SUBHANKAR SIL, University of British Columbia

Non-invertible mappings relating linear PDEs to corresponding nonlinear PDEs through symmetry-based method

We show that the well-known Hopf-Cole transformation mapping the linear heat equation to the nonlinear Burgers' equation naturally extends to the mapping of any linear PDE to a non-invertibly equivalent nonlinear PDE. This map is obtained through the symmetry-based method by using the admitted obvious scaling symmetry in the dependent variable of any linear homogeneous PDE. Moreover, each nontrivial point symmetry of any linear PDE yields a corresponding nonlocally related nonlinear PDE through the symmetry-based method. The mapping relating the linear PDE and the corresponding nonlinear PDE is not one-to-one. We demonstrate interesting examples of how the linear heat equation (one-dimensional and two-dimensional) can be non-invertibly mapped into corresponding nonlocally related nonlinear PDEs through its admitted point symmetries.