

Vectorized single-track model in Modelica for articulated vehicles with arbitrary number of units and axles

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A single-track model for articulated vehicles has been implemented in Modelica. Model equations are vectorized which allows the model to represent articulated vehicles with arbitrary number of units and axles without rewriting or adding new equations. Non-linear kinematic constraints are defined for coupling points between units making the model valid for large articulation angles.

Four use cases for the model are presented: Inverse dynamics for feedforward control, frequency responses when varying parameters, steady-state evaluations and dynamic simulation. For these use cases, four parametrizations of the model are used corresponding to a tractor with a semitrailer, a truck with a dolly and a semitrailer, an A-double (tractor+semitrailer+dolly+semitrailer) and an airport baggage carrier with five trailers. Figure 1 shows results for three of the use cases.

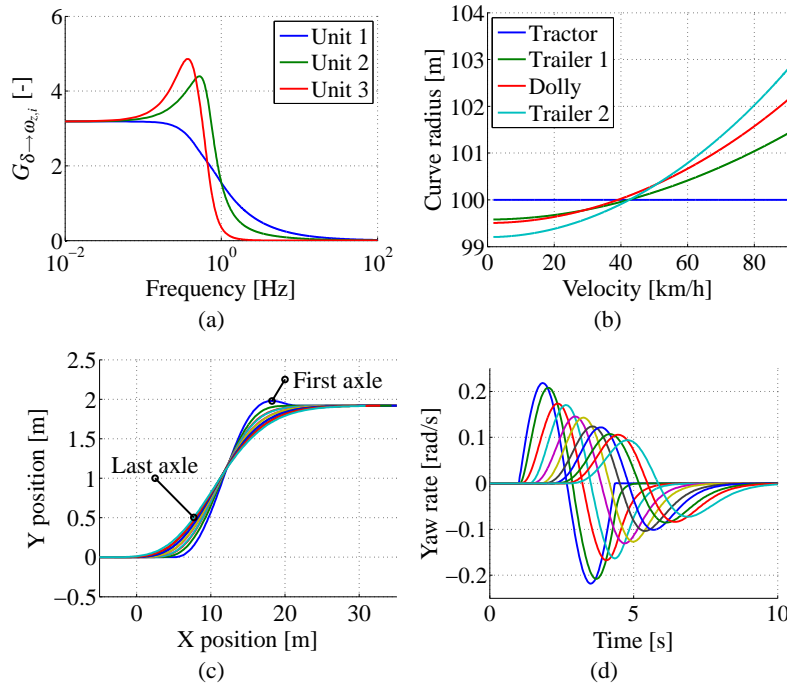


Figure 1: (a) Yaw rate frequency response of a three unit truck combination (b) Trailer steady-state off-tracking of a four unit truck combination (c) Axle positions of a five trailer vehicle in a lane change maneuver (d) Yaw rates of the 5 trailer vehicle in lane change maneuver