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	authors	• Tarik Dzanic • Freddie D. Witherden	**authors**	• Tarik Dzanic • Freddie D. Witherden	DUPLICATES	32
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	abstract	In this work, we present a positivity-preserving adaptive filtering approach for discontinuous spectral element approximations of the ideal magnetohydrodynamics equations. This approach combines the entropy filtering method (Dzanic and Witherden, J. Comput. Phys., 468, 2022) for shock capturing in gas dynamics along with the eight-wave method for enforcing a divergence-free magnetic field. Due to the inclusion of non-conservative source terms, an operator-splitting approach is introduced to guarantee that the positivity and entropy constraints remain satisfied by the discrete solution. Furthermore, a computationally efficient algorithm for solving the optimization process for this nonlinear filtering approach is presented. The resulting scheme can robustly resolve strong discontinuities on general unstructured grids without tunable parameters while recovering high-order accuracy for smooth solutions. The efficacy of the scheme is shown in numerical experiments on various problems including extremely magnetized blast waves and three-dimensional magnetohydrodynamic instabilities.	**abstract**	In this work, we present a positivity-preserving adaptive filtering approach for discontinuous spectral element approximations of the ideal magnetohydrodynamics equations. This approach combines the entropy filtering method (Dzanic and Witherden, J. Comput. Phys., 468, 2022) for shock capturing in gas dynamics along with the eight-wave method for enforcing a divergence-free magnetic field. Due to the inclusion of non-conservative source terms, an operator-splitting approach is introduced to guarantee that the positivity and entropy constraints remain satisfied by the discrete solution. Furthermore, a computationally efficient algorithm for solving the optimization process for this nonlinear filtering approach is presented. The resulting scheme can robustly resolve strong discontinuities on general unstructured grids without tunable parameters while recovering high-order accuracy for smooth solutions. The efficacy of the scheme is shown in numerical experiments on various problems including extremely magnetized blast waves and three-dimensional magnetohydrodynamic instabilities.		
	versions		**versions**			