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On Nonlocally Related PDE Systems in Multi-dimensions

For many systems of partial differential equations (PDEs), including nonlinear ones, one can construct nonlocally related PDE systems. In recent years, such nonlocally related systems have proven to be useful in applications. In particular, they have yielded systematically nonlocal symmetries, nonlocal conservation laws, non-invertible linearizations, and new exact solutions for many different PDE systems of interest.

However, the overwhelming majority of new results and theoretical understanding pertain only to PDE systems with two independent variables. The situation for PDE systems with more than two independent variables turns out to be much more complicated due to gauge freedom relating potential variables.

We present a systematic treatment of nonlocally related PDE systems with $n \geq 3$ independent variables, and compute new examples of nonlocal symmetries, nonlocal conservation laws, and exact solutions for such systems.

This is joint work with George Bluman (UBC).