Behavior modeling of Vulnerable Road Users
Internship at TNO, department Integrated Vehicle Safety

Introduction
Although most current Collision warning and avoidance (CW/A) systems and development primarily focus on occupant safety, over 44% of the total road fatalities in the Netherlands in 2009 are vulnerable road users (VRUs) [1]. The performance of CW/A systems can be significantly improved by including predictions of collisions of VRUs by implementing behavior models of different road users. Furthermore, the overall performance of CW/A systems can be further improved by including the behavior of both cars and VRUs. In [2] a mathematical method is presented regarding a CW system that is particularly designed for VRUs. The results showed a probabilistic CW system based on simple probability density functions. In continuation of the work in [2], filtering, sensor fusion and target tracking are added to the preprocessing part [3]. To obtain accurate collision probability estimation relevant and reliable inputs are required for the estimation models. Also, behavior models for different road users are added in [3] that can be used for a VRU CW system. However, these models are currently based on a limited dataset and estimations on physical parameters. Improving these models will lead to a more accurate collision probability and thereby improve CW/A systems.

Your assignment
The assignment is twofold:
1. Improve the current probabilistic model for behavior prediction of cyclists:
   a. Literature review and study current model.
   b. Perform a short sensitivity analysis to determine the relevant parameters.
   c. Write a test plan to determine the missing parameters.
   d. Perform & organize the required tests.
   e. Fit a probabilistic model which predicts the behavior of a cyclist as function of all relevant parameters.
2. Develop a probabilistic model for behavior prediction of pedestrians:
   a. Literature review and model development.
   b. Perform a short sensitivity analysis to determine the relevant parameters.
   c. Write a test plan to determine the missing parameters.
   d. Perform & organize the required tests.
   e. Fit a probabilistic model which predicts the behavior of a pedestrian as function of all relevant parameters.

References

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