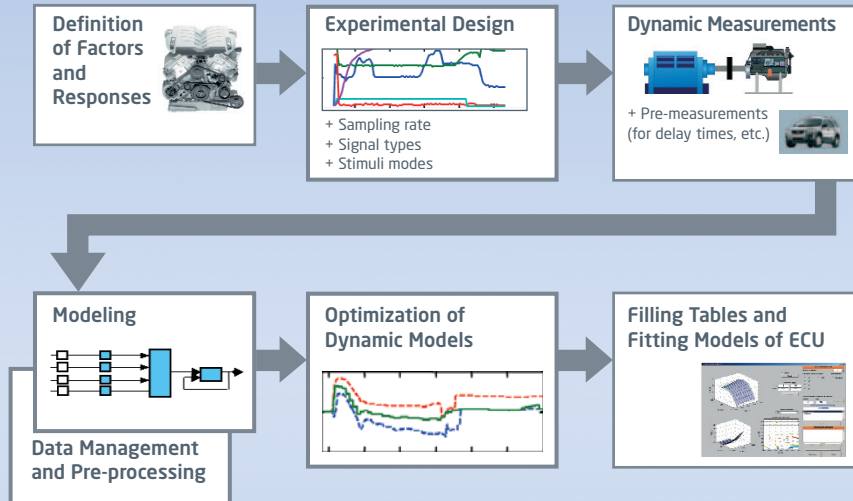


# DMT: Dynamic Modeling Toolbox

## MATLAB® based Toolbox for Dynamic Modeling Process



The Dynamic Modeling Toolbox (DMT) provides the software tools for modeling dynamic engine behavior.

### The Toolbox Contains

- ▶ Experiment Design Tool
- ▶ Data Management Tool
- ▶ Modeling Tool
- ▶ Optimization Tool

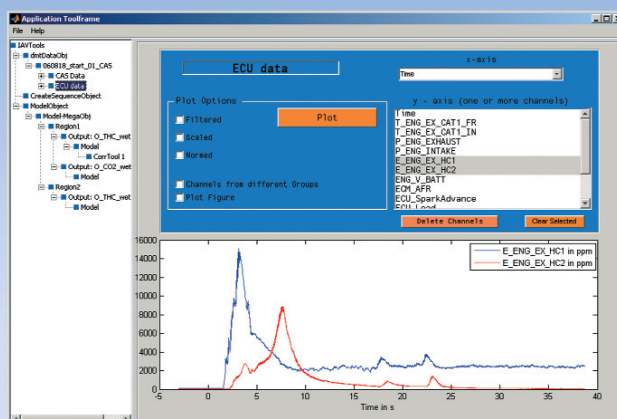
### Model-based Application Process for Dynamic Engine Behavior

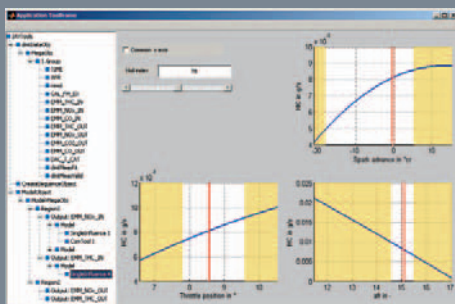
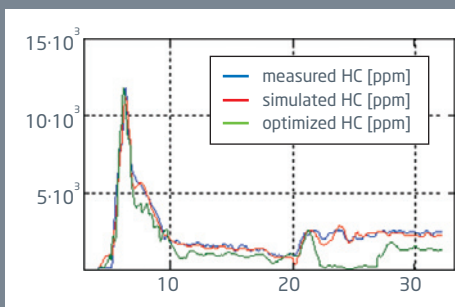
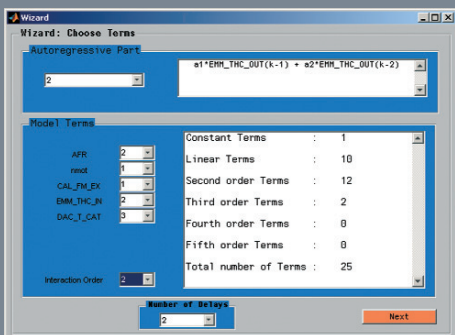
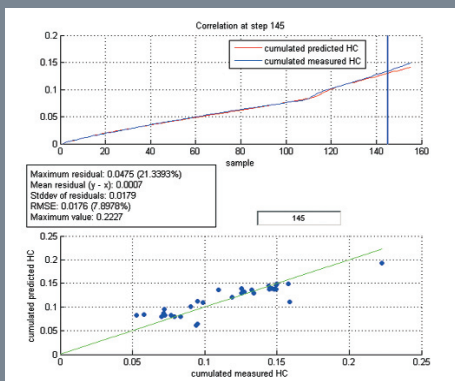
The model-based engine calibration process is an established method for steady state applications. For dynamic engine behavior a tool chain was lacking. The Dynamic Modeling Toolbox provides such a tool chain. The DMT contains modeling and optimization tools based on a promising model type, the Extended Parametric Volterra Series (EPV). In addition, the DMT provides experiment design and data management tools for measurement planning and analysis. User-defined models and optimization methods can be integrated into the toolbox as well.

The DMT contains a Graphical User Interface (GUI) that enables easy access to the main functions of the toolbox. For data management, the GUI allows easy input of the dynamic data, provides data access tools and plots data either quickly or produces enhanced plots. A wizard is included for modeling EPV and the GUI provides access to the completed models and their visualization. Optimization tools provide set up and execution of optimization objectives.

### Data Management Tool

- ▶ Loads several file formats
- ▶ Exports to MATLAB®, ASCII or Excel
- ▶ Quick visualization of data
- ▶ All data and additional information in one file
- ▶ Data-preprocessing:
  - Resampling
  - Filter
  - Synchronization of several measurement devices
  - Concatenation of measurements for model fitting





### Modeling Tool

This tool creates dynamic models using EPV and allows user-defined dynamic models to be integrated as well.

Features:

- ▶ Model Fitting
- ▶ Model Validation
- ▶ Correlation Tool
- ▶ Single Influence Tool

A wizard guides the user through the process of defining and fitting Extended Parametric Volterra Series.

### Optimization Tool

With the Optimization Tool you can

- ▶ Define an optimization target, including Pareto optimization criteria
- ▶ Define constraints for inputs
- ▶ Set non-linear constraints using models
- ▶ Set initial values

For optimizing EPV models, an optimization algorithm called 'Dynamic Programming' is implemented. User defined optimization algorithms can be integrated into the tool as well.

The DMT can be used as a base for demanding modeling tasks. All functions of the DMT can be used within MATLAB® programs. For example, data preprocessing and checking can be automated using DMT and MATLAB® scripts.

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