Manual

Introduction

This manual explains how to use the vehicle simulation program. The vehicle simulation program is able to design and evaluate two types of vehicles, i.e. a Battery Electric Vehicle (BEV) and a Fuel Cell Hybrid Electric Vehicle (FCHEV) due to a given driving cycle. The program calculates the mass, volume, energy, and cost of each component of the vehicles. The program is developed in Matlab/Simulink (version R2010b) and Matlab/Simulink is therefore also required in order to use the program.

Vehicles

In Figure 1 and Figure 2 the main components and variables of the BEV and FCHEV, respectively, can be seen.
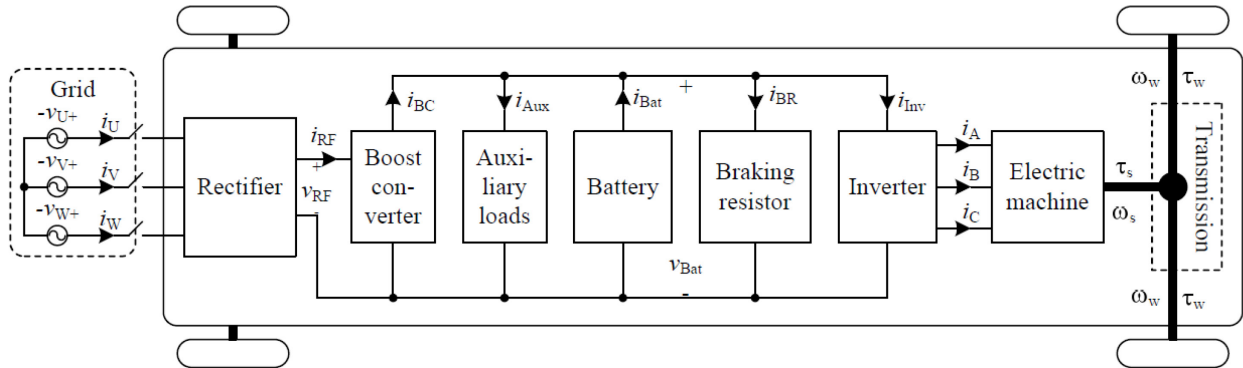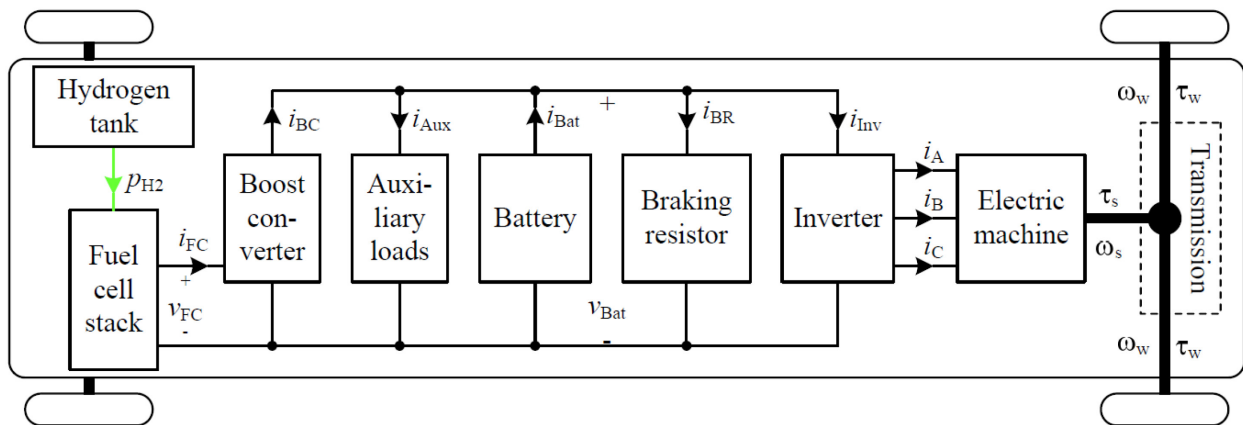

Figure 1: Main components of the BEV.

Figure 2: Main components of the FCHEV.

Driving Cycle

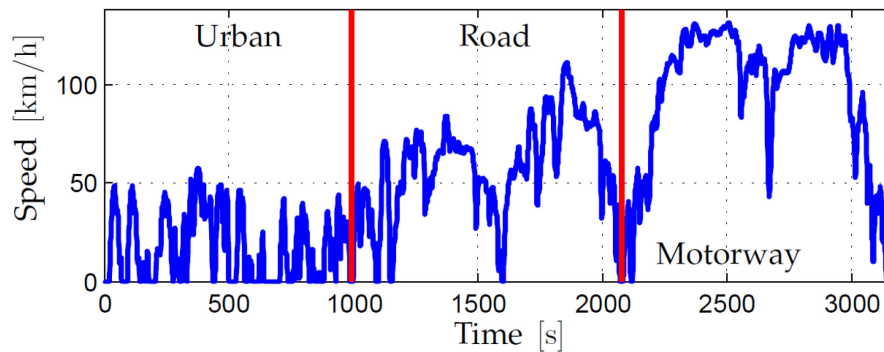The driving cycle used for the design and vehicle evaluation can be seen in Figure 3.

Figure 3: Used driving cycle for vehicle design and simulation.

Procedure

In order to run the program the files of the zip-file must be placed in the same directory as several of the different files are executed or used during the usage of the program. The procedure to run the program is:

1. Run the "simulation.m"-file either by typing "simulation" in the Matlab commando prompt or by open it and selecting "Debug"->"Run simulation.m" in the menu of the Editor.
2. The program is then asking about which vehicle to simulated, i.e. the BEV or FCHEV. Follow the instruction on the screen and press a number (1: BEV, 2: FCHEV, or 0: Exit) followed by Enter.
3. The base driving cycle is then plotted. The program is now asking about how many times the driving cycle should be repeated. Type a number followed by Enter. The base driving cycle has a length of app. 51 km, so if one types e.g. 3 the program will design the vehicle selected in step 2 to be able to handle 3 of the base driving cycles, i.e. 3 X 51 km = 153 km totally.
4. The program is now designing and simulating the vehicle. This can take some time (especially if many repetitions of the base driving cycles are selected), so please be patience. Executing the FCHEV with 10 repetitions of the base driving cycle takes app. 15 minutes (tested on a Lenovo ThinkPad T500). In order to stop the program while it is still calculating type "Ctrl+c".
5. The simulation program is now finishing calculating (unless it has been forced to stop). The key figures are displayed on the screen and the energy distribution of the vehicle is shown in a pie-chart. The key figures include the distribution of the mass, volume, energy, and cost of each component. The tank-to-wheel efficiency and energy per km are also displayed on the screen.
6. If one want to make a new simulation repeat step 1, 2 and 3. The results of the previous simulation can be cleared by typing "clc" in the Matlab commando prompt; otherwise they are still visible for easy comparison with the new simulation results. However, the pie-chart will be closed when a new simulation is executed, so it should be saved before the program is executed again (if the pie-chart is not needed it is of cause not necessary to save it). The Matlab workspace will also be cleared when the program is executed again.