Inverse Design, Exact Controllability and Domain of Dependence for Conservation Laws

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For conservation laws, it is well known that, due to wave breaking, one cannot work with classical solutions (in global time) but rather in the framework of entropy solutions. However in this setting we loose reversibility in time. Given such a conservation law one can consider the three following problems.

- The inverse design problem consists in describing the profiles that are reachable in time T from at least one initial data and then for one such profile describe the set of all initial data that give rise to it.

- The domain of dependence question asks for us to describe, given an entropy solution and a point (t, x), on which part of the initial data does the value of the solution at (t, x) really depends.

- Finally one instance of the exact controllability problem asks the following (the conservation law now evolves on a bounded domain). Given an initial data, a target profile and a time T, how may one choose the boundary conditions of the problem in order to drive the entropy solution of the conservation law from the initial data to the target profile in time T.

The goal of the talk will be to describe the connection between those problems and some partial results on them.

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