

SNTRACKER: HIGH-SPEED MULTI-OBJECT TRACKING WITH SPIKE CAMERAS

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Abstract

The rapid evolution of neuromorphic vision sensors, particularly spike cameras, has enabled ultra-high temporal resolution visual sensing beyond the capabilities of conventional frame-based cameras. Spike cameras generate asynchronous, binary event streams representing intensity changes at microsecond precision, making them highly suitable for high-speed motion analysis in dynamic environments. However, traditional multi-object tracking (MOT) algorithms are primarily designed for frame-based image sequences and struggle to efficiently process sparse spike-based data. To address this challenge, this work proposes SNNTracker, an online high-speed multi-object tracking framework tailored for spike camera streams. SNNTracker integrates spike-frame generation, object detection, and real-time track management into a unified pipeline optimized for low-latency processing. The system first aggregates spike events into short temporal windows to form binary spike frames. A lightweight blob-based detection module extracts object centroids from the sparse spike patterns, enabling efficient localization under noise and event dropouts. For tracking, a constant-velocity Kalman Filter is employed to model object dynamics, while data association between predicted track states and current detections is solved using the Hungarian algorithm with spatial gating constraints. This approach ensures robust identity preservation even in the presence of occlusions, missed detections, and background spike noise.