CS 3530: Assignment 3a

Fall 2023

Exercise 3.1c (10 points)

Problem

This exercise concerns TM M_2 whose description and state diagram appear in Example 3.7. In each of the parts, give the sequence of configurations that M_2 enters when started on the indicated input string.

c. 000

Solution

c. You may wish to know that ⊔ gives the symbol for blank.

(q1, 0) = (q2, ⊔, R)

(q2, 0) = (q3, x, R)

(q3, 0) = (q4, 0, R)

(q4, ⊔) = (q^{reject}, ⊔, R)

Exercise 3.8b (10 points)

Problem

Give implementation-level descriptions of Turing machines that decide the following languages over the alphabet $\{0, 1\}$.

b. $\{w|w$ contains twice as many 0s as 1s $\}$

Solution

b. Format your answer like M_1 in the chapter. For example:
Let $M_{3.8b}$ = "On input string w:

1. scan tape for any unmarked 1's
2. if there are no unmarked 1's go to 5, else place head at start of tape
3. scan to find unmarked 0, and mark it. if no unmarked 0's are found reject
4. Repeat last step of loop, then move head to front and tape and return to step 1
5. If there are *no* unmarked 0's, then *accept*. Otherwise, *reject*."