Problem

Consider the problem of determining whether a Turing machine M on an input w ever attempts to move its head left at any point during its computation on w. Formulate this problem as a language and show that it is decidable.

Step-by-step solution

Step 1 of 2

Consider a problem of determining whether a Turing machine M on input w ever attempts to move its head left at any point during its computation on w. The language that describes the problem is,

$L = \{< M, w >| M \text{ moves its head left on input } w\}$

Comment

Step 2 of 2

Construct a Turing machine A that decides the problem.

$A =$ "On input $<M, \ w>$:
    1. Run the machine for $|Q|+|w|+1$ steps.
    2. If the Turing machine M's head moved to the left then accept. Otherwise, reject."

Here, |Q| represents the number of states and |w| represents the length of the input string. The problem is said to be decidable, if the Turing machine M moves its head left on input w within the first $|Q|+|w|+1$ steps. The problem is decidable because, there exists a Turing machine for it.

Therefore, the language L is decidable.

Comments (1)