## Development of a Novel Three-dimensional Active Suspension System for a Railway Vehicle

## Abstract of the Ph.D. thesis by Dipl.-Ing. Philipp Schlautmann

Since 1997, the research initiative "Neue Bahntechnik Paderborn (New Railway Technology Paderborn)" has been working on the "RailCab" system. This system combines opposing system properties of railway and road traffic by providing individual traffic on rails. For this purpose a multitude of small shuttles are projected to travel along the conventional rail network, on demand and without a stop between start and destination.

This thesis describes the development of a novel **three-dimensional active suspension system** in an underfloor construction for the shuttles of the RailCab system. The mechatronic design process is presented, from the first conception to the tests on an HIL testbed. A consistent structuring, applied to the engineering design as well as to the architecture of the control and the information processing, is proved to allow an extremely efficient development of highly complex systems.

For the active suspension, an innovative **three-dimensional distance sensor** and a novel **GRP spring** were engineered in the process. Design and testing of these components are also presented.

The testbed checks have proved the new active 3-D suspension system to function properly. Components can be exchanged for others that follow entirely different solution principles (e.g., replacement of an airspring with a GRP spring) only by means of a function-oriented modularisation. The exchangeability of function modules is thus supported by the function-oriented design of mechatronic systems.