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A robust, efficient equidistribution 2D grid generation method LUIS CHACON, GIAN LUCA DELZANNO, JOHN FINN, LANL, JEOJIN CHUNG, SMU, GIOVANNI LAPENTA, LANL — We present a new cell-area equidistribution method for two- dimensional grid adaptation [1]. The method is able to satisfy the equidistribution constraint to arbitrary precision while optimizing desired grid properties (such as isotropy and smoothness). The method is based on the minimization of the grid smoothness integral, constrained to producing a given positive-definite cell volume distribution. The procedure gives rise to a single, non-linear scalar equation with no free-parameters. We solve this equation numerically with the Newton-Krylov technique. The ellipticity property of the linearized scalar equation allows multigrid preconditioning techniques to be effectively used. We demonstrate a solution exists and is unique. Therefore, once the solution is found, the adapted grid cannot be folded due to the positivity of the constraint on the cell volumes. We present several challenging tests to show that our new method produces optimal grids in which the constraint is satisfied numerically to arbitrary precision. We also compare the new method to the deformation method [2] and show that our new method produces better quality grids. [1] G.L. Delzanno, L. Chacón, J.M. Finn, Y. Chung, G. Lapenta, *A new, robust equidistribution method for two-dimensional grid generation*, in preparation. [2] G. Liao and D. Anderson, A new approach to grid generation, Appl. Anal. 44, 285–297 (1992).

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