Efficient calibration for AT, DCT and AMT

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Automatically shifting transmissions of different types (AT, AMT or DCT) are getting more and more popular on all operation markets. The enhancing customer acceptance results from the improved consumption characteristics and therefore from the reduced emission output on the one hand, from the improved driveability in connection with shifting quality and shifting strategic behaviour of the characteristic converter on the other. The immense capacity of modern automatic transmissions is, besides mechanical innovations (e.g. new planetary wheel set combinations), essentially based on the steadily increasing calibration of electronic systems. Relating to this, the complexity of the TCU is continuously enhancing for more than 20 years now, and so is the personal expenditure necessary for the development. Additionally, the increasing popularity of automatically shifting transmissions among customers also leads to more vehicle-engine-transmission-combinations offered by the manufacturers. The growing effort is synonymous to a raised employment of personnel, longer calibration periods and consequently with higher expenses.

The present state of the art with regard to the production application of transmission control devices is defined by road tests and the engineers' subjective evaluation of the shifting process as well as the measuring variables. The so-called calibration parameters (CP) of the different transmission ratios, shifting types and operating points responsible for the shifting process within the TCU are manually varied via an application laptop on the road.
With regards to this calibration area, highly efficient methods and tools for the automated calibration of transmissions are being developed by the Institute of Automotive Engineering (Technical University of Braunschweig).

These include:

1. the displacement of road tests on a test rig (roller dynamometer). Advantages: reproductive, more security, time efficient etc. Instead of a driver, a driving robotic is used.
2. an automatic analysis including an objective benchmark regarding sponaneity and comfort of every single gear shift.
3. the automated transmission calibration of the calibration parameters on the test rig. A previously defined test plan using control parameters and operating points is used to gather enough data to define computer based models (e.g. neural networks) . These models are being used to optimise the control parameters with regard to comfort and/or spontaneity of every single gear shift.

This speech will show the potential of the above described approach and the results the IAE has achieved during extensive tests.