# Einladung zu Vorträgen

UNIVERSITÄT DES SAARLANDES

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## Equivalence groups of underdetermined equations

**Prof. Dr. Victor Lehenkyi**

We consider the so-called "equivalence groups" admitted by underdetermined systems of differential equations. We study their role in the analysis of control systems and nonholonomic systems. Specifically, we study techniques of calculating the equivalence algebra and geometric aspects of the infinitesimal method in the problem of group classification. We also develop the technique of group foliation for constructing classes of equations admitting infinite-dimensional subalgebras of the main equivalence algebra. For some nonlinear second and third order control systems we demonstrate the utilization of equivalence algebras in solving optimal problems and building "recursive" control systems.

## Examples of invariant tracking control for the kinematic car: planar and spherical case

**Dipl.-Ing. Carsten Collon**

The design of invariant control laws for the kinematic car driving in a plane and on a sphere is discussed. In the planar case, geometric considerations yield an invariant tracking error given by a contouring error and a perpendicular distance w.r.t. the reference trajectory. Due to the symmetry of the model equations, i.e. the invariance w.r.t. the action of elements of SE(2), the model can also be stated in a coordinate-free fashion as a left-invariant system on SE(2).
Using the Lie group framework, the motion of the kinematic car on a sphere embedded in Euclidean space can be described by a left-invariant system on SO(3). Further, the design of an invariant tracking control can be carried out by exploiting the Lie group structure of the problem.
Finally, numerical integration schemes making use of the Lie group properties complete the picture.

**Alle Interessenten sind herzlich eingeladen.**

**Univ.-Prof. Dr.-Ing. habil. J. Rudolph**