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Corrigendum

On the existence and 'blow-up' of solutions to a two-dimensional nonlinear boundary value problem arising in corrosion modelling

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There is a slight discrepancy between that which is proven in § 4 of this paper and the stated alternate characterization of the set of the blow-up points in Theorem 4.1.

Using the notation $\nu = \mu^+ + \mu^-$ in place of $|\mu|$, what is indeed proven in § 4 is the following result.

THEOREM 4.1. *Let $v_{\lambda_n} \in H^1(\Omega)$, $\lambda_n \to 0^+$, be a sequence of solutions to (4.1) which additionally satisfy (4.2) and (4.3), and define*

$$v^0_{\lambda_n} = v_{\lambda_n} - \frac{1}{|\partial\Omega|}\int_{\partial\Omega} v_{\lambda_n}\,\mathrm{d}\sigma.$$

There exists a subsequence, also referred to as v_{λ_n}, a positive, regular, finite Borel measure ν (on $\partial\Omega$), and a finite set of points $\{x^{(i)}\}_{i=1}^N \subset \partial\Omega$, $N \geqslant 1$, such that

$$\left|\frac{\partial v_{\lambda_n}}{\partial \boldsymbol{n}}\right|_{|\partial\Omega} = \lambda_n|\sinh(v_{\lambda_n})|_{|\partial\Omega} \to \nu$$

in the sense of measures. The points $x^{(i)}$, $i = 1, \ldots, N$, are exactly the points at which ν has point masses, i.e. at which $\nu(\{x\}) \neq 0$. The same points $x^{(i)}$, $i = 1, \ldots, N$, also represent the blow-up points for the sequence $v^0_{\lambda_n}$, in the sense that

$$\{x^{(i)}\}_{i=1}^N = \{x \in \bar{\Omega} : \exists x_n \to x, x_n \in \bar{\Omega},\ \text{with}\ |v^0_{\lambda_n}(x_n)| \to \infty\}.$$

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This differs from what was stated in the paper in that it correctly characterizes the set of blow-up points for the sequence $v^0_{\lambda_n}$ as the point mass locations of the limiting measure

$$\nu = \lim \left|\frac{\partial v_{\lambda_n}}{\partial \boldsymbol{n}}\right|,$$

not of the limiting measure

$$\mu = \lim \frac{\partial v_{\lambda_n}}{\partial \boldsymbol{n}}.$$

The same change applies to the place in the introduction where we discuss the blow-up behaviour. The point mass locations of the measure

$$\mu = \lim \frac{\partial v_{\lambda_n}}{\partial \boldsymbol{n}}$$

are potentially only a subset of the blow-up points. The cause of our misstatement is the (unsubstantiated) remark we made concerning the measure $\nu = \mu^+ + \mu^-$ – we cannot automatically assume that this is the total variation measure of the measure $\mu = \mu^+ - \mu^-$; more specifically, we cannot, without further arguments, exclude the existence of points such that $(\mu^+ + \mu^-)(\{x\}) > 0$ but $(\mu^+ - \mu^-)(\{x\}) = 0$.

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