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Feedback Turing Computability, and Turing Computability as Feedback.

The notion of a feedback query is a natural generalization of choosing for an oracle the set of indices of halting computations. Notice that, in that setting, the computations being run are different from the computations in the oracle: the former can query an oracle, whereas the latter cannot. A feedback computation is one that can query an oracle, which itself contains the halting information about all feedback computations. Although this is self-referential, sense can be made of at least some such computations.

In this paper, we study feedback around Turing computability. In one direction, we examine feedback Turing machines, and show that they provide exactly hyperarithmetic computability. In the other direction, Turing computability is itself feedback primitive recursion (at least, one version thereof). (Received July 29, 2015)