Problem

Show that A_{DFA} ? L.

Step-by-step solution

Step 1 of 1

2287-8-7E AID: 1134 I 24/04/2012

RID: 48 I 18/05/2012

Class *L* : In deterministic Turing machine, L can be defined as class of languages complexity decidable in logarithmic space *i.e.* $L = SPACE(\log n)$

Now we need to prove that $A_{DFA} \in L$

$A_{DFA} = \{\langle B, w\rangle \mid B \text{ is a } DFA \text{ that accepts input string } w\}$

To prove $A_{DFA} \in L$ we need to construct a deterministic Turing machine (*TM*) to decide

A_{DFA} in logarithmic space.

Let M be the *TM* that decides A_{DFA} in log – space.

The construction of *TM* M is as follows:

$M =$"on input $\langle B, w\rangle$, where B is a *DFA* and w is string:

1. Simulate B on w by keeping track of B's current state and its current head location and updating them appropriately.

2. If the simulation ends in an accept state, accept

3. else if the simulation end in non accepting that, reject"

The SPACE required to carry out this simulation is $O(\log n)$, since n items of values storing its input by M. Thus we constructed *TM* M to decide A_{DFA} in log – space therefore $A_{DFA} \in L$.

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