**Module 4: Option #1**

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CSC515-1: Foundations of Computer Vision

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20 November 2022

The mean filtering method has been shown to provide better overall results when filtering an image with impulse noise. However, when excessive noise is present, the median filtering method may cause excessive smoothing which can lead to a loss of detail in the image (Jiang, etc., 2022). Median filters are superior in terms of breadth, for the overall noise removal (Kim & Kim, 2019). The median filter utilizes the median value of groups of pixels, this is done by first sorting the pixels, then applying the value, because it requires sorting, there is additional time required to complete the implementation.

The performance of these filters is determined by the amount of noise reduced, along with the structure of the image remaining intact. While the results of this assignment were interesting, the most visually appealing image that was created was the median filter with kernel size of 3x3. The effects of this filter removed much of the noise while leaving the overall structure of the image intact. As the kernel size increased, the distortion of the image became significant, although the amount of noise continued to decrease. When the image had a larger kernel size, the image elements began to bleed into one another, which leads to image destabilization. An interesting thing to note, is that the Gaussian 1 filter delivered almost the same image, regardless of kernel size.

While examining the mean filter, the image quality with the 3x3 kernel returned an almost unchanged imaged, however, as the image began to obscure and become blurry as the kernel size increased. Based on the research that had been previously conducted, I had assumed that the Gaussian filter would have returned the most impressive results, however this was not the case. These results are most likely due to imperfect sigma selections that were chosen. All the filters returned a similar growth of blurring, as kernel size increases as due the instances of blurred pixels. For each of the filters, the 3x3 kernel returned the most similar to the original image, without excessive blurring. The preservation of important features are important to maintain the intended elements of the photo, or to correctly identify the right person, or to notice a small detail that may be important. Given the second example, if the image became too blurred or removed essential elements to the facial features then identifying a bank robber could become exceedingly difficult. While that is just one specific example, there are many others that are just as important.

The results that were returned are like the preferred method discussed previously. With the most basic median filter, it was still able to outperform the other filtering methods. Although, given the right algorithm, each of these filters are able to have standalone value, with a basic model, the median filter has the advantage. As discussed previously, when excessive filtering is needed with the median filter, the image loses details that could be important in future events.

Calendar

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**References**

Jiang, Y., Wang, H., Cai, Y., & Fu, B. (2022). Salt and pepper noise removal method based on the edge-adaptive total variation model. *Frontiers in Applied Mathematics and Statistics*, *8*. https://doi.org/10.3389/fams.2022.918357

Kim, B. G., & Kim, S. K. (2019). Comparison and Analysis of Noise Filtering Algorithms for Path Tracing. *International Journal of Engineering Research and Technology*, *12*, 770–775. https://doi.org/974-3154