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CORRECTION NOTE: A STRONG ORDER 1/2 METHOD FOR MULTIDIMENSIONAL SDES WITH DISCONTINUOUS DRIFT

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There is a gap in the proof of [3], Theorem 3.20. For closing this gap, weak additional assumptions on the regularity of the exceptional set Θ are needed. In this note, we close the gap and state the corrected version of the main theorems of [3]. The changes we state below only apply from Section 3 onward. The one-dimensional case in Section 2 is not affected.

For the multidimensional case, the function $\phi\colon \mathbb{R} \to \mathbb{R}$ defined in [3], equation (2), needs to be C^3; we define

$$\phi(u) = \begin{cases} (1+u)^4(1-u)^4 & \text{if } |u| \le 1, \\ 0 & \text{else.} \end{cases} \tag{1}$$

This function has the properties:

1. ϕ is C^3 on all of $\mathbb{R}$;
2. $\phi(0) = 1$, $\phi'(0) = 0$, $\phi''(0) = -8$;
3. $\phi(u) = \phi'(u) = \phi''(u) = \phi'''(u) = 0$ for all $|u| \ge 1$.

With this, we define for some $c \in (0, \operatorname{reach}(\Theta))$ and for all $x \in \Theta^c$,

$$G(x) := x + \big(x - p(x)\big) \cdot n\big(p(x)\big)\big\|x - p(x)\big\|\phi\bigg(\frac{\|x - p(x)\|}{c}\bigg)\alpha\big(p(x)\big), \tag{2}$$

where for all $\xi \in \Theta$,

$$\alpha(\xi) := \lim_{h \to 0+} \frac{\mu(\xi - hn(\xi)) - \mu(\xi + hn(\xi))}{2n(\xi)^\top \sigma(\xi)\sigma(\xi)^\top n(\xi)}. \tag{3}$$

Note that (3) replaces [3], equation (6), and G has precisely the same form as in [3], equation (5), only now we use the new versions of α, ϕ.

Due to the change in the definition of ϕ, the following lemma needs to be adapted.

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