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VQ-BASED BAYESIAN ESTIMATION FOR BLUR IDENTIFICATION AND IMAGE SELECTION IN VIDEO SEQUENCES

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Abstract. *We address the problem of blur identification and image selection with statistical blur priors in the context of the vector quantization (VQ) based framework. Firstly, we assume some dominant blur priors for estimating point spread functions (PSFs) of blurred frames in Bayesian MAP estimation. The blurred frames with estimated PSFs can be stored in VQ-based multiple codebooks. These codebooks can thus be used for identifying blurred video frames via VQ encoding distortion measure. Secondly, vector quantizer codebooks supply incorporate prior incrementally to the Bayesian learning process. The probabilistic model predicts and adds new codebooks dynamically for identifying more blurred frames in a video sequence. Experimental results demonstrate that the method offers an efficient way for practical blur identification and image selection in video sequences.*

Keywords: Vector quantization, Bayesian estimation, Point spread function, Blind image deconvolution, Blur identification, Image selection, Video sequences

1. **Introduction.** Since a typical video sequence contains a large number of frames, blur identification from a video sequence becomes a challenging problem. Blur also influences the automation, robustness and efficiency of many visual systems in some respects. In visual surveillance systems, blurred frames or blurred objects in video sequences influence the efficiency of such systems. During the 3D reconstruction from uncalibrated video data, freely taken digital video sequences may have some kind of blur. Those blurred images can heavily influence the next processing step, e.g. feature based image matching. For automatic restoration or enhancement of video sequence, identification of blurred frames and restoration of such frames in video data may become one of the key solutions. In surveys of state-of-the-art literature, we have found that there are not many relevant papers to describe an efficient method for automatically identifying degraded frames in a large video sequence till now. Urgent demands of such method are not only in the domain of video restoration but also in the domain of data mining, e.g. identification of the degraded or noisy images automatically in huge remote sensing or video datasets.

The point spread function (PSF) of blur is normally neither known nor perfectly known in video sequences. Some information about the PSF is available but not exact. Such blur identification can then be considered as blind image deconvolution. Blind image deconvolution is classified broadly into two categories: nonparametric and parametric techniques. Parametric methods have been used to identify PSF models that are more