Nonlinear Control Systems
Exam

The exam for the Nonlinear Control Systems course will be a 20 minutes oral exam. It will consists of two parts: In the first part (approximately 10 minutes) you will be asked to solve (on the blackboard) or discuss/explain one of questions 6, 7 or 8 below. In the second part (approximately 10 minutes) you will be asked to solve (on the blackboard) or discuss/explain one of questions 1, 2, 3, 4 or 5 below (for 3,4 and 5 you may use examples to explain the concepts).

1) 4.16 page 184 in [Kha00].
2) 13.2 on page 544 in [Kha00].
3) Discuss modeling of LPV systems: polytopic, LFT, and descriptor.
4) Discuss when an LPV system is quadratic and robustly stable. How to verify stability with LMIs
5) Discuss a gain-scheduled state-feedback for LPV systems (for quadratic and robust stability)
6) EKF/UKF

   What is the theoretical foundation for EKF/UKF ?

   When is this estimation methods needed ?

   What are the differences in theory and practice ?
7) Model uncertainty

   How can a model be validated ?

   If the model is not acceptable/validated what approaches can be used ?
8) PF

   What is the differences between PF and EKF/UKF from a theory/methodology point of view ?

   What is the differences between PF and EKF/UKF from a application/practice point of view ?

References

[Kha00] Hassan K. Khalil. *Nonlinear Systems*. Prentice-Hall. Inc., 2000.