

Chattering variational limits of control systems[†]

Zvi Artstein*

(Communicated by Héctor J. Sussmann)

Abstract. Variational convergence is developed for optimal control problems depending on time-varying parameters. Systems with chattering parameters serve then as variational limits when the parameters are rapidly oscillating. Continuity of the value, robustness of controls and continuous dependence of optimal controls are examined.

1991 Mathematics Subject Classification: 49J45, 49N99.

1. Introduction

This paper addresses the variational convergence problem of optimal control systems. The form we choose to work with is a minimization problem with constraint equation depending on a time-varying parameter. The variational convergence of this parameter function is sought. Namely, we consider a family of control systems

$$\begin{aligned}
 & \text{minimize} && \int_a^b Q(x, u, t, \varrho(t)) dt \\
 (\mathcal{C}_\varrho) & \text{subject to} && \frac{dx}{dt} = f(x, u, t, \varrho(t)) dt \\
 & && x(a) = x_0.
 \end{aligned}$$

Each element in the family is determined by a parameter function $\varrho = \varrho(\cdot)$. We seek a convergence notion for the collection of parameter functions such that: (i) the cost functional with a fixed control depends continuously on ϱ , and (ii) the value of (\mathcal{C}_ϱ) vary continuously with ϱ .

[†] Research supported by a grant from the Basic Research Fund,
The Israel Academy of Science and Humanities.

* Incumbent of the Hettie H. Heineman Professorial Chair in Mathematics.