Publ. Mat. (2014), 111–134
Proceedings of *New Trends in Dynamical Systems.* Salou, 2012.
DOI: 10.5565/PUBLMAT_Extra14_06

GEOMETRIC SINGULAR PERTURBATION THEORY FOR NON-SMOOTH DYNAMICAL SYSTEMS

Pedro T. Cardin, Paulo R. da Silva, and Marco A. Teixeira

Abstract: In this article we deal with singularly perturbed Filippov systems Z_ε:

$$\dot{x} = \begin{cases} F(x,y,\varepsilon) & \text{if } h(x,y,\varepsilon) \leq 0, \\ G(x,y,\varepsilon) & \text{if } h(x,y,\varepsilon) \geq 0, \end{cases} \qquad \varepsilon\dot{y} = H(x,y,\varepsilon), \tag{1}$$

where $\varepsilon \in \mathbb{R}$ is a small parameter, $x \in \mathbb{R}^n$, $n \geq 2$, and $y \in \mathbb{R}$ denote the slow and fast variables, respectively, and F, G, h, and H are smooth maps. We study the effect of singular perturbations at typical singularities of Z_0. Special attention will be dedicated to those points satisfying $q \in \{h(x,y,0)=0\} \cap \{H(x,y,0)=0\}$ where F or G is tangent to $\{h(x,y,0)=0\}$. The persistence and the stability properties of those objects are investigated.

2010 Mathematics Subject Classification: Primary: 34C20, 34C26, 34D15, 34H05.

Key words: Filippov systems, singular perturbation, tangency points.