Object Tracking with Self Supervision Algorithms

Group - 35

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Problem Statement

We have used Simple Online Real Time Tracking (SORT) as the baseline for Unsupervised Object Tracking.

We wanted to incorporate different self-supervised methods along with SORT, study the results and try to improve upon them.

We have tried three independent approaches for the same purpose in this assignment.

1. Simple Online Real Time Tracking (SORT)

At each frame, Kalman filter predicts the next state of each object in the current list of tracks.

Hungarian Algorithm is used to optimally match the actual detections with the current tracks.

We modified the implementation of SORT which we found in order to retain the the tracks of an object for longer durations.

2. Adversarial Video Generation

Kalman filter assumes a constant velocity model and uses the information from a single past frame to generate predictions.

Idea is to replace the predictions from the Kalman filter by finding the detections on the predicted video frame.

We used multi-scale GAN's for predicting the next frame and obtained detections on those frames. We then applied Hungarian Algorithm to associate those detections with the current tracks.
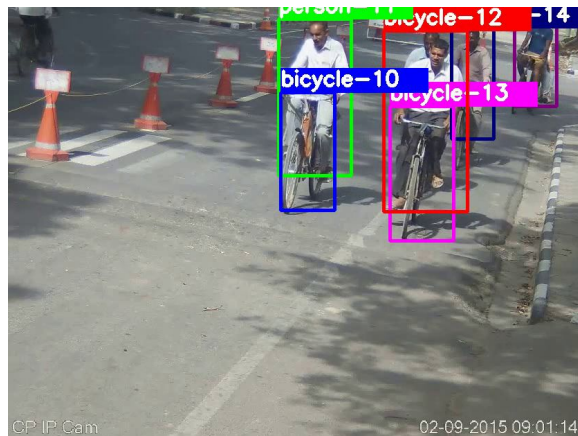
3. Unsupervised Domain Adaptation

SORT uses YOLOv3 pre-trained on COCO dataset. We wanted to train YOLOv3 on our dataset for obtaining better detections, but our dataset wasn't annotated.

We wanted to modify the weights of YOLOv3 using Domain Adaptation, which we would then use for SORT.
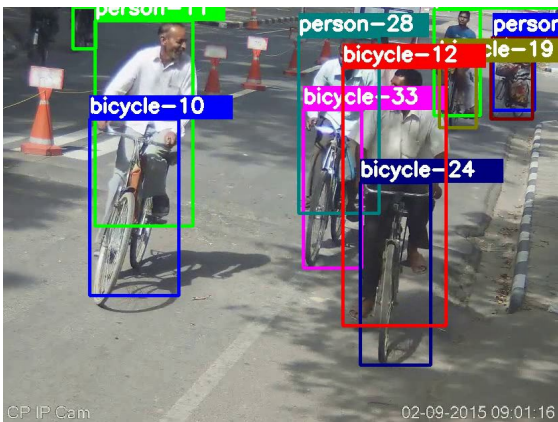
The implementation of Domain Adaptation did not produce better results. We observed that the classification and discriminative accuracy were stagnant during training.

Results
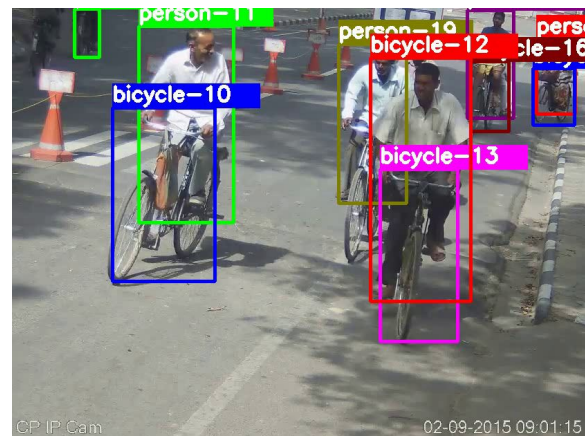

Before
Speed Breaker

Actual paper's
Implementation

After
Speed Breaker

Our
Implementation

After
Speed Breaker

Predicted Frame

Actual Frame

YOLOv3 was not able to detect the Bicycle in the predicted frame.

References

1. SORT - https://arxiv.org/pdf/1602.00763.pdf
2. Unsupervised Domain Adaptation by Backpropagation - https://arxiv.org/pdf/1409.7495.pdf
3. Deep Multi Scale Video Prediction Beyond Mean Square Error - https://arxiv.org/pdf/1511.05440.pdf