Milstein-type methods for strong approximation of systems of SDEs with a discontinuous drift coefficient

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We consider d-dimensional systems of SDEs with drift coefficient μ and Lipschitz continuous diffusion coefficient σ. We assume that there exists a C^5-hypersurface $\Theta \subseteq \mathbb{R}^d$ such that μ is intrinsic Lipschitz continuous on $\mathbb{R}^d \setminus \Theta$ and such that μ and σ are C^1 with intrinsic Lipschitz continuous derivatives on $\mathbb{R}^d \setminus \Theta$.

It was recently proven in [1] that for SDEs of this type in the case $d = 1$ a Milstein-type scheme achieves an L_p-error rate of order at least $3/4$. Furthermore it was proven in [2] that in the same setting an adaptive Milstein-type scheme achieves an L_p-error rate of order at least 1. For general $d \in \mathbb{N}$, no strong error result for schemes of this type was known until recently. In this talk we will present for $d \in \mathbb{N}$ Milstein-type schemes which can be used for the approximation of the solutions of such systems of SDEs at the final time point and we will analyse their convergence rates.

[1] Müller-Gronbach, Thomas & Yaroslavtseva, Larisa. (2022). *A strong order 3/4 method for SDEs with discontinuous drift coefficient.* IMA Journal of Numerical Analysis. 42. 229-259

[2] Yaroslavtseva, Larisa. (2022). *An adaptive strong order 1 method for SDEs with discontinuous drift coefficient.* Journal of Mathematical Analysis and Applications. 513. 2. Paper Number 126180, 29