

Research summary:

- 1) I extended symmetry methods to nonlocal differential equations and classified all symmetries of the integrable nonlocal nonlinear Schrödinger equation and the nonlocal modified Korteweg—de Vries equation.
- 2) We use the discrete moving frame method to understand difference variational problems and in particular Euler—Lagrange equations in terms of invariants. This yields to boundary terms that can be transformed to conservation laws, requiring both invariants and the frame for their expression. One of the applications is to derive symmetry-preserving symplectic integrator. This is collaboration with E.L. Mansfield, A. Rojo-Echeburúa and P.E. Hydon (Kent, UK).

Published papers:

1. X. Zhang, N. Wang, Y. Cao, L. Peng and H. Meng, A Stochastic Analytical Modeling Framework on ISP–P2P Collaborations in Multidomain Environments, *IEEE System Journal* **12**, 2320-2331, 2018.
2. Linyu Peng, Comparison of symmetry prolongation formulae for differential-difference equations, *RIMS Kôkyûroku*, 2019, 8pp.
3. E.L. Mansfield, A. Rojo-Echeburúa, L. Peng and P.E. Hydon, Moving frames and Noether's finite difference conservation laws, *Transactions of Mathematics and its Applications*, accepted.
4. M. Khalid, Y. Cao, X. Zhang, C. Han, L. Peng, N. Aslam and N. Ahmad, Towards autonomy: Cost-effective scheduling for long-range autonomous valet parking (LAVP), *IEEE WCNC'18*, Barcelona, Spain, 15-18 April 2018, 6pp.

Book chaoter:

1. X. Zhang, Y. Cao, L. Peng and J. Li, Enhancing mobile data offloading with in-network caching, in *Paving the Way for 5G Through the Convergence of Wireless Systems*, IGI Global Publisher, pp. 250-270, 2019.

Conference talks:

1. L. Peng, "Symmetries of semi-discrete variational problems and Noether's theorems", RIMS Workshop Symmetry and Singularity of Geometric Structures and Differential Equations, Ritsumeikan University, Shiga, Japan, December 18-21, 2018
2. L. Peng and H. Yoshimura, "The discrete Lagrange-d'Alembert principle for physical systems with constraints", The 5th International Conference on Dynamics, Vibration and Control (ICDVC-2018), Shijiazhuang, China, July 28-30, 2018
3. L. Peng, "A semi-discrete version of Noether's theorem", Asymptotic, Algebraic and Geometric Aspects of Integrable Systems Workshop, Tsinghua Sanya International Mathematics Forum, Sanya, China, April 9-13, 2018
4. L. Peng, "Symmetries of differential-difference equations and Noether's conservation laws", Symmetry & Computation, Centre International de Rencontres Mathématiques (CIRM), Marseille, France, April 3-7, 2018