



CMC Newsletter July 2024:

Spotlight on some of the recent publications by CMC

This newsletter will provide you with a recap of 2 publications by CMC:

- **Path Prediction:** A whitepaper on Path Prediction was published, with important findings (and a warning) about its current state of the art.
- **Accident Analysis:** An extension of the Accident Analysis study, by widening the focus from German data to European level.

The new report shows that the overall trends were also applicable to the whole of Europe, while also a range of interesting differences were discovered.

Whitepaper about Path Prediction

Path prediction is a key pillar for systems like Advanced Driver Assistance Systems (ADAS) or Cooperative Intelligent Transport Systems (C-ITS) to recognize dangerous situations ahead. For motorcycles, accurate path prediction will help to reduce critical situations and accidents and thereby save lives of motorcycle riders.

Study setup

CMC's whitepaper gives an overview of possibilities with the current technical state of the art, related to different sensors and algorithms (e.g. Inertial Measurement Unit (IMU), Global Navigation Satellite System (GNSS)). It further highlights limitations regarding curvature calculation and path prediction on motorcycles.

The level of path prediction was investigated based on two levels:

- **Level B** (by means of radius of curvature calculation based on the instantaneous state of the vehicle, as measured with a combination of vehicle sensors)
- **Level C** (based on information provided by CAMs, such as 'referencePosition', 'heading' and 'speed').

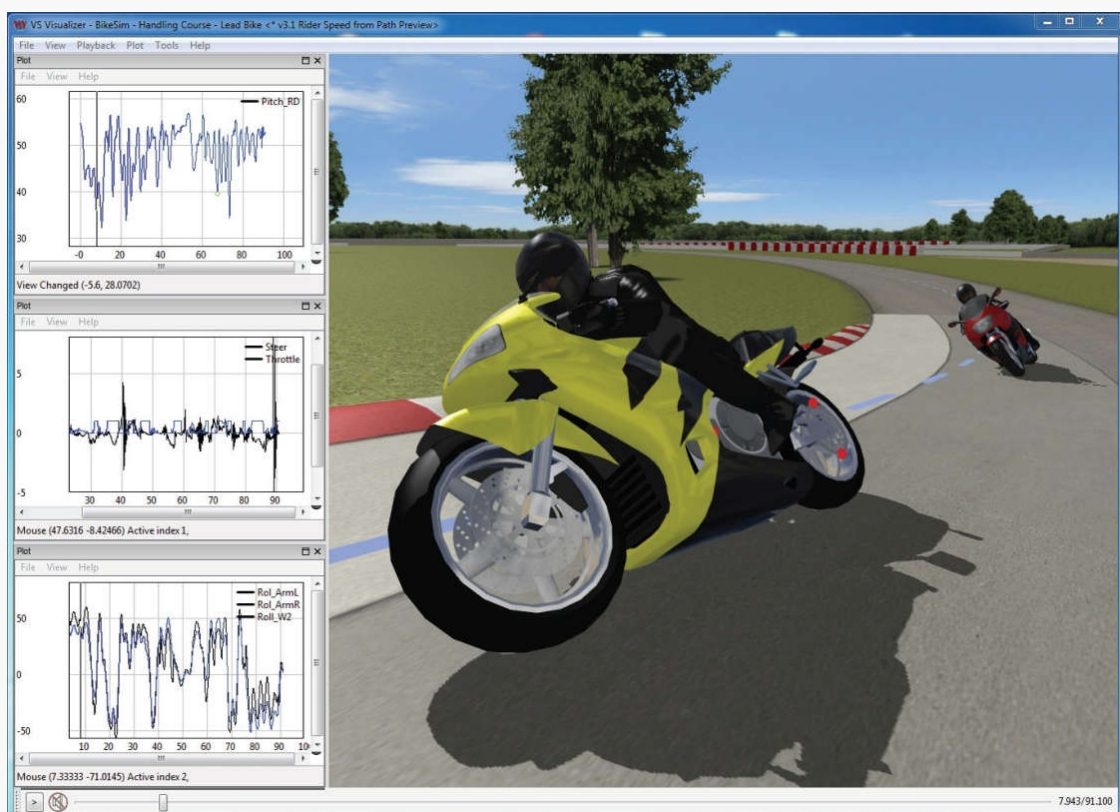
Level A (more advanced and complex methods such as contextual behaviour predictions using machine learning) was seen as exceeding currently available technology standards and therefore not tested within the scope of this whitepaper.

A left turn situation was taken as scenario since this case often involves severe consequences.

In both cases the path prediction and collision risk can be calculated based on a 'Ghost Vehicle' method.

Based on the above, CMC examined how far ahead (how many seconds ahead) the calculated predicted path is valid, within a threshold of 2 meters.

Various intersection passage scenarios were investigated with a BikeSim tool and five different algorithms were tested.



BikeSim motorcycle simulation platform

Key outcomes

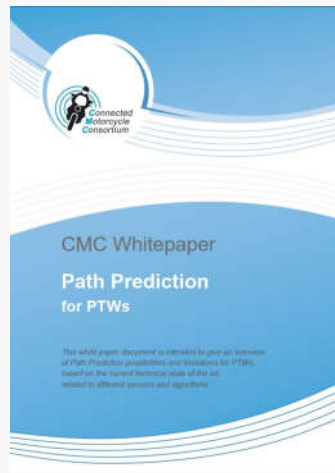
In most cases, there were no big differences between the algorithms. During an actual manoeuvre, a path prediction of only up to about 1-2 seconds ahead was the limit of these systems. On straights, the path prediction can be valid for more seconds, but as soon as there is a small degree of roll motion (which is natural for motorcycles, even on straights) this is already reduced to 2-3 seconds.

The main factor behind the performance limit is that it depends fully on the instantaneous curvature. In order to improve that, consideration could be given to

items like rider intention, map information, and next algorithm improvements; in the future also machine learning / artificial neural networks.

For the moment, however, this means that **an oncoming vehicle driver cannot be informed early enough** whether the motorcycle is going straight or turning and path prediction for motorcycles is not sufficiently solved.

<https://www.cmc-info.net/path-prediction.html>



Please find more details in the report itself

Accident Analysis extended

For more accurate assessment of motorcycle safety for the whole of Europe and the future improvement of rider safety with technology, CMC analysed motorcycle accidents in European countries, comparing them to previously analysed German accident data.

(The reason to start with German data initially, is that this database contains the most in-depth and extensive description of accidents).

Study setup

In detail, 2 levels of analysis were conducted:

- High-Level analyses, based on official accident statistics, like the EU CARE database and national statistics in Italy and France, in order to provide an initial estimate of the proportion of PTW accidents that can be addressed by connective safety systems.
- Detailed Analyses, based on IGLAD Data: The 5 most frequent accident types were further analysed for the included European countries, in order to find suitable use cases and find out if they have different characteristics or a different nature compared to those in Germany.

Key outcomes

Overall, we found that the main trends in the German data were also applicable to the whole of Europe.

Additionally, a range of interesting differences were discovered, for these details please check the full report:

<https://www.cmc-info.net/accidentology.html>



Please find more details in the report itself

Together for Rider Safety