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## Impulse noise detection technique based on fuzzy set

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### Article

In this study, a new fuzzy-based technique is introduced for denoising images corrupted by impulse noise. The proposed method is based on the intuitionistic fuzzy set (IFS), in which the degree of hesitation plays an important role. The degree of hesitation of the pixels is obtained from the values of memberships of the object and the background of the image. After minimising the obtained hesitation function, the IFS is constructed and the noisy pixels are detected outside the neighbourhood of mean intensity of the object and the background of an image. Denoised images are relatively analysed with five other methods: modified decision-based unsymmetric trimmed median filter, noise adaptive fuzzy switched median filter, adaptive fuzzy switching weighted average filter, adaptive weighted mean filter, iterative alpha trimmed mean filter. Performances of the proposed method along with these five state-of-the-art methods are evaluated using a peak signal-to-noise ratio and error rate along with the time for computation. Experimentally, derived denoising method showed an improved performance than five other existing techniques in filtering noise in images due to the reduction of uncertainty while choosing the noisy pixels.

**Inspection keywords:** impulse noise; fuzzy set theory; image filtering; iterative methods; image denoising; adaptive filters

**Other keywords:** impulse noise detection technique; iterative alpha trimmed mean filter; signal-to-noise ratio; fuzzy-based technique; adaptive fuzzy switching weighted average filter; noise adaptive fuzzy switched median filter; modified decision-based unsymmetric trimmed median filter; IFS; intuitionistic fuzzy set; image denoising; adaptive weighted mean filter; hesitation function

**Subjects:** Interpolation and function approximation (numerical analysis); Computer vision and image processing techniques; Combinatorial mathematics; Interpolation and function approximation (numerical analysis); Optical, image and video signal processing; Combinatorial mathematics

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