Analysing cyclist behavior at signalized intersections using computer vision

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Artificial intelligence (AI), in particular deep learning and computer vision, is a promising new tool for automated video analysis in traffic studies. It allows for facilitated extraction of detailed data from video recordings at higher efficiency and lower costs, improved precision of obtained data, and reduced errors caused by manual video elaboration. This method has the potential to answer detailed questions on human traffic behavior which were very difficult, if not impossible, to answer previously. In this work we use such AI tools to investigate cyclist behavior at signalized intersections. We approach the problem by utilizing state-of-the-art tools for automated video analysis and apply them to detect and track road users in video recordings (cyclists, vehicles, and pedestrians) and extract their travelled trajectories. This gives us a fine-grained spatio-temporal data set of cyclist movements in the present of vehicles, pedestrians, and traffic lights regulation throughout the day. We perform clustering of the trajectories to identify various patterns of movements from different origins to destinations, and analyze their desire lines. This data set also allows for an insightful intersection safety analysis through assessing conflicts and surrogate measures of safety. We further investigate the social factor on cyclist behavior, such as individual versus group behavior in obeying the rules. We recorded a busy intersection in Copenhagen, Denmark for 10 hours and recovered cyclist trajectories, uncovering insights about cyclist behavior and factors affecting it. These results can be used in better and more efficient planning and operation of intersections with cyclist, to improve safety by better identifying critical conflict points, inadequate bicycle infrastructure, and situations at which regulations are not followed that may cause confusion and risky behavior.

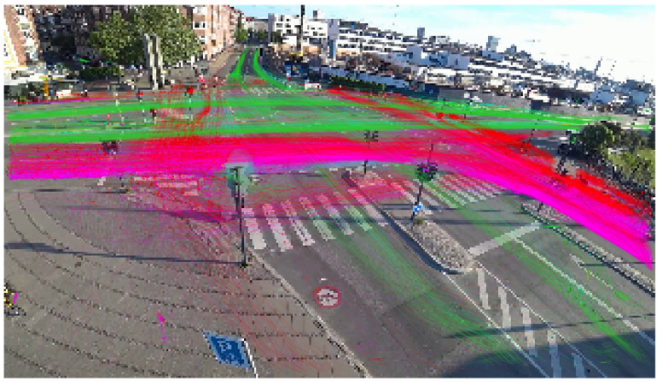

Fig. 1: In a pilot project we recorded and studied the Dybbølsbro intersection in Copenhagen. We applied AI-based computer vision algorithms to reveal trajectories.

References:

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