Variable Window for Outlier Detection and Impulsive Noise Recognition in Range Images

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Abstract

To improve comprehensive performance of denoising range images, an impulsive noise (IN) denoising method with variable windows is proposed in this paper. Founded on several discriminant criteria, the principles of dropout IN detection and outlier IN detection are provided. Subsequently, a nearest non-IN neighbors searching process and an Index Distance Weighted Mean filter is combined for IN denoising. As key factors of adapatablity of the proposed denoising method, the sizes of two windows for outlier INs detection and INs denoising are investigated. Originated from a theoretical model of invader occlusion, variable window is presented for adapting window size to dynamic environment of each point, accompanying with practical criteria of adaptive variable window size determination. Experiments on real range images of multi-line surface are proceeded with evaluations in terms of computational complexity and quality assessment with comparison analysis among a few other popular methods. It is indicated that the proposed method can detect the impulsive noises with high accuracy, meanwhile, denoise them with strong adaptability with the help of variable window.

adaptive variable window size determination Algorithm design and analysis computational complexity discriminant criteria dropout IN detection dynamic environment Educational institutions image denoising image recognition impulse noise impulsive noise denoising impulsive noise recognition index distance weighted mean filter Indexes invader occlusion multiline surface nearest nonIN neighbors searching process Noise noise reduction outlier detection outlier IN detection quality assessment range image denoising Variable window wavelet transforms