The Theory of Computation

Bernard M.E. Moret

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Solution Manual
Chapter 2, Problem 2.35

From a purely mathematical point, the answer is quite simple: as we dovetail, we check whether the fraction represented by the two indices can be reduced. If it cannot, we are encountering this rational number for the first time and so do enumerate it; if it can, however, the rational number it represents has been seen before (because of the monotonicity of the pairing function used in the dovetailing process) and so we simply skip to the next fraction. The enumeration algorithm is clear and remains quite efficient, since a check for common factors is not too expensive; however, the mathematical expressions we derived for the pairing and unpairing are now invalid and cannot easily be fixed: the new pairing function defined implicitly by our procedure does not have a simple closed form, nor do its inverses.