Complexity analysis via approach spaces

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This talk is related to joint work with S. De Wachter and M. Schellekens [1].

When dealing with some recursive algorithm of which the running time can be modelled as a solution of an associated recurrence equation, a solution of this equation can be obtained as a fixed point of some operator $\Phi : X \to X$ [6]. Usually $X =]0, \infty]^Y$ with Y some subset of $\mathbb{N}$ or of some power of $\mathbb{N}$ depending on whether the algorithm has a single variable or several variables as inputs and $]0, \infty]$ is endowed with some quasi metric inducing the Scott topology of the usual order.

We obtain fixed point results for Φ with wider range of applicability than what was obtained in the literature so far [2], [4], [5], by endowing X with the categorical product in the category App of approach spaces [3], rather than working in a quasi metric setting. App has both topological and quasi metric ingredients and the coreflector to Top preserves products. We explain the impact of these facts on a class of recursive algorithms.

References

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