On optimal path-independent discretizations for SDEs with jumps

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We will present the results for a strong global approximation of systems of stochastic differential equations (SDE) of the following form

$$\begin{cases} dX(t) = & a(t, X(t))dt + b(t, X(t))dW(t) + c(t, X(t-))dN(t), t \in [0, T] \\ X(0) = & x_0, \end{cases} \tag{1}$$

where $x_0 \in \mathbb{R}^d$, functions $a, c : [0, T] \times \mathbb{R}^d \to \mathbb{R}^d$, $b : [0, T] \times \mathbb{R}^d \to \mathbb{R}^{d \times m_w}$ satisfy some regularity conditions, $W = W(t)_{\in[0,T]}$ is m_w dimensional Wiener process and $N = N(t)_{t\in[0,T]}$ is non-homogeneous Poisson process with the intensity function $\lambda = \lambda(t) > 0$. We also impose suitable commutativity conditions on diffusion and jump coefficients. We investigate two classes of algorithms, based on equidistant and non-uniform discretizations of the interval $[0, T]$. We provide asymptotically optimal algorithms in these two classes. Finally, we present results of some numerical tests performed on GPU by using cuSTOCH library (part of the joint AGH-NVIDIA project).