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Abstract

High reconstructed performance compressed video sensing (CVS) with low computational complexity and memory requirement is very challenging. In order to reconstruct the high quality video frames with low computational complexity, this paper proposes a tensor-based joint sparseness regularization CVS reconstruction model FrTVCST (fractional-order total variation combined with sparsifying transform), in which a high-order tensor fractional-order total variation (FrTV) regularization and a tensor discrete wavelet transform (DWT) L0 norm regularization are combined. Furthermore, an approach for choosing the regularization parameter that controls the influence of the two terms in this joint model is proposed. Afterwards, a tensor gradient projection algorithm extended from smoothed L0 (SL0) is deduced to solve this combined tensor FrTV and DWT joint regularization constrained minimization problem, using a smooth approximation of the L0 norm. Compared with several state-of-the-art CVS reconstruction algorithms, such as the Kronecker compressive sensing (KCS), generalized tensor compressive sensing (GTCS), N-way block orthogonal matching pursuit (N-BOMP), low-rank tensor compressive sensing (LRTCS), extensive experiments with commonly used video data sets show the competitive performance of the proposed algorithm with respect to the peak signal-to-noise ratio (PSNR) and subjective visual quality.

Keywords: compressed video sensing, tensor, fractional-order total variation, reconstruction, smoothed L0