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Ph.D. Thesis Defense

Some aspects of the minimal surface theory

Abstract:

A manifold (M^n, g) is called an asymptotically flat manifold if outside a compact set it is diffeomorphic to the Euclidean half space minus a ball and its metric g satisfies some decay conditions. We can define a geometric invariant m_{ADM} called the ADM mass. The ADM mass m_{ADM} is nonnegative provided that the scalar curvature R_g of M and mean curvature H_g of ∂M are both nonnegative. $m_{\text{ADM}} = 0$ if and only if M is isometric to the standard Euclidean half space. This result is called the positive mass theorem with a noncompact boundary.

Almaraz, Barbosa and de Lima in a recent article use minimal surfaces to prove this theorem. In this thesis, we use minimal surface with free boundary. Formally, this is similar to Schoen and Yau's original proof. We prove that the manifold $(\mathbb{T}^{n-1} \times [0,1]) \# M_0$ does not admit a positive scalar curvature metric with minimal boundary. We use Lohkamp's idea to study the relationship of the geometry of $(\mathbb{T}^{n-1} \times [0,1]) \# M_0$ and the positive mass theorem.

Based on the definition of m_{ADM}, we derived definitions of Hawking mass and isoperimetric mass with boundary and prove their convergence to the ADM mass.

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Date: 25 June 2018 (Monday)
Time: 10:30 a.m. – 12:30 p.m.
Venue: Room 219, Lady Shaw Building
The Chinese University of Hong Kong, Shatin

All are Welcome!