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COMPLETE EMBEDDED MINIMAL SURFACES OF FINITE TOTAL CURVATURE

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Abstract

A general construction, for complete embedded minimal surfaces of finite total curvature in Euclidean three-space, is carried out. In particular, examples with an arbitrary number of ends are given for the first time. The construction amounts to desingularizing the circles of intersection of a collection of coaxial catenoids and planes. The desingularization process uses Scherk's singly periodic surfaces for an approximate construction which is subsequently corrected by singular perturbation methods.

1. Introduction

Historical background.

Among all minimal surfaces, those which are complete, embedded in E^3, and of finite total curvature, form a very restricted class which has fascinated many geometers. It is remarkable that besides the classical examples of the catenoid and the plane no other examples were known until the early eighties. At that time Costa [2], [3] discovered a new complete minimal surface of finite total curvature, which was proved to be embedded [8]. This sparked a great deal of activity in this subject, and some more new examples were first found by Hoffman and Meeks [9], [10], and later by others [30], [31] [18] [12] [7]. We refer the reader to the excellent survey article of Hoffman and Karcher [6] where a detailed account is given and many more references can be found.

This paper is motivated by a systematic study of a sequence of such surfaces of increasing genus by Hoffman and Meeks [11]. They proved that the sequence in consideration tends to the union of a catenoid and

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