Fig. 14 The position RMSE for two almost identical filters, the only difference is that one filter is using the so-called negative information.

better since the effect of the particles that are visible from the point-of-view of the sensor is suppressed. An intuitive explanation for reducing the effect of the visible particles is given as follows. If the particles that are visible represented the true state, then the pedestrian would have been detected, but he/she is not, and therefore such particles should be less probable.

6 Conclusions

The pedestrian tracker proposed in this work is a multiple-model particle filter that uses prior information about the walkways to enhance the estimation performance. The tracking is performed in 3D global coordinates by utilizing the road network information. The states of the pedestrians are estimated by separate filters. Thus, the correlation between pedestrians are neglected, but experiments show that this is a reasonable approximation. For example, cars on a road are in general much more correlated than pedestrians.

The sampling based GNN association method works very well since the detector performs well with few false detections and the measurement noise is quite small for vision/infrared sensors compared to, for instance, radar. Using the Student’s T-distribution for the measurement noise makes the filter more robust against minor outliers caused by the detector.

There are a number of advantages of using a road model. The tracking performance is significantly better if the road network information is used. On the other hand, filters based only on an off-road model perform quite well too as long as the detections are received on a regular basis and a reliable ground model is available. The gains in incorporating an on-road model into the estimation are significant not only for pedestrian motion prediction (e.g. due to occlusion or not in the field-of-view), but also for enhanced sensor management, track analysis and anomaly detection.