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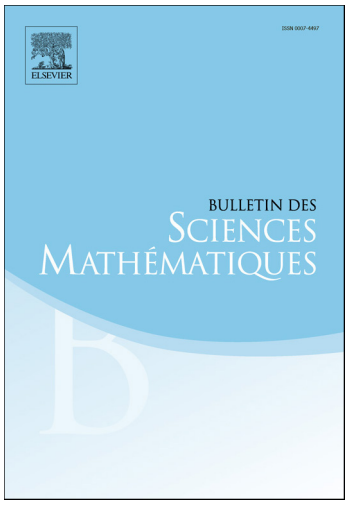

Invertible harmonic mappings of the unit disk onto Dini smooth Jordan domains

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Abstract

In this paper we extend Radó-Kneser-Choquet theorem for the mappings with weak homeomorphic Lipschitz boundary function and Dini's smooth boundary but without restriction on the convexity of the image domain, provided that the Jacobian satisfies a certain boundary condition. The proof is based on a recent extension of Radó-Kneser-Choquet theorem by Alessandrini and Nesi [1] and is used the approximation principle.

1 Introduction

Harmonic mappings in the plane are univalent complex-valued harmonic functions of a complex variable. Conformal mappings are special cases where the real and imaginary parts are conjugate harmonic functions, satisfying the Cauchy-Riemann equations. Harmonic mappings were studied classically by differential geometers because they provide isothermal (or conformal) coordinates for minimal surfaces. More recently they have been actively investigated by complex analysts as generalizations of univalent analytic functions, or conformal mappings. For the background to this theory we refer to the book of Duren [3] (cf. [4, 5]). If w is a univalent complex-valued harmonic function, then by Lewy's theorem (see [10]), w has a non-vanishing Jacobian and consequently, according to the inverse mapping theorem, w is a diffeomorphism. Moreover, if w is a harmonic function of the unit disk $\mathbf{U}$ onto a bounded convex Jordan domain Ω in $\mathbf{C}$, mapping the boundary $\mathbf{T} = \partial\mathbf{U}$ onto $\partial\Omega$ homeomorphically, then w is a diffeomorphism. This is celebrated theorem of Radó, Kneser and Choquet ([9]). This theorem has been

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