

# The Hamiltonian Inclusion in Dynamic Optimization

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In the calculus of variations, optimizing arcs satisfy a set of conditions known as Hamilton system of equations. In generalizations to optimal control, when the dynamic constraint is formulated as a differential inclusion, Clarke Hamiltonian Inclusion provides an analogous optimality condition. The Hamiltonian inclusion was the first known necessary condition for differential inclusion problems, valid under un-restrictive hypotheses. While the Hamiltonian Inclusion has now been joined by other, broadly applicable, necessary conditions, such as different versions of the Euler Lagrange inclusion, the Hamiltonian Inclusion retains a special significance. In this talk we discuss the Hamiltonian Inclusion and recent refinements, and their distinctive role in the analysis of optimal controls. Special attention is given to the insights, provided by the Hamiltonian inclusion, into the effects of relaxation.