On Some Composite Multiple-Cost Models and Associated Vector Inequalities

Savin Treanta
National University of Science and Technology POLITEHNICA Bucharest, Bucharest, Romania

Cristina-Mihaela Cebuc
National University of Science and Technology POLITEHNICA Bucharest, Bucharest, Romania

Abstract

This paper investigates a distinctive family of (weak) composite controlled variational inequality models of vector type, contextualized within the domain of vector control. We establish its intrinsic relationships with the composite multiple objective variational control problem, shedding light on the intricate dynamics of control systems. An exploration of the connections between a critical or (weak) efficient point in the composite vector optimization problem and a solution of the associated composite vector controlled variational-like inequality is undertaken, guided by the assumption of composite (strictly) invariant convexity and/or pseudo invariant convexity of the involved functionals. By using the KKM lemma, a result on the existence of solutions for the composite controlled variational inequality problem is stated. Additionally, a gap functional is defined specifically for the composite controlled variational inequality problem, providing a valuable tool for understanding the nuances of control scenarios. The significance of our findings is exemplified through illustrative examples, offering concrete insights into applying the derived results in vector control scenarios.