

Advection on Graphs

Consensus is a popular linear protocol for the network dynamics. Consequently, it is a rich area of research. We explore the advection protocol which shares many characteristics of consensus, facilitating the extension of many of the consensus results to advection. The advection protocol proves advantageous to formation control and load balancing applications. We demonstrate the latter with our robotic platform.

Publications:

- Airlie Chapman, Eric Schoof and Mehran Mesbahi (2012) [Advection on Networks with an Application to Decentralized Load Balancing](#), 2680-2681. In Proc. of the IEEE International Conference on Intelligent Robots and Systems.
- Airlie Chapman and Mehran Mesbahi (2011) [Advection on Graphs](#), 1461-1466. In Proc. of the IEEE Conference on Decision and Control. [Slides](#)

Z-Matrix Theory

Linear consensus can also be generalized to nonlinear consensus. The Laplacian matrix, the system matrix at the heart of consensus, lives in the family of Z-matrices. Many results from nonlinear consensus generalize to nonlinear Z-matrix applications. We explore these results, which include the characterization of the set of equilibria and the establishment of asymptotic stability

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Publications:

- Airlie Chapman and Mehran Mesbahi (2012) [Cartesian products on Z-Matrix networks: Factorization and interval analysis](#). In 20th International Symposium on Mathematical Theory of Networks and Systems. [Slides](#)
- Airlie Chapman and Mehran Mesbahi (2012) [Stability Analysis of Nonlinear Networks via M-matrix Theory: Beyond Linear Consensus](#), 6626-6631. In Proc. of the American Control Conference. [Slides](#)