Course Announcement

MATH 710 A Optimization and Control of Nonsmooth Systems

Spring 2010

Instructor: Jinglai Shen

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Lectures Mondays and Wednesdays, 2:30–3:45 pm

Prerequisites Basic knowledge in multivariable calculus, convex analysis, optimization, and ODE or dynamical systems

Course Description Many optimization and control problems have inherent nonsmooth features, for which the conventional differentiability assumptions fail. The last several decades have witnessed a fast growing interest in developing nonsmooth techniques for optimization and control. These techniques play an increasingly important role in various fields of applied math and lead to powerful analytic and numerical tools. This course aims at a solid introduction to nonsmooth analysis and its applications in optimization and control theory. Potential topics to be covered include: generalized gradients (including generalized directional derivatives and sub-differentials), generalized Jacobians and their calculus, tangent and normal cones, semismooth functions, applications to convex and constrained optimization, applications to differential inclusions, constrained optimal control, and stability theory.

Homework and Project Homework will be assigned every two or three weeks. (*There will be no exam.*) Each participant must select a course-relevant topic, carry out a course project due at the end of the term, and present his/her work in class.

Grading Policy The grading scheme is as follows:

- 50% homework   • 45% project   • 5% class participation and involvement

Major References

1. F.H. Clarke. *Optimization and Nonsmooth Analysis*, Classics in applied mathematics, No.5, SIAM press, 1990.

2. F.H. Clarke, Y.S. Ledyaev, R.J. Stern, and P.R. Wolenski. *Nonsmooth Analysis and Control Theory*, GTM 178, Springer-Verlag, 1998.

3. G.V. Smirnov. *Introduction to the Theory of Differential Inclusions*, Graduate Studies in Mathematics, Vol.41, American Math Society, Providence, 2002.