A Hamilton-Jacobi formalism for the study of propagation in reaction-subdiffusion systems

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Certain intracellular protein exhibit random motion that deviates from standard diffusion due to trapping phenomena. These systems may be described by a probability density function $n(t, x, a)$ depending on time t, space x, and also on a structural memory or 'age' variable a that allows to account for the trapping. Roughly speaking, n is governed by a renewal equation in (t, a) (with a heavy-tailed waiting times distribution) coupled with spatial relocation at renewal.

I will motivate and give an overview of certain results obtained at the end of my PhD thesis on the hyperbolic space-time asymptotics of those equations, how they tend to a limiting Hamilton-Jacobi equation, and what this means. The interesting features of our work lie in how we dealt with complications in the limit procedure due to the memory effects being 'non-Markovian' in a certain sense.