OBJECTIVE VEHICLE DYNAMICS EVALUATION OF COMMERCIAL VEHICLES BY MEANS OF MODEL BASED PARAMETER IDENTIFICATION

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The objective evaluation of the dynamics and handling behaviour of commercial vehicles is an important task during their development. The presently used procedures are based on international standardisation and on company-specific testing procedures. Conventional test methods take place off-line, with partially large statistical spread and they are quite time consuming.

Newer approaches focus on the on-board identification of system properties. This procedure differs substantially from currently used methods. Especially for heavy commercial vehicles new evaluation methods and criteria have to be developed. Existing procedures are strongly based on subjective criteria, which often reflect the company philosophy. These approaches do not allow the identification of vehicle parameters and successful chassis improvement measures.

The idea of the present paper is to simplify and speed up the currently used complex objective vehicle dynamics evaluation process. Therefore the focus is on the application of new procedures to evaluate the vehicle dynamics of heavy commercial vehicles, which are already successful applied to measurement data of passenger cars [3, 4]. These methods enable the use of simple test manoeuvres instead of the common used complex and time consuming driving procedures, which require steering machines and large dynamic platforms. Thus, with simply and freely driven manoeuvres (e.g. sine- sweep, step input and double lane change) a sufficiently high accuracy and reproducibility can be achieved.

The method is applied to driving manoeuvres within the linear vehicle dynamics range; therefore a single track model is used. For the identification, the well known and fast least- squares algorithm is applied. The results of the vehicle dynamics evaluation program are the step-, frequency- and phase response of the vehicle, also vehicle parameters can be delivered. Especially the influence of the rolling behaviour and the mounting of the driver's cabin are discussed. A great advantage of the evaluation programme is the availability of identification method and the presentation of the outputs are already available in standard software codes.

Finally, the used method is shown by selected measurements of different manoeuvres. A quite good correlation between the measurements and a simulation with the identified vehicle parameters can be achieved; an example can be seen in Figure 1.

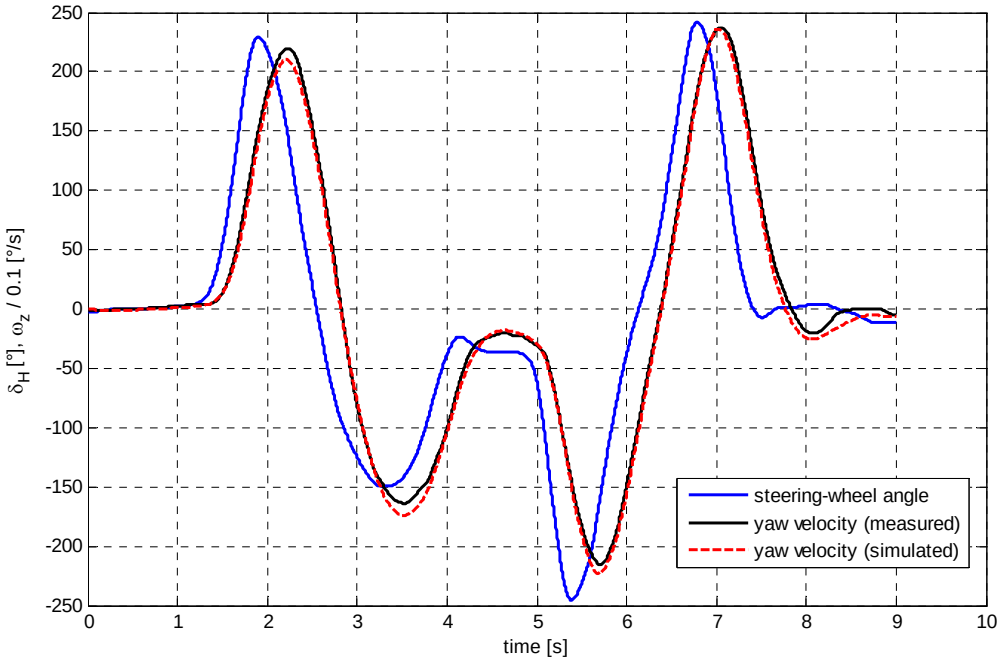

Figure 1 : Correlation between measured and simulated data

Literature and previous papers

[1] Kober W., Hirschberg W.: On-Board Payload Identification for Commercial Vehicles. Budapest: Proc. IEEE 3rd Conference on Mechatronics 2006

[2] Mitschke M., Wallentowitz H.: Dynamik der Kraftfahrzeuge. Berlin, Heidelberg: Springer Verlag 2004

[3] Prenninger K., Hirschberg W., Ecker J.: A novel Approach in Vehicle Dynamics Evaluation by means of System Identification. Budapest: 11th European Automotive Congress EAEC 2007

[4] Prenninger K., Hirschberg W., Volkwein S.: A novel Approach in Vehicle Dynamics Evaluation, Würzburg: VDI Tagung Erprobung und Simulation, 2007