MFT: Improving Convolutional Object Tracking with Feed Separated Learning

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Effective object tracking is vital to consumer safety and utility in emerging technologies such as self-driving vehicles and automated video tracking. This study centered around the creation of Multi Feed Tracker (MFT), a real-time object tracking system that uses a novel network design to achieve an accuracy, speed, and reliability that are among the highest in the field. MFT learns from object tracking data using a uniquely designed convolutional neural network with both short-term and long-term learning updates. In this network, high stride length was substituted for conventional max pooling layers to preserve spatial relationship information. Additionally, a completely novel branched classification layer was added to the network architecture, with each branch corresponding to each video feed. MFT was over 9% more accurate than any of the seven top tracking algorithms compared against, and ranked the highest in robustness. Remarkably, MFT performed best on many challenge sequences like fast motion, illumination variation, occlusion, and low resolution feeds. MFT was also 36% faster, with real-time speed (20 fps) achieved using GPU parallelization with CUDA cores. This exceptional performance indicates that MFT is ready for implementation within self-driving cars, where it may improve passenger safety and reduce risk on the road.

Awards Won:

Intel ISEF Best of Category Award of $5,000

Intel Foundation Cultural and Scientific Visit to China Award

Air Force Research Laboratory on behalf of the United States Air Force: First Award of $750 in each Intel ISEF Category

Serving Society Through Science: Second Award of $500

Association for the Advancement of Artificial Intelligence: Third Award of $500

Association for Computing Machinery: Second Award of $500