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A Dynamic Bayes Network for visual Pedestrian Tracking

T. Klinger, F. Rottensteiner, and C. Heipke
Institute of Photogrammetry and GeoInformation, Leibniz Universität Hannover, Hanover, Germany

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Abstract. Many tracking systems rely on independent single frame detections that are handled as observations in a recursive estimation framework. If these observations are imprecise the generated trajectory is prone to be updated towards a wrong position. In contrary to existing methods our novel approach suggests a Dynamic Bayes Network in which the state vector of a recursive Bayes filter, as well as the location of the tracked object in the image are modelled as unknowns. These unknowns are estimated in a probabilistic framework taking into account a dynamic model, prior scene information, and a state-of-the-art pedestrian detector and classifier. The classifier is based on the Random Forests-algorithm and is capable of being trained incrementally so that new training samples can be incorporated at runtime. This allows the classifier to adapt to the changing appearance of a target and to unlearn outdated features. The approach is evaluated on a publicly available dataset captured in a challenging outdoor scenario. Using the adaptive classifier, our system is able to keep track of pedestrians over long distances while at the same time supporting the localisation of the people. The results show that the derived trajectories achieve a geometric accuracy superior to the one achieved by modelling the image positions as observations.

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