

Scaled regression: a framework for functional program termination

Daniel M. Leivant
Indiana University, Bloomington
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Abstract. The template of primitive-recursion (PR) is powerful enough to program all functions of interest, but very few natural algorithms. Indeed, PR is justified by induction on a single argument, whereas most algorithms are seen to terminate by induction on measures which are rarely as trivial as the size of one particular input value.

We explore here a framework for crafting terminating functional programs, that extends primitive-recursion while preserving its methodological benefits. In particular, we allow inductive measures, dubbed *scales*, that may involve several arguments, and may be different for each function. In addition, to permit such measures to refer to previously defined functions, we associate with each function an *index*, which carries a rough bound on the function's size-changing behavior. As a functional program is incrementally developed, scales are used to guarantee termination (given previous indices), and new indices are computed from previous ones, for future use.