Existence of positive solutions of a class of semilinear elliptic systems

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Abstract

This paper gave a positive answer to a prescribing singularity problem: *For any given finite points* $x_1, \ldots, x_m$ *in* R^3 *and integers* $d_1, \ldots, d_m$*, there is a harmonic map* u *from a domain* $\Omega \subset R^3$ *to* S^2 *such that* Ω *contains* $\{x_1, \ldots, x_m\}$*,* $u \in C^\infty(\Omega \setminus \cup_{i=1}^m \{x_i\})$ *and* $deg(u, x_i) = d_i$*,* $i = 1, \ldots, m$*. In particular, if all* $d_i \neq 0$*, then the singular set of* u *is precisely* $\{x_1, \ldots, x_m\}$*.* The proof follows from a bridge principle for harmonic maps, which were also proven in this paper.

Key Words: *bridge principle, linearization, fixed point theorem, separation of variables.*