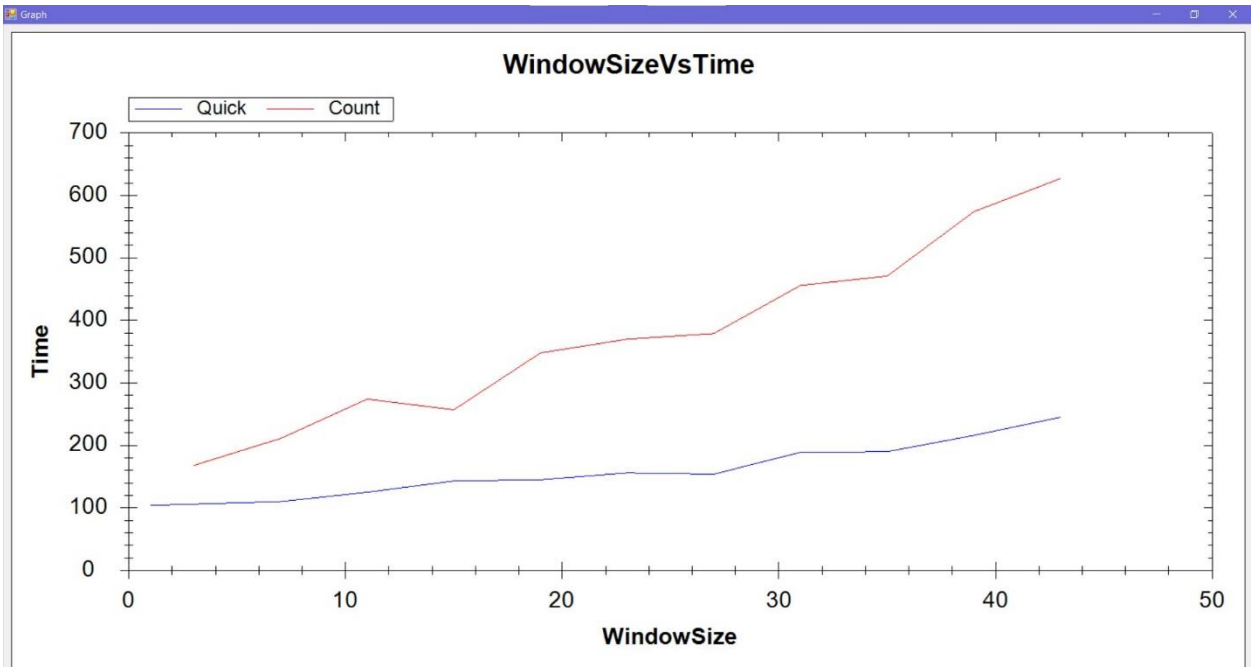


As presented in the graph their functions shows being linear

- While for the adaptive median it took 257 for the counting sort and 128 for the quick sort

```
The Execution time of the program is 128ms
```

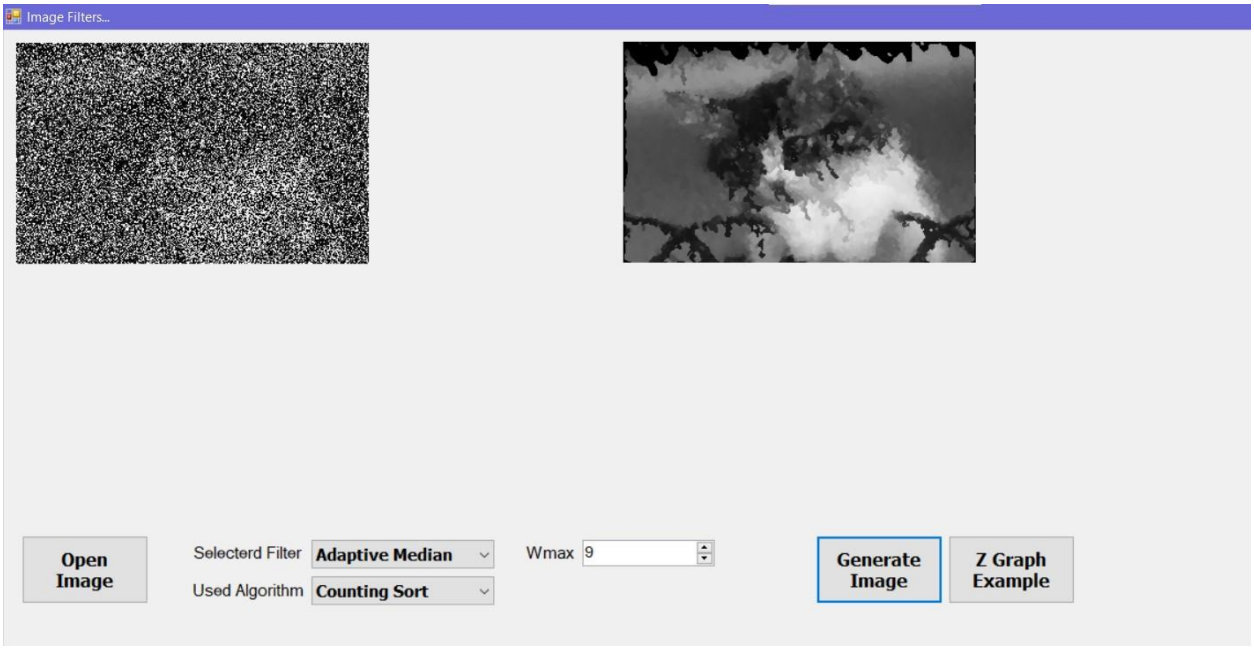
```
The Execution time of the program is 257ms
```

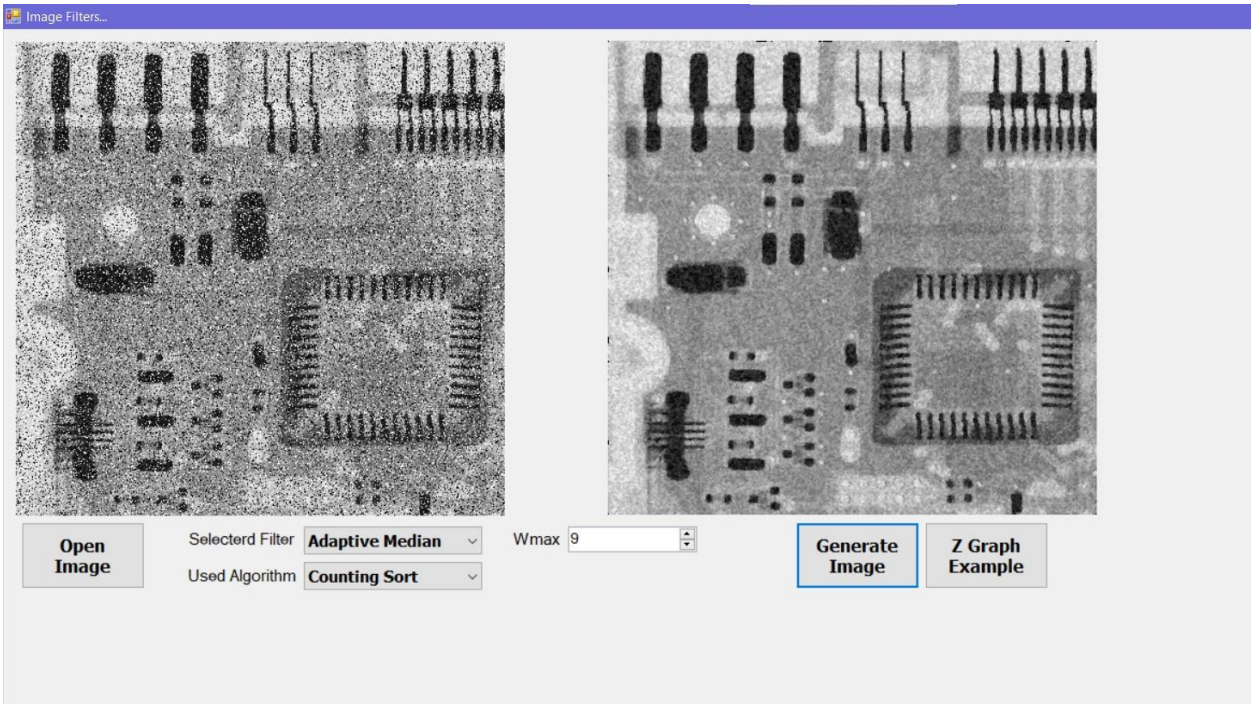


As presented in the graph there is a curve that shows the complexity's nonlinearity almost closer to a quadratic graph

**Which is logical since the Adaptive Median's implementation is more complex and thorough than the Alpha Trim

- In terms of the quality of noise and pepper removal the Adaptive Median has given better result than the Alpha Trim:
  Adaptive Results on two samples





Alpha Trim Result on two samples


Image Filters...
Open Image
Selecterd Filter
Alpha Trim
Used Algorithm
Kth Smallest/Large
Wmax
9
T
2
Generate Image
Z Graph Example