

## Two new methods for removing salt-and-pepper noise from digital images

### ABSTRACT

In this study, we developed two new alternative methods to enhance images which operate satisfactorily with high levels of noise in any given window size. We also conducted a test by adding the most frequently used noise type to the test images of salt-and-pepper noise. The results are compared with other well-known noise remover methods in the literature such as, standard median filter (SMF) and adaptive median filter (AMF), and much better results were obtained. For instance, the results of SMF and AMF filters as well as peak signal-to-noise ratio (PSNR) are 33.2 and 29.8 respectively by adding a ratio of 0.1 salt-and-pepper noise to the Lena image. With the new methods, the results are 41.4 and 41.4. The newly developed methods also generate better results in reducing high volume of noise. For instance, if a ratio of 0.5 salt-and-pepper noise is applied to a Lena image, PSNR results are 15.22 and 22.78 in SMF and AMF, and 25.8 and 28.9 with newly developed methods.

**Keyword:** Image processing; Peak signal-to-noise ratio; Image enhancement factor; Elastic median filters