

QUOTATION

A. M. TURING ON RULE-GOVERNED AND CONTINGENCY-SHAPED COMPUTER LEARNING PROGRAMS

We normally associate punishments and rewards with the teaching process. Some simple child-machines can be constructed or programmed on this sort of principle. The machine has to be so constructed that events which shortly preceded the occurrence of a punishment-signal are unlikely to be repeated, whereas a reward-signal increased the probability of repetition of the events which led up to it. These definitions do not presuppose any feelings on the part of the machine. . . .

The use of punishments and rewards can at best be a part of the teaching process. Roughly speaking, if the teacher has no other means of communicating to the pupil, the amount of information which can reach him does not exceed the total number of rewards and punishments applied. By the time a child has learned to repeat "Casabianca" he would probably feel very sore indeed, if the text could only be discovered by a "Twenty Questions" technique, every "NO" taking the form of a blow. It is necessary therefore to have some other "unemotional" channels of communication. If these are available it is possible to teach a machine by punishments and rewards to obey orders given in some language, e.g., a symbolic language. These orders are to be transmitted through the "unemotional" channels. The use of this language will diminish greatly the number of punishments and rewards required. (Turing, 1950, p. 457)

In his biography of Alan Turing, Hodges comments about this paper that it "boldly extended the range of 'intelligent machinery' to general conversation. As such it was vulnerable to his own criticism, that it would require 'contact with the outside world' for this to be possible. He did not meet the problem that to speak seriously is to *act*, and not only to issue a string of symbols. Speech may be uttered in order to effect changes in the world . . ." (Hodges, 1985, p. 421). Elsewhere, Hodges, quoting an unpublished Turing manuscript, points out that in his account of learning machines Turing had recognized the importance of having the machine discriminate its own behavior, in processes that might well be called autoclitic, for example: "At comparatively late stages of its education the memory might be extended to include important parts of the configuration of the machine at each moment, or in other words it would begin to remember what its thoughts had been" (Turing, quoted in Hodges, 1985, p. 443).

From: Hodges, A. (1985). Alan Turing: The enigma of intelligence. London: Unwin.

Turing, A. M. (1950). Computing machinery and intelligence. *Mind*, 59, 433-460.