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Integrate a OpenXWD Powertrain Model in CM4SL and CarMaker Standalone

The user has the possibility to integrate his OpenXWD powertrain model as C-code, FMU, Simulink Plug-in model or directly in CM4SL. Today we want to share an example about how to integrate an OpenXWD Powertrain Model in CarMaker for Simulink by manipulating the corresponding UAQs and in CarMaker Standalone as Simulink Plug-in.

Technical Background

The powertrain model OpenXWD can be used to determine the distribution of drive torques on the wheels within a user specific model. In this case the drive source, such as motor, gearbox and drive line, is part of the user model. CarMaker takes care of the wheel rotation calculation. Some parameters are required for the initialization of the output variables in the interface struct tPowerTrainXWD_CfgIF. For our example we will use an OpenXWD powertrain model representing a front-wheel driven electric car with in-wheel motors.

Solution

1. Simulink Plug-in

Step 1:

Create a Simulink Plug-in Model with the model type “PowertrainXWD” under the src folder. Name the model MyPowerTrainXWD. About how to integrate Simulink Plug-in Model, please refer to the chapter “Integration of Simulink models with CarMaker’s Model Plug-in” in the Programmer’s Guide.

Insert the user specific Simulink OpenXWD powertrain model in the new created Simulink model. Here we will use a simple OpenXWD powertrain model like the following:

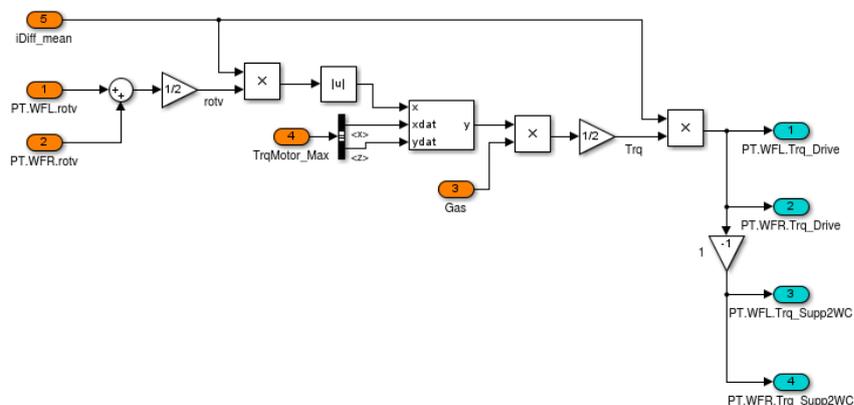


Fig. 1: User defined OpenXWD powertrain model to be integrated

The user OpenXWD powertrain model only outputs the driving torque at the front wheels and the driving torque support on the front wheel carriers. As inputs, the gas pedal position and the rotation speed of the front wheels are used.

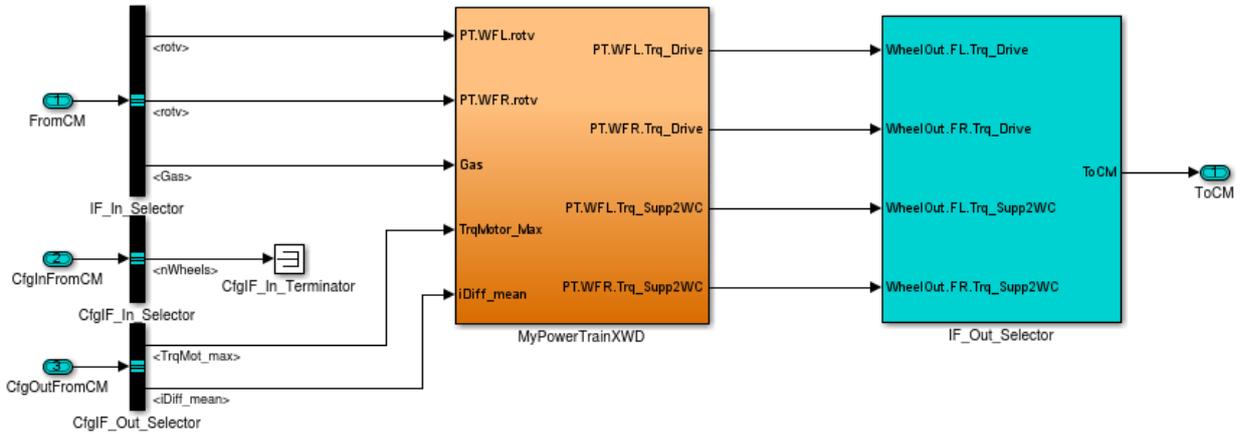


Fig. 2: Integration of the user defined OpenXWD powertrain model

Build a new CarMaker executable and select it under the Application Configuration in the CarMaker Standalone main GUI.

Step 2:

To activate the new OpenXWD powertrain model, go to the Powertrain tab in the vehicle data set dialog. Select *MyPowerTrainXWD* under the *Powertrain XWD*.

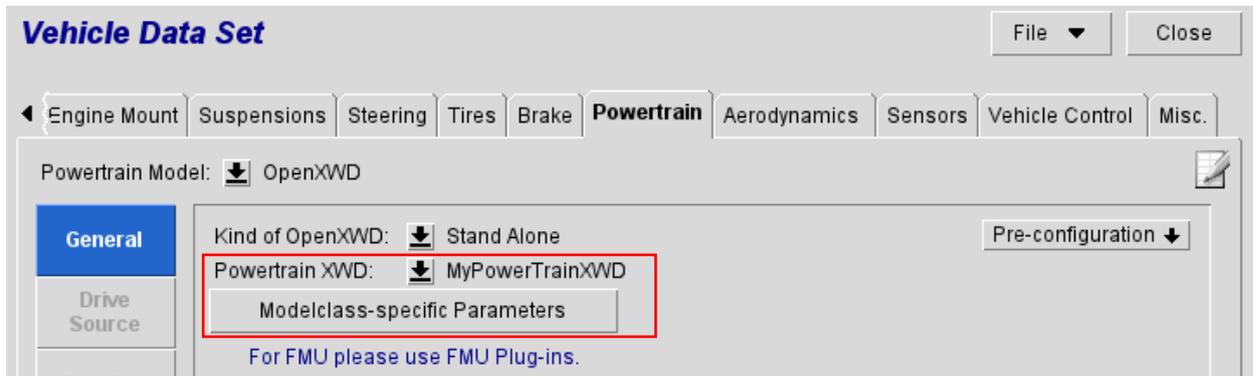


Fig. 3: Activation of the user defined OpenXWD powertrain in the vehicle data set

Open the dialog of “Modelclass-specific Parameters” and specify the parameters for the initialization function. Which parameters should be modified here, is depending on the kind of powertrain. For example, “BEV” should be set as the “PowerTrain.PTKind” for an electric car.

For the further information, please refer to the chapter “Powertrain model “OpenXWD”” in Reference Manual.

2. CarMaker for Simulink

Step 1:

Open the generic.mdl model under the src_cm4sl and insert the same user defined OpenXWD powertrain model “MyPowerTrainXWD” under the block CarMaker>>IPGVehicle>>PowerTrain. Assign the outputs to the corresponding UAQs such as “PT.WFL.Trq_Drive” and “PT.WFL.Trq_Supp2WC” with the *Write CM Dict* block. The inputs can be read with the *Read CM Dict*.

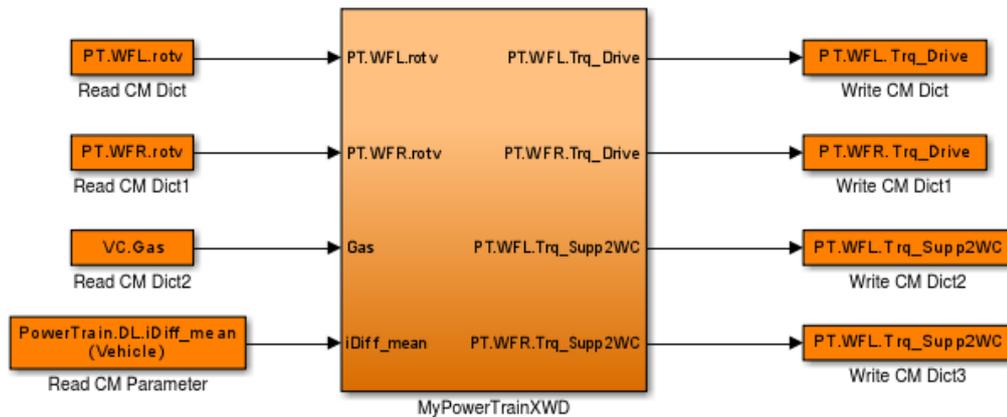


Fig. 4: Insert the user defined OpenXWD powertrain model

Step 2:

To activate the OpenXWD powertrain model under CarMaker for Simulink, go to the *Powertrain* Tab and select *None* as *Powertrain XWD*.

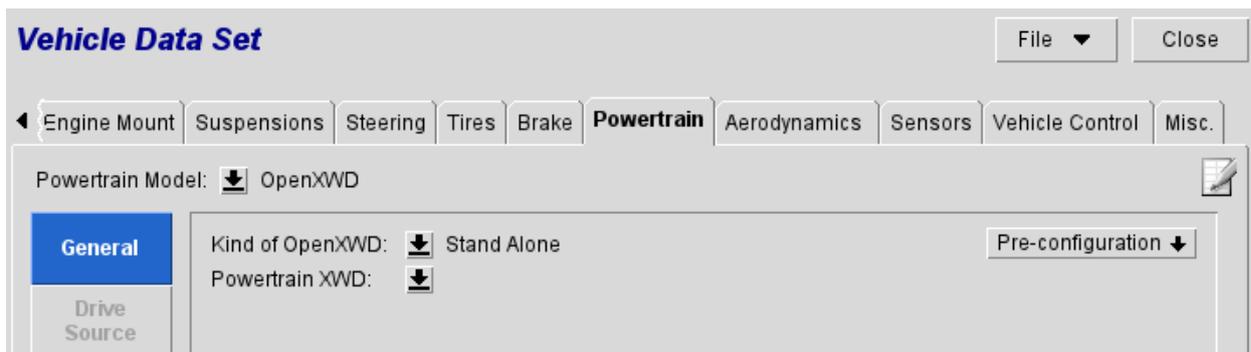


Fig. 5: Configuration for the OpenXWD powertrain model in vehicle data set

Step 3:

Specify the parameters for the initialization function as additional parameters under the *Misc* tab in the vehicle data set dialog.

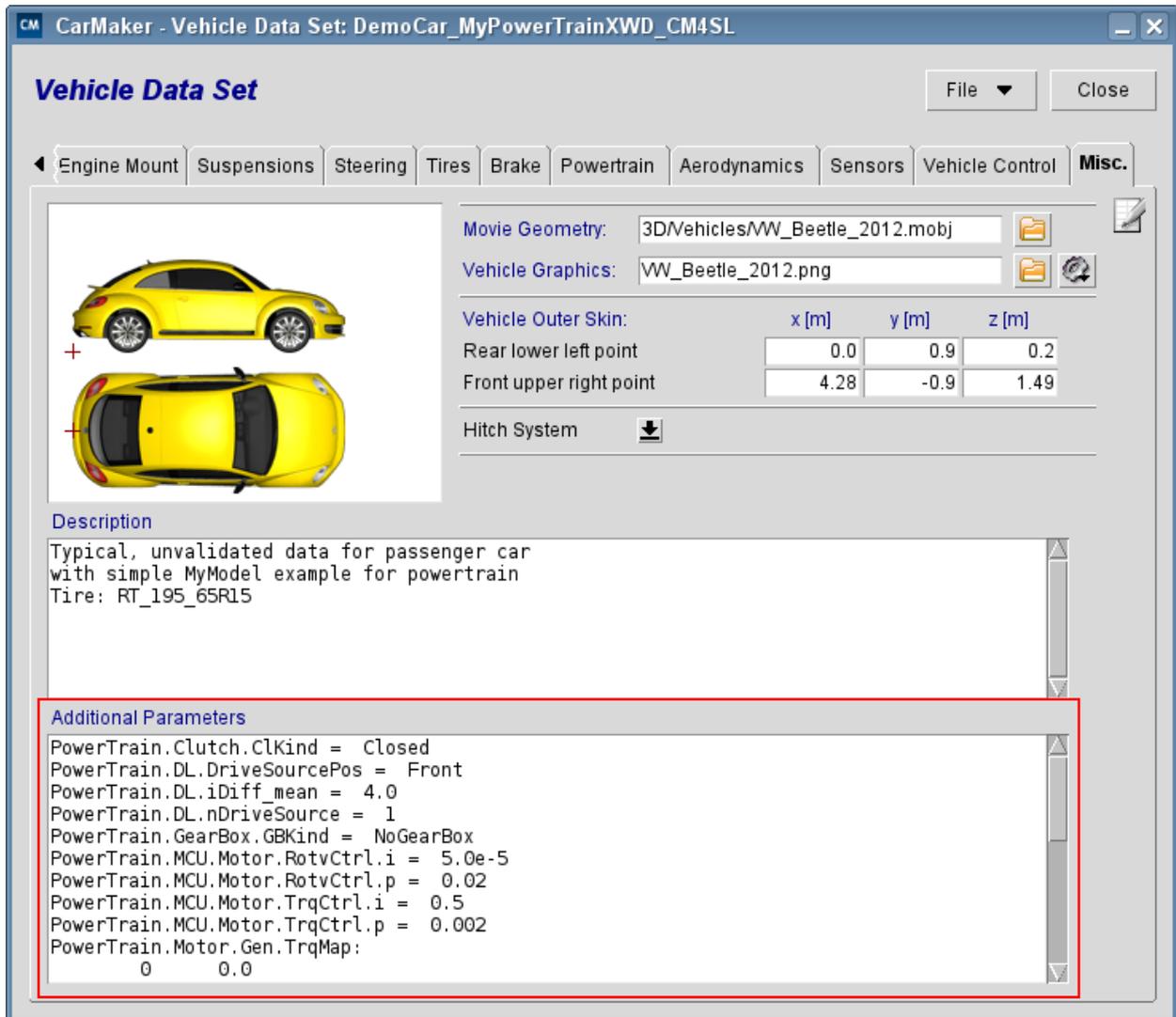


Fig. 6: Additional Parameters under the tab Misc

For the further information, please refer to the chapter "Powertrain model "OpenXWD"" in Reference Manual.