On CMC-foliations of asymptotically Euclidean manifolds

Carla Cederbaum*
Mathematics Department
University of Tübingen
Germany

Abstract

Three-dimensional Riemannian manifolds are called asymptotically Euclidean if, outside a compact set, they are diffeomorphic to the exterior region of a ball in Euclidean space, and if the Riemannian metric converges to the Euclidean metric as the Euclidean radial coordinate r tends to infinity. In 1996, Huisken and Yau proved existence of a foliation by constant mean curvature (CMC) surfaces in the asymptotic end of an asymptotically Euclidean Riemannian three-manifold. Their work has inspired the study of various other foliations in asymptotic ends, most notably the foliations by constrained Willmore surfaces (Lamm-Metzger-Schulze) and by constant expansion/null mean curvature surfaces in the context of asymptotically Euclidean initial data sets in General Relativity (Metzger, Nerz).

After a rather extensive introduction of the central concepts and ideas, I will present a new foliation by constant spacetime mean curvature surfaces (STCMC), also in the context of asymptotically Euclidean initial data sets in General Relativity (joint work with Sakovich). This STCMC-foliation is well-suited to define the center of mass of an isolated system in General Relativity and thereby answers some previously open questions of relevance in General Relativity.

*e-mail: cederbaum@math.uni-tuebingen.de