Spike Coding: Towards Lossy Compression for Dynamic Vision Sensor

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Dynamic vision sensor (DVS) as a bio-inspired camera, has shown great advantages in high dynamic range (HDR) and high temporal resolution (μs) in vision tasks. However, how to lossy compress asynchronous ***spikes*** for meeting the demand of large-scale transmission and storage meanwhile maintaining the analysis performance still remains open.

Towards this end, this paper proposes a lossy spike coding framework for DVS. In this framework, we first present a distortion measurement method for spike trains with consideration of the polarity. Then, we further extend previous lossless compression [1] with several strategies: optimized inter-cube prediction, empty mode and residual quantization. Moreover, the experiments on MNIST-DVS show that our approach achieves impression compression ratio within reasonable distortion (Shown in Fig. 1). Surprisingly, classification accuracies remain remarkably unchanged until compression ratio near to 7.5 (Shown in Fig. 2), this indicates that our proposed framework can significantly improve compression ratio while sustaining the analysis performance.

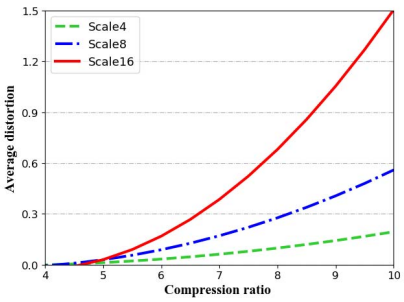

Figure 1: The curve of average distortion and compression ratio on MNIST-DVS.

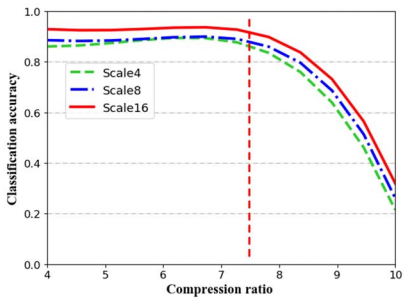

Figure 2: The effects of lossy compression on object classification for MNIST-DVS.

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[1] Siwei Dong, Zhichao Bi, Yonghong Tian, and Tiejun Huang, "Spike coding for dynamic vision sensors in intelligent driving," *IEEE Internet of Things Journal*, 2018.

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