Equal Area Principle and Area-preserving Parametric Interpolation

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Conservation laws are fundamental first order partial differential equations which describe transport phenomena in fields such as fluid dynamics, meteorology, traffic flow modelling and plasma physics.

Even in their simplest form, conservation laws are difficult to study from a numerical perspective. The main source of this challenge arises due to discontinuities (shocks) which may form in the solution. A common tactic to handle such discontinuities is to utilize upwinding, which reduces the order of approximation and smooths out the solution in a neighbourhood of the shock.

In this talk, I will introduce an alternative method which combines the equal area principle and parametric interpolation to produce area-preserving highly accurate solutions with sharp features. An emphasis will be placed on proving the validity of this approach for 1-D scalar conservation laws in the presence of source terms.

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