Symmetry and Darboux integrable systems

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Abstract:

The method of characteristics, a procedure for solving various classes of partial differential equations, arose in the 18th century and subsequently generalised by Darboux. This generalisation was studied by Goursat culminanting in a classification of 2nd order hyperbolic partial differential equations in one dependent and two independent variables that could be solved by the so called "method of Darboux". In the 1940s Vessiot made a deep analysis of Goursat's classification which has inspired our work. The main aim of this talk will be to uncover the hidden symmetries associated to Darboux integrable systems and then use these to gain a clear geometric understanding which increases the range of application of Darboux integrability well beyond the classical domain. The main result can be regarded as one of the few instances in the literature in which one has an elegant solution to an inverse problem in the theory of quotients for exterior differential systems.

 Joint work with Ian Anderson and Mark Fels

Key words: exterior differential system, Lie group action, superposition formula, hyperbolic partial differential equation, quotient system, Darboux integrable system