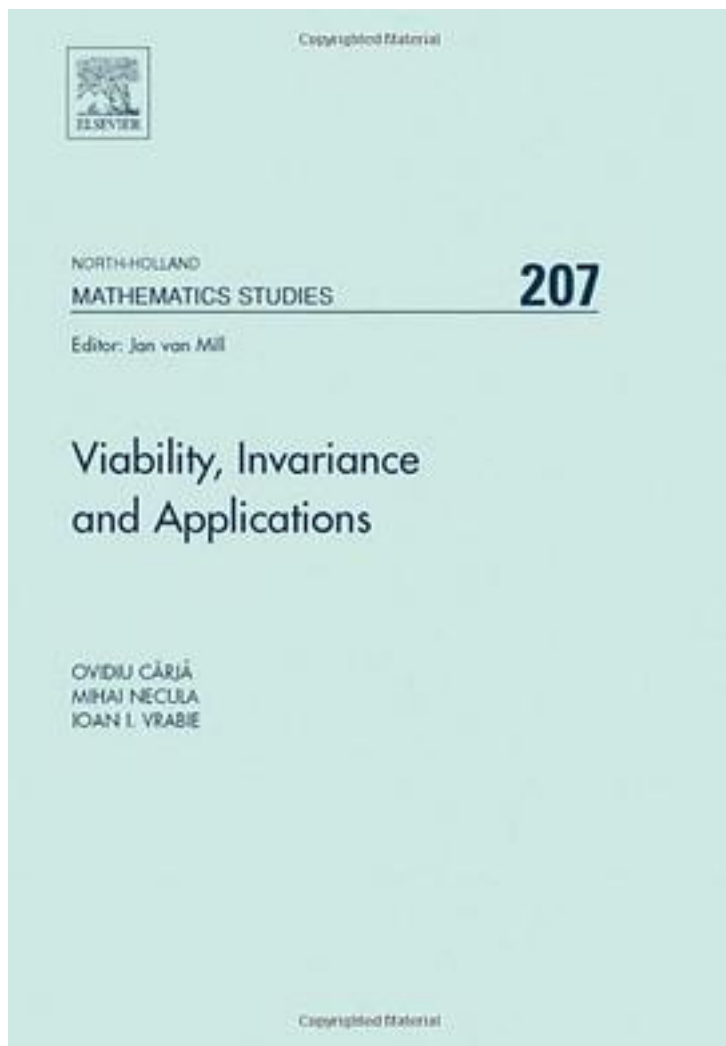


# Viability, Invariance and Applications



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This book is an almost self-contained presentation of the most important concepts and results in viability and invariance. The viability of a set  $K$  with respect to a given function (or multi-function)  $F$ , defined on it, describes the property that, for each initial data in  $K$ , the differential equation (or inclusion) driven by that function or multi-function) to have at least one solution. The invariance of a set  $K$  with respect to a function (or multi-function)  $F$ , defined on a larger set  $D$ , is that property which says that each solution of the differential equation (or inclusion) driven by  $F$  and issuing in  $K$  remains in  $K$ , at least for a short time. The book includes the most important necessary and sufficient conditions for viability starting with Nagumo's Viability Theorem for ordinary differential equations with continuous right-hand sides and continuing with the corresponding extensions either to differential inclusions or to semilinear or even fully nonlinear evolution equations, systems and inclusions. In the latter (i.e. multi-valued) cases, the results (based on two completely new tangency concepts), all due to the authors, are original and extend significantly, in several directions, their well-known classical counterparts. This title presents new concepts for multi-functions as the classical tangent vectors for functions. It provides the very general and necessary conditions for viability in the case of differential inclusions, semilinear and fully nonlinear evolution inclusions. It features clarifying examples, illustrations and numerous problems, completely and carefully solved. It illustrates the applications from theory into practice. It is written in very clear and elegant style.

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