Open Thesis Topic

Practical Stability

Description:
Lyapunov Stability is a well known concept in control theory. However, there is a class of systems, which are not stable in the sense of Lyapunov but show a similar qualitative behavior. They are characterized by the fact that the vector fields of these systems depend on a parameter $\epsilon$, i.e., $\dot{x} = f(t, x, \epsilon)$. The system is said to be \textit{practically stable} if the neighborhood of the origin where the trajectories converge to, can be made arbitrarily small by decreasing the parameter $\epsilon$. Therefore, the system is Lyapunov stable only for $\epsilon \to 0$. One can think of $\frac{1}{\epsilon}$ as, e.g., the frequency of sinusoidal perturbations. In the current literature, there are various definitions for \textit{practical stability}. The goal of this project is twofold. First, a survey of the different definitions of \textit{practical stability} has to be given. Second, similar as for Lyapunov Stability, one can define \textit{practical stability} in terms of an $(\epsilon, \delta)$-definition but as well as in terms of $\mathcal{KL}$-functions. It should be examined in how far these definitions are equivalent and which statements can be made and proven.

Prerequisites:

- Courses (helpful but not mandatory): \textit{Konzepte der Regelungstechnik, Nonlinear Control}
- Interested in theoretical and mathematical work.

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Area:

Nonlinear Systems
Stability Theory

Properties:

Type: BA, SA

Beginning:

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Weitere Informationen: www.ist.uni-stuttgart.de/education/sada

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