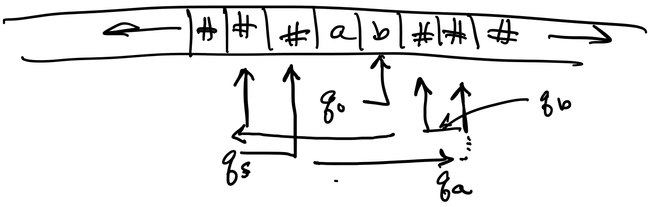
tm examples

Tuesday, November 26, 2024 12:02 PM

ex create a tm for $L = \{a^n b^n : n \geq 1\}$



// go leftmost

(q_0, a, a, L, q_0)
(q_0, b, b, L, q_0)
$(q_0, \#, \#, R, q_s)$

// blank 'a' + move Right → leftmost

$(q_s, a, \#, R, q_a)$
(q_a, a, a, R, q_a)
(q_a, b, b, R, q_a)
$(q_a, \#, \#, L, q_b)$

// blank 'b' + move left or (start over) → rightmost

$(q_b, b, \#, L, q_0)$

// go to final

$(q_s, \#, \#, R, q_f)$

Instantaneous description:

s = aabb

$\#\#aa\,b\,q_0\,b\,\#\# \vdash \#\#aa\,q_0\,bb\,\#$

$\vdash \#\#a\,q_0\,abb\,\# \vdash \#\#q_0\,aabb\,\#$

$\vdash \#\#q_0\,\#aabb\,\# \vdash \#\#q_s\,aabb\,\#$

$\vdash \#\#\#q_a\,abb\,\# \ldots$

s = bbaa

$\#\#b\,q_0\,baa\,\# \vdash \#\#q_0\,bbaa\,\#$

$\vdash \#q_0\,\#bbaa\,\# \vdash \#\#q_s\,bbaa\,\#$

$\notin L$ ✓

ex $L = \{f(x) = 2x : x \in \{a\}^*\}$

$\#\,aa\,\# \rightarrow \#\,aaaa\,\#$

$\#aa\,\# \rightarrow \#aaaa\#$ [$\#aaaa\#$]

$\#\,aa\,\# \rightarrow \#\,aaxx\,\# \rightarrow \#\,aaxxxx\#$