Benchmarking EfficientTAM on FMO datasets

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Abstract

The tracking and detection of small and/or fast-moving objects (FMOs) remains relatively underexplored, particularly in comparison to research on general objects. Specific challenges occur in such scenarios including motion blur, which can distort the appearance of objects and complicate the performance of general object detectors and trackers. Moreover, data annotation becomes more difficult due to the size and motion blur of FMOs, leading to a scarcity of available annotated datasets. Unlike larger objects, small objects often suffer from reduced visibility and lower image cover rate, leading to fewer appearance cues and increased background interference. Considering both issues, fast and small object tracking, are therefore still challenging for modern tracking techniques.

We propose to extend Fast Moving Object (FMO) datasets (Falling Object, FMOv2, TbD and TbD-3D) with additional ground truth information in JSON format (FMOX) for easy processing in machine learning pipeline. We test a recently proposed foundational tracking model EfficientTAM on FMOX showing that its performance compares well with the pipelines originally developed for 4 public FMO datasets. Our experimental results demonstrate its competitive performance and limitations, including difficulties in initializing tracking for strongly motion-blurred objects, in challenging scenarios. Notably, EfficientTAM achieves superior performance without requiring specialized training or modifications to its default parameters, yielding average Trajectory-Intersection over Union (TIoU) scores of 0.7093 for Falling Objects and 0.8604 for TbD-3D datasets. These results showcase its effectiveness in tracking FMOs.