

Periodic orbits of piecewise smooth (PWS) systems under discretization, and event techniques for PWS systems

Luca Dieci¹, Timo Eirola², Cinzia Elia³ and Luciano Lopez³

¹ *School of Mathematics, Georgia Tech, Atlanta USA. dieci@math.gatech.edu*

² †, ³ *Dip. Matematica, Università di Bari, Bari, ITALY.*

In the first part of this talk, we consider the Euler discretization with fixed stepsize of a planar discontinuous system having an attracting periodic orbit. We show that, in general, the resulting discrete dynamical system does not possess an invariant curve, unlike what happens for smooth problems. Still, we show that the discrete trajectories are forced to remain inside a band, whose width is proportional to the stepsize. We further show that by forcing the numerical solution to step exactly on the discontinuity line, then there is a discrete periodic solution near the one of the original problem. After this, we consider so-called “event driven” techniques and propose a family of explicit Runge-Kutta techniques which approach the discontinuity surface from one side.