Temple-Type Systems with Discontinuous Flux

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Abstract

This talk addresses a one-dimensional 2×2 Temple-type system of conservation laws with discontinuous flux functions, motivated by models of vehicular traffic. Such discontinuities naturally arise when road conditions or driving regimes change abruptly, leading to interfaces in the governing dynamics. We examine the analytical structure of the problem and prove the existence of entropy solutions under appropriate assumptions on the flux discontinuity.

Our approach is based on wave-front tracking, which provides a constructive framework for building approximate solutions and passing to the limit in a rigorous manner. Within this setting, we introduce an explicit Riemann solver tailored to the discontinuous-flux system and investigate its key properties, including well-posedness, consistency, and admissibility criteria for shocks and contact discontinuities.

To illustrate the theoretical results, we present numerical simulations that capture the qualitative features of the solutions and demonstrate the impact of flux discontinuities on wave propagation. These examples emphasize the relevance of the model for traffic applications and highlight the effects of discontinuities in traffic dynamics.