Robust Control of chained systems
Project #: AA1

The problem of robust stabilization (in the presence of input and measurement noise) of a class of systemswith velocity constraints (modeling for example mobile robots) is studied. This project will study the problem of designing hybrid output feedback control laws achieving robust stabilization. This is the continuation of a past project, in which state feedback control laws were designed.

A modified Branin method
Project #: AA2

The problem of global minimization of continuous functions is studied. Goal of the project is to design a modified Branin algorithm, generating sequences which converge (in finite time) to a stationary point of the function to be minimized.
The properties of the modified algorithm will be studied by means of Lyapunov theory, and the performance will be evaluated via application of the algorithm to well-known test functions.

Destabilizing friction
Project #: AA3
It is in general assumed that the presence of frictionin a mechanical system simplifies the stabilization task. However, it is possible to show that, under particular circumstances, friction may have a destabilizing effect. Goal of the project is to assess the role of friction in controlled mechanical systems and to design control laws which are robust against the presence of (small) friction terms.

Integer programming
Project #: AA4
The problem of optimizing a function depending on variables which can only assume integer values is considered.
Goal of the project is to design software implementing classical optimization procedures, to develop novel optimization algorithms and to test the proposed algorithm on practical case studies, such as resources assignment problems and data flow optimization.

Nonlinear discrete-time IDA-PBC
Project #: AA5
Nonlinear discrete-time IDA-PBC
We consider the problem of controllling nonlinear systems in a sampled-data setting, and exploiting the so-called Interconection and Damping Assignment PassivityBased Control (IDA-PBC) approach. Applications of the theoretical results to electro-mechanical systems, such as power converters and electrical machines, will be considered.

A Toolkit for planar constrained optimization
Project #: AA6
Goal of this project is to design a general purpose graphical interface based on Matlab) to illustrate the basic principles, oncepts and algorithms of constrainedoptimization in the plane.

Convex/concave programming
Project #: AA7
The problem of minimizing a concave function on a convex set is studied.
Goal of the project is to develop optimization algorithms yielding global convergence to the optimal solution.

Adaptive repetitive control
Project #: AA8
Repetitive control is used to design control laws able to asymptotically track (reject) periodic reference signals (disturbances).
Classical repetitive control schemes require a precise knowledge of the period of such periodic signals. Goal of this project is to relax this assumption and to design adaptive repetitive control schemes, i.e. schemes which are able to identify the period of the signals to track (reject), while achieving asymptotic tracking (rejection).