Objective Assessment Criteria for Median Based Filtering of Impulse Noise Corrupted Images

Zhang, Bertrand

Impulse noises can seriously corrupt images. Median based filters are used to remove impulse noises. However, these filters introduce distortions while removing impulse noises. Traditionally, the capability of a median based filter in reducing impulse noises is simply measured by MSE (mean square error) or SNR (signal-to-noise ratio) based criteria. However, MSE or SNR based criteria is not very effective in filtering assessment for impulse noise corrupted images because it makes no difference between impulse and non-impulse noises, ignores spatial distributions and fails to take into account the sensitivity of human vision. Because of these shortcomings, subjective assessment has been used as supplement, which is qualitative, inaccurate, uneconomic and inefficient. This paper proposes a set of objective criteria, named Target Criteria, as an alternative. The proposed criteria measures impulse noise reduction, image structure preservation and visual sensitivity by distinguish impulse and non-impulse noise and taking into consideration of spatial distribution and human visual sensitivity. A computer simulation study shows that the proposed criteria provide a number of advantages in objective assessment of median based filtering for impulse noise corrupted images and identifying filter’s strength and weakness, which are unavailable with traditional MSE or SNR based criteria and subjective evaluation.

Awards Won: