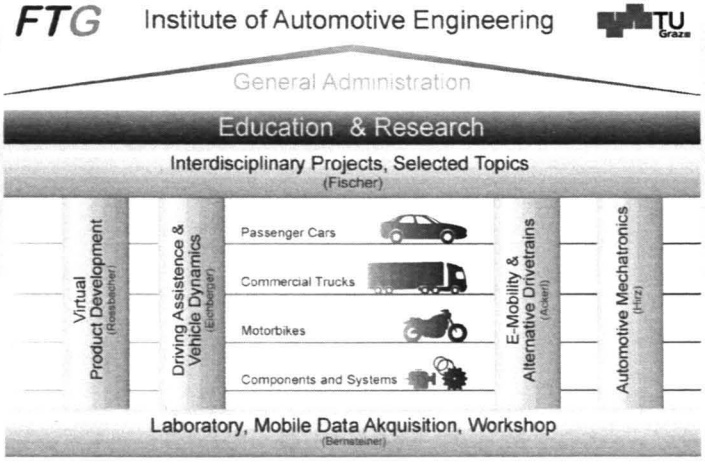
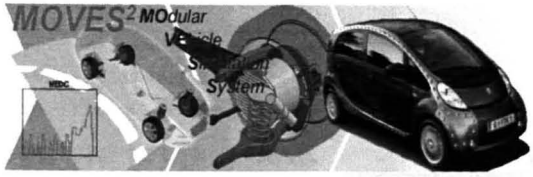
Research area of E-Mobility and

The Institute of Automotive Engineering belongs to the Frank Stronach Institute (FSI). It was founded at the University of Technology in Graz in 2003. Head of the Institute is Univ.-Prof. DI Dr. techn. Peter Fischer.

The Institute of Automotive Engineering consists of four main research areas and a laboratory. These research areas work on the component level up to the complete vehicle level (passenger cars, motorbikes and trucks) and are divided in

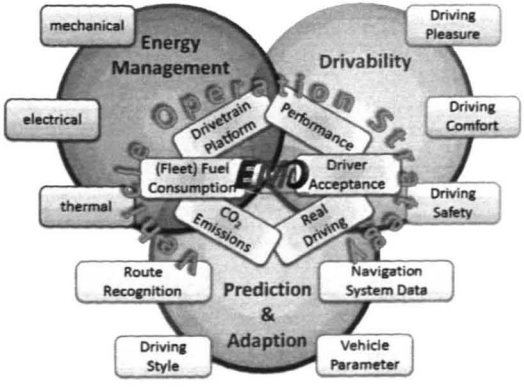
- Automotive Mechatronics,
- Driver Assistance and Vehicle Dynamics,
- E-Mobility and Alternative Drivetrains,
- Virtual Product Development.





E-Mobility and Alternative Drivetrains

E-Mobility and Alternative Drivetrains is a research group at the Institute of Automotive Engineering of the Frank Stronach Institute (FSI) at the Graz University of Technology. The main research topics are holistic energy management, system design, real driving and drivability of alternative and complex drivetrains. This widespread research area implies complete vehicle and component knowledge. Besides propulsion systems such as internal combustion engines and/or electric motors there are many different energy consumers that have to be considered in vehicle's energy balance. Especially for all-electric and plug-in hybrid electric vehicles, consumers such as heater or A/C compressor extremely affect the overall driving range and thus influencing driving comfort.



Research activities at the EMD research group deal with:

- Virtual Development Methodology (CAE)
- Vehicle and Drivetrain Modelling
- Vehicle Operation Strategies
- Prediction and Adaption Algorithms
- Energy Management
- Drivability
- Emissions / Fuel Consumption
- Multi-Domain Co-Simulation
- System design
- Drivetrain Platform development
- Multi-Domain Co-Optimization
- Experimental Development Methods
- Implementation in Prototype Vehicles
- In-vehicle Testing
- Benchmark and Measurement
- Real-Time Capable Implementation of Algorithms

The research area of E-Mobility deals with the design and optimization of all-electric- and hybrid-vehicles of various topologies with special concern on the development of intelligent vehicle operation strategies.

Research area of E-Mobility and alternative drivetrains EMD

These supervisory control algorithms are developed and adapted for different application as they may occur in passenger and commercial vehicles, respectively. Apart from energy efficient components, effects of the operation strategies on alternative propulsion systems and drivability are analysed in detail. This comprises series, parallel, power-split, combined, plug-in hybrid electric, all-electric vehicles and range extender applications. The modular operation strategies concurrently enable outstanding fuel savings while enhancing driving pleasure by using customized optimization algorithms.

Predictive and Adaptive Energy Management for Fuel Consumption Reduction & Drivability Improvement

Research projects of E-Mobility and Alternative Drivetrains develop holistic vehicle energy management controller based on prediction of future driving states and adaption to the individual driver's behaviour. Such prediction algorithms also require knowledge about the vehicle itself. Hence, vehicle parameters are also observed and adapted for better power demand prediction until the end of the route going to be driven. Prediction algorithms provide vehicles with information about the upcoming height and velocity profile. This rough information must be adapted to the individual driving style, driving environment and changing vehicle parameters. This additional dynamic data improves the prediction quality by providing more detailed information of the route ahead. The vehicle parameter directly influences the prediction quality because they are arise from losses and resistances. Such prediction and adaption algorithms in energy management strategies of plug-in hybrid vehicles have the potential to save about 15% of fossil fuel compared to conventional (state-of-the-art) operation strategies algorithms. Furthermore, the approximated future information is used for thermal management and demanded auxiliary control to reduce CO2-emission.

If you are interested in this novel methods please contact Martin Ackerl martin.ackerl@tugraz.at, employee of the Institute of Automotive Engineering and responsible for the research group E-Mobility and Alternative Drivetrains.