On CMC-foliations of asymptotically flat manifolds

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In 1996, Huisken and Yau [3] constructed foliations by constant mean curvature (or *CMC*-) surfaces in the asymptotic ends of asymptotically flat Riemannian manifolds. Their result has been generalized in many ways — to weaker decay assumptions, by including strong uniqueness statements, and to higher dimensions — by Eichmair, Huang, Metzger, Nerz, Ye, etc.

Their work inspired the study of other foliations in asymptotically Euclidean ends, most notably by constrained Willmore surfaces by Lamm–Metzger–Schulze and by constant null mean curvature surfaces in initial data sets in General Relativity by Metzger. With Sakovich [2], we suggest a new foliation by constant spacetime mean curvature (or *STCMC*-) surfaces, also in initial data sets. The STCMC-foliation allows to define the center of mass of an isolated relativistic system, and remedies a deficiency of previous definitions uncovered with Nerz [1].

References

[1] C. Cederbaum and Chr. Nerz, Explicit Riemannian manifolds with unexpectedly behaving center of mass, *Ann. Henri Poincaré* **16**, nr. 7 (2015), pp. 1609–1631.

[2] C. Cederbaum and A. Sakovich, On center of mass and foliations by constant spacetime mean curvature surfaces for isolated systems in General Relativity, *preprint* (2018), arXiv:1901.00028v1.

[3] G. Huisken and S.-T. Yau, Definition of Center of Mass for Isolated Physical Systems and Unique Foliations by Stable Spheres with Constant Mean Curvature, *Invent. Math.* **124** (1996), pp. 281–311.