

# Entropy Satisfying Schemes For Shallow Water Systems Writing Positive Well Balanced Entropy Satisfying Numerical Schemes For Shallow Water Flows

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### Entropy Satisfying Schemes For Shallow

#### AN ENTROPY SATISFYING SCHEME FOR TWO-LAYER ...

real-life applications resides in this flow regime The numerical schemes satisfying this property are called well-balanced Well-balanced schemes have been derived for the one-layer shallow water system by various authors, see in particular [3-6,9,15,17] For the case of two layers, some schemes have been proposed in [2,11,16] 2 Numerical

#### A FULLY WELL-BALANCED, POSITIVE AND ENTROPY ...

ENTROPY-SATISFYING GODUNOV-TYPE METHODFOR THE SHALLOW-WATER EQUATIONS CHRISTOPHE BERTHON\* AND CHRISTOPHE CHALONS† AMS subject classifications 65M60, 65M12, 76M12, 35L65 Key words Shallow-water equations, steady states, finite volume schemes, well-balanced prop-erty, positive preserving scheme, entropy preserving scheme Abstract

Franc,ois Bouchut and Tomas Morales de Luna´

AN ENTROPY SATISFYING SCHEME FOR TWO-LAYER SHALLOW WATER EQUATIONS WITH UNCOUPLED TREATMENT Francis Bouchut<sup>1</sup> and Tomas Morales de Luna<sup>2</sup> Abstract We consider the system of partial differential equations governing the one-dimensional flow of two superposed immiscible layers of shallow water The difficulty in this system comes from

**arXiv:2010.09994v1 [math.NA] 20 Oct 2020**

entropy conservative schemes can be made entropy stable In this work, we focus specifically on 1D junction treatments and coupling between 1D-2D domains for the shallow water equations (SWE) and the compressible Euler equations 21 Shallow water equations in one and two dimensions We begin with introducing the two-dimensional shallow water

#### **IV Conference on Numerical Aspects of Hyperbolic Balance ...**

About (fully)-well-balanced and entropy satisfying schemes for shallow-water equations Christophe Berthon University of Nantes, France The present work concerns the numerical approximation of the weak solutions of the well-known shallow-water model A particular attention is paid on the steady states

#### **Entropy-satisfying scheme for a hierarchy of dispersive ...**

HAL Id: hal-01242128 <https://halinriafr/hal-01242128v2> Preprint submitted on 26 Sep 2017 (v2), last revised 25 Jul 2019 (v4) HAL is a multi-disciplinary open access

#### **Novel entropy stable schemes for 1D and 2D fluid equations**

Novel entropy stable schemes for 1D and 2D fluid equations 5 In fact, (10) specifies the precise entropy decay rate In the case of the Euler equations,  $\lambda = \mu = \kappa = 0$ , total entropy is precisely conserved,  $\int \rho S(x,t) dx = \int \rho S(x,0) dx$  This corresponds to the scalar entropy conservation (3) 22

Entropy stable schemes for the

#### **Entropy Stable Schemes - CSCAMM**

finite-volume schemes, for the approximate solution of nonlinear systems of conservation laws The question of entropy stability plays an important role in both, the theory and computation of such systems, which is reflected by the extensive literature on this topic Here we focus on a several key ingredients in the study of entropy stable

#### **Entropy stable schemes on two-dimensional unstructured grids**

The construction of entropy stable schemes for systems of conservation laws was pioneered by Tadmor in [27] The construction is based on two ingredients - (i) construction of an entropy conservative flux satisfying a discrete entropy equality, and (ii) addition of suitable dissipation operators to satisfy a discrete entropy inequality

#### **Kinetic entropy inequality and hydrostatic reconstruction ...**

state relations It leads to a consistent, well-balanced, positive scheme satisfying a semi-discrete entropy inequality, in the sense that the inequality holds only in the limit when the timestep tends to zero The method has been generalized to balance all subsonic steady-states in [11], and to multi-layer shallow water in [12]

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**Maximum-principle-satisfying and positivity-preserving ...**

Maximum-principle-satisfying and positivity-preserving high order schemes for conservation laws: Survey and new developments By Xiangxiong Zhang<sup>1</sup> and Chi-Wang Shu<sup>2</sup> † <sup>1</sup>Department of Mathematics, Brown University, Providence, RI 02912, USA <sup>2</sup>Division of Applied Mathematics, Brown University, Providence, RI 02912, USA In Zhang & Shu (2010b), genuinely high order accurate ...

**Maximum-principle-satisfying and positivity-preserving ...**

to be high order accurate and maximum-principle-satisfying This was the first time that genuinely high order schemes are obtained satisfying a strict maximum principle especially for multidimensional nonlinear problems For hyperbolic conservation law systems, the entropy solutions in general do not satisfy the maximum principle

**A SUBSONIC-WELL-BALANCED RECONSTRUCTION SCHEME ...**

steady states, but however it is not satisfying a discrete entropy inequality <sup>2</sup> Saint Venant system and well-balanced schemes The Saint Venant system describes the evolution of the water height  $\hat{h}(t;x)$  and the velocity  $u(t;x)$  in the horizontal direction, of a thin layer of water owing over a ...

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Sep 04, 2020 entropy satisfying schemes for shallow water systems writing positive well balanced entropy satisfying numerical schemes for shallow water flows Posted By Danielle SteelPublic Library TEXT ID 0144583f8 Online PDF Ebook Epub Library the scheme under consideration has been proven to preserve the positivity of the water height and to be fully well balanced ie to exactly preserve the

**A multi well-balanced scheme for the shallow water MHD ...**

flows [10], where we built an entropy satisfying approximate Riemann solver for the SWMHD system without topography that is accurate on all contact waves A generic tool for building well-balanced schemes that we use is the hydrostatic reconstruction method, that has been introduced in [1] One of its

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the entropy and entropy fluxes without topography The derivation of an efficient, robust and stable numerical scheme for the Saint-Venant system has received an extensive coverage The issue involves the notion of well-balanced schemes, and we refer the reader to [10, 17, 15, 19] and references therein