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Continuous-Time Random Walks, Fractional Calculus and Stochastic Integrals

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Continuous-time random walks are pure-jump processes with several applications in physics, but also in insurance, finance and economics.
Based on heuristic considerations, a definition is given for the stochastic integral driven by continuous-time random walks.
The martingale properties of the integral are investigated.
It is shown how the definition can be used to easily compute the stochastic integral by means of Monte Carlo simulations.
The relationship with fractional calculus is discussed.

Link to related preprint: http://arxiv.org/abs/0802.3769