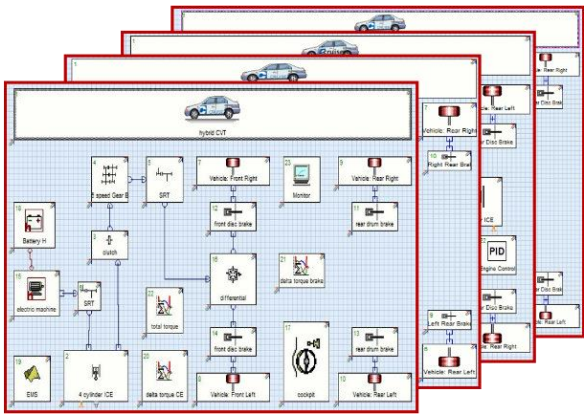
Development of a driver assistance embedded system that can be used in vehicles

During the development an embedded vehicle control hardware/software package (the so called “Smarty”) was prepared for pilot and demonstration purposes. Our aim was to establish vehicle/vehicle and vehicle/infrastructure communication environment using commercially available, motor-car industry grade components. As part of the intelligent traffic system, the applied vehicles and the installed units are equipped with GPS for precise positioning and a WLAN module permitting wireless communication by which the data of the GPS and other data having local relevance can be distributed.

The task to be solved is to provide that the vehicles follow each other and do not approach each other too close (i.e. keep a safe following distance), and to receive commands and warnings from the present units, such as driving direction, speed limit, acceleration limit, traffic light signals. For performing the task additional important information can be obtained from other sensors (e.g. accelerometer, rotation sensor), as well as from the CAN network of the vehicle (such as speed, throttle position, and engine revolution number). Our application written in ChibiOS/RT real time environment in “C” programming language is run on a STM32F4 processor (with ARM architecture), complemented by a program made in NET environment and run on a PC for diagnostic purposes.

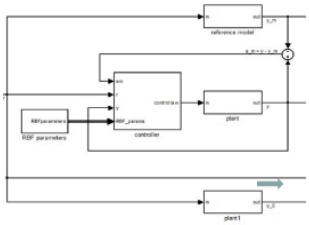
Analysing and controlling the drive trains of hybrid motor vehicles in order to minimize the emission

In accordance with the TÁMOP-4.2.2.A-11/1/KONV-2012-0012 tender our object was to analyse the drive trains of hybrid motor vehicles and to disclose and perform the potential optimization tasks in this context. During the research work several drive train and vehicle models were created in Cruise-AVL and Matlab/Simulink environment.

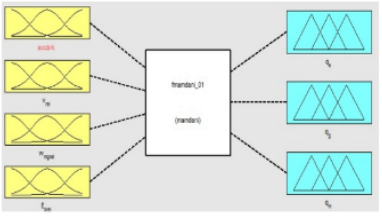


By analysing the parameter-sensitivity of the models we detected its nonlinear characteristics that proposed other questions regarding the optimal operation (e.g. minimal emission). The nonlinear controller providing the optimal function of the selected in-line hybrid drive train model can be viewed as the other major pillar of the project. Therefore, essentially four basis concepts were worked up and implemented: state machine, fuzzy logics, neural network, and polynomial structure developed by evolutionary algorithm. Based on our test results, combining these concepts in an appropriate way, an effective control mechanism was achieved, creating a complex controller with brand-new architecture.

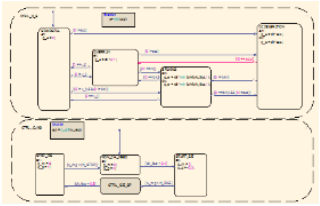
NEURALIS HÁLÓZAT



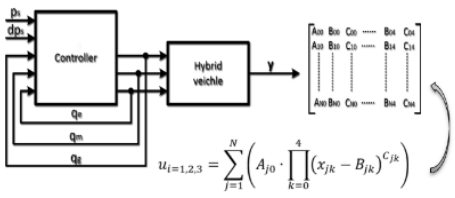
FUZZY LOGIKA



ÁLLAPOTGÉP

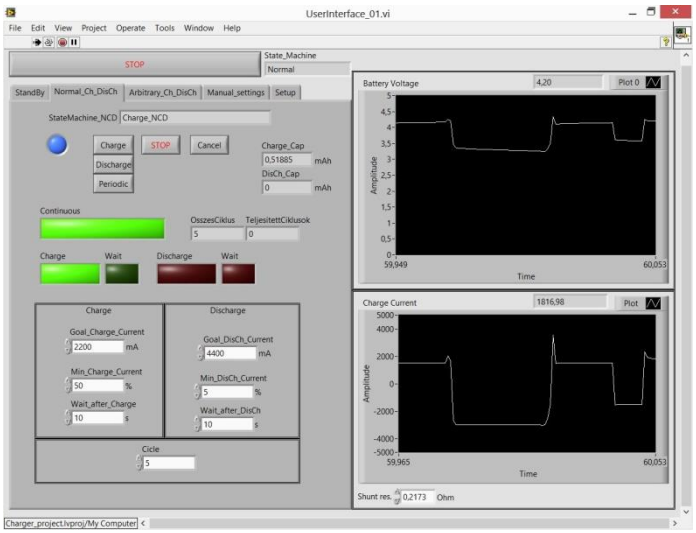


GENETIKUS ALGORITMUS



Development of a battery tester optimized for lithium-ion battery cells

A method and an apparatus have been developed for testing batteries by applying several charge/discharge cycles. The apparatus is primarily useful for testing single cell lithium-ion batteries. Single or multicell batteries are manufactured wholesale all over the world.



These batteries have wide applicability – they can be found almost everywhere from watches and entertainment electronic products to the safety-critical industrial applications. The high energy density and charging/discharging behaviour of these batteries in extreme conditions, as well as knowing their state of charge and overall condition (particularly in safety-critical applications) is very important aspects of their design and activation. In safety-critical applications it is essential to check the actual state of unknown or partly known, used batteries. For this reason, in order to know the application conditions of batteries, very accurate preliminary or operational tests have to be performed. Our aim was to develop a method and apparatus for analysing batteries that provides information about the characteristics of batteries for the developer or operator. The method covers the analysis of the operational safety conditions and provides fully documented test results for quality certification.