"LIMIT SOLUTIONS" FOR CONTROL SYSTEMS

M.- SOLEDAD ARONNA AND FRANCO RAMPazzo

ABSTRACT. For a control Cauchy problem
\[ \dot{x} = f(t,x,u,v) + \sum_{\alpha=1}^{m} g_\alpha(x) \dot{u}_\alpha, \quad x(a) = \bar{x}, \]
on an interval \([a,b]\), we propose a notion of limit solution \(x\) that verifies the following properties: i) \(x\) is defined for \(L^1\) (impulsive) inputs \(u\) and for standard, bounded measurable, controls \(v\); ii) in the commutative case (i.e. when \([g_\alpha, g_\beta] \equiv 0\), for all \(\alpha, \beta = 1, \ldots, m\), \(x\) coincides with the solution constructed via multiple fields’ rectification; iii) \(x\) subsumes former concepts of solution valid for the generic, noncommutative case. In particular, when \(u\) has bounded variation, we investigate the relation between limit solutions and (single-valued) graph completion solutions. Furthermore, we prove consistency with the classical Carathéodory solution when \(u\) and \(x\) are absolutely continuous. Some generalizations are under investigation, e.g. to the case where the dynamics is polynomial in \(\dot{u}\).

M.S. Aronna, Rosario, Argentina
E-mail address: aronna@cmap.polytechnique.fr

F. Rampazzo, Dipartimento di Matematica, Università di Padova, Padova 35121, Italy
E-mail address: rampazzo@math.unipd.it