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Infinite computations, randomness and genericity

The study of Infinite-Time Turing machines, ITTMs for short, goes back to a paper by Hamkins and Lewis. Informally these machines work like regular Turing machines, with in addition that the time of computation can be any ordinal. This model of infinite time computation differs from the main other definition for infinite computations, α -recursion, which corresponds to Σ_1 -definability in L_α . In the former, there is no bound in the time of computation allowed, but a bound on the storage space as it is not possible to keep track of all the previous stages. In the latter, all previous stages are accessible but the time of computation is bounded in advance.

Recently Carl and Schlicht used the ITTM model to extend algorithmic randomness and effective genericity notions in these settings. In this talk, we present a general framework to study randomness and genericity within Godel's constructible hierarchy. Using this framework, we answered several of Carl and Schlicht's open questions and we asked new ones. In particular the question about the separation of two randomness notions related to ITTMs and α -recursion is particularly interesting. Intuitively, these notion seems to be different, as their Π_1^1 -analogue do, but the proof does not lift. In order to argue that it is not absurd to think that these two randomness notions may actually coincide, we showed that it is the case for their categorical analogues.