Smart City Intersections: Tracking Objects Using Bird's-Eye View Videos

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Traffic intersections in a metropolis: bird's-eye view videos

Autonomous vehicles in dense urban environments will need collaboration with city infrastructure. On busy intersections of a city, crowded and unruly pedestrian who walk between many vehicles make object tracking very complex. Bird's eye view videos can be a powerful monitoring and management tool. Small objects and moving shadows create difficulty in detection and tracking.

Figure 1. Two frames of a bird's eye view video on a busy intersection in NYC

Deep learning approach to detection and tracking: Mask-RCNN + Optical flow

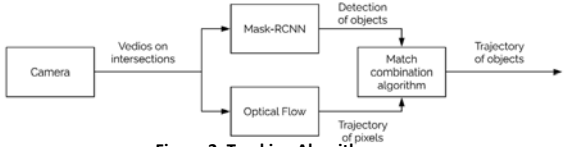

Figure 2. Tracking Algorithm

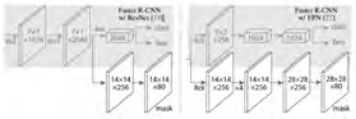

Figure 3. Mask-RCNN

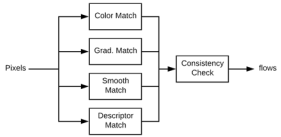

Figure 4. Optical-flow

Results in NYC: Amsterdam Avenue and 120th street

Figure 5. Detection by Mask-RCNN

Figure 5. Optical Flows

Figure 6. Tracking by combining detection and flows

Key results

Successful fusion of Mask-RCNN and Optical Flow methods.

Improved performance in tracking: Reduction in (i) object disappearance and (ii) object switching.

Progress in establishing quantitative performance evaluation methodology.

Conclusions and Future work

The method fuses contour level detection and pixel level tracking , successfully achieving improved accuracy. We are working on improving the method by (i) iteratively performing tracking and detection to form a closed loop; (ii) fusing the results from multiple videos.

Acknowledgments

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References

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