Proposed Course

on

Differential Inclusions

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This course will cover the basic theory of Differential Inclusions (DI) and is roughly broken into three parts. We shall begin with a short overview of ODEs and introduce some basic concepts of Nonsmooth Analysis and control theory. The middle of the course will cover the basic theory of (DI), and will provide the necessary background to read recent research papers. The final part of the course will involve special topics and discuss current research directions. An outline (perhaps overly ambitious) of the specific topics follows.

I. Introduction

- A. Review of classical ODE theory.
- B. Control systems.
- C. Differential inclusions and the Filippov lemma.
- D. Basic concepts of set-valued and nonsmooth analysis.

II. Basic theory

- A. Assumptions; Existence theory.
- B. Compactness of Trajectories and the Approximation Theorem.
- C. Aumann's Theorem, Relaxation, and Bang-Bang theorem.
- D. Time discretization.
- E. The Min Time and Mayer variational problems.
- F. The maximum principle.
- G. Flow invariance and Hamilton-Jacobi theory.

III Special topics

- A. Impulsive systems.
- B. One-sided Lipschitz hypotheses.
- C. Stratified systems.
- D. Systems with time-delay.
- E. Fully convex control.