

nonlinear control systems

lecturers

Prof. dr. B. Jayawardhana, University of Groningen
Dr. B. Besselink, University of Groningen

objective

The course aims at introducing basic properties of nonlinear systems, fundamental stability notions in nonlinear systems and a set of self-contained results on the control design of nonlinear systems.

contents

Lecture 1 (Introduction to nonlinear systems). During this lecture, the students will be given examples on nonlinear systems, and several fundamental properties and stability notions of nonlinear systems will be introduced.

References

H. Khalil, *Nonlinear Systems*, 3rd edition, Prentice Hall, 2002, Chapter 1, 2, and 3.

Lecture 2 (Lyapunov stability). The students will learn Lyapunov converse theorem and characterization of input-to-state stability notion.

References

H. Khalil, *Nonlinear Systems*, 3rd edition, Prentice Hall, 2002, Section 4.7 – 4.9.
E.D. Sontag, "Input to state stability: basic concepts and results," P. Nistri & G. Stefani (eds.), *Nonlinear and Optimal Control Theory*, pp. 163-220, Springer-Verlag, Berlin, 2006.

Lecture 3 (Feedback linearization). In this lecture, the students will be introduced to the concept of relative-degree and normal forms. The application of these notions to feedback linearization and for control design will be given.

References

H. Khalil, *Nonlinear Systems*, 3rd edition, Prentice Hall, 2002, Chapter 13.

Lecture 4 (Nonlinear control design). During this lecture, the students will learn the backstepping control design approach.

References

H. Khalil, *Nonlinear Systems*, 3rd edition, Prentice Hall, 2002, Section 14.3.

course materials

The lecture notes will be distributed during the course.

prerequisites

The students are expected to be familiar with ordinary differential equations,

linear control systems and linear algebra.

homework assignments

A set of homework assignments will be distributed at the end of each lecture.