Analysis of Adaptive Filter and ICA for Noise Cancellation from a Video Frame

Noise cancellation algorithms have been frequently applied in many fields including image/video processing. Adaptive noise cancellation algorithms exploit the correlation property of noise and remove the noise from the input signal more effectively than non-adaptive algorithms. In this paper different noise cancellation techniques are applied to de-noise a video frame. Three different variants of gradient based adaptive filtering algorithms and independent component analysis (ICA) procedure are implemented and compared on the basis of signal to noise ratio (SNR) and computational time. The common algorithms used in adaptive filters are least mean square (LMS), normalized least means square (NLMS), and recursive least mean square (RLS). The simulation results demonstrates that NLMS algorithm is computationally efficient but cannot handle impulsive noise whereas LMS and RLS can perform better for long duration noise signals. The comparative analysis of adaptive filtering algorithms and ICA shows that ICA can perform better then all three iterative gradient based algorithms because of its non-iterative nature. For testing and simulations, three variants of white Gaussian noise (WGN) are used to corrupt the video frame.