

# *Removable Singularities of Harmonic Maps and an Application to Minimal Submanifolds*

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**Introduction.** By a classical result, a set of capacity zero constitutes a removable singularity for any bounded solution of Laplace's equation, while on the other hand a single point is removable if the solution is  $o(|\log r|)$  or  $o(r^{2-n})$  in the neighborhood. Carleson [2] established a removable singularity theorem for sets of intermediate size, the idea being to relate their Hausdorff dimension to the Lebesgue class of the solution.

Our paper deals with the corresponding problem for harmonic mappings between Riemannian manifolds.

In the first part we shall prove that a bounded harmonic map  $U$  has a harmonic extension across a set of capacity zero if the image of  $U$  is contained in a geodesic ball with radius  $M_0$ ,  $M_0 \leq \pi/(2\sqrt{\kappa})$ , where  $\kappa \geq 0$  denotes an upper bound for the sectional curvature of the target manifold. In the limit case  $M_0 = \pi/(2\sqrt{\kappa})$  it must also be assumed that the image of  $U$  does not completely lie on the boundary of this ball. Furthermore, we exhibit an example showing that in general there does not even exist a weakly harmonic extension of  $U$  if the last condition is violated (§2).

Section 3 contains an extension theorem for non-parametric minimal submanifolds  $\mathcal{X}$  in the Euclidean space, which follows by applying the previous result to the Gauss map of  $\mathcal{X}$ .

In the last section, harmonic maps into manifolds with nonpositive sectional curvature are considered. Here we establish the exact analogue of Carleson's theorem and also present some sharp removable singularity results concerning logarithmic and other pointwise growth conditions. Somewhat weaker and less complete results were obtained by the author [15] for a rather broad class of quasilinear elliptic systems. The iteration technique employed in [15] even applies to certain systems with nonlinear principal part but has the drawback that the behavior of a solution and its derivatives near the exceptional set need be analyzed simultaneously. Our improvements in the present case rest upon the observation that the problem can be reduced to the study of subsolutions of