CS 302 Recitation 11

December 28, 2020

Problem 1

Design a DTM accepts the language L s.t. number of 0's are twice number of 1's.

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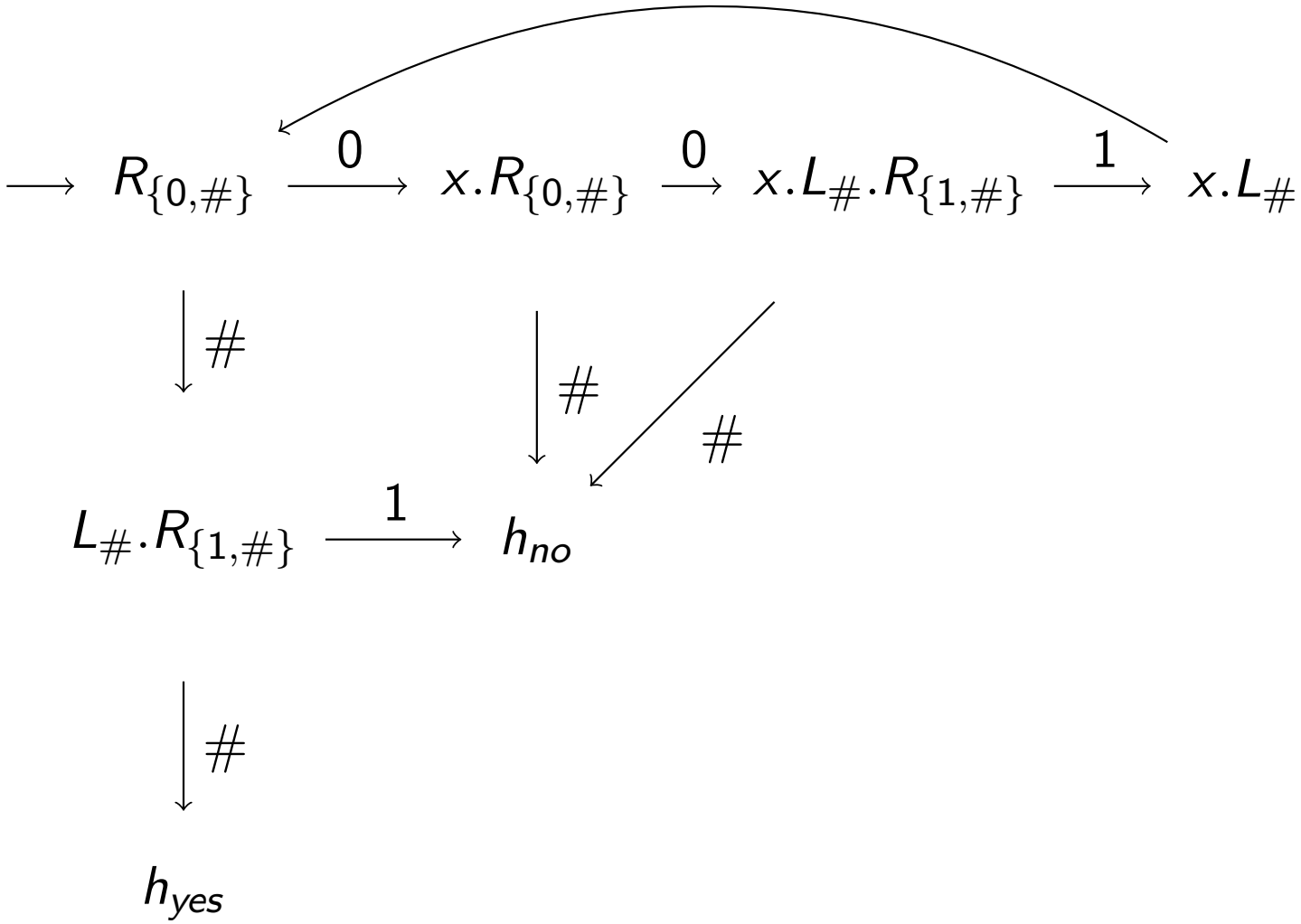
1. Scan the tape and mark the first 0 that has not been marked. If there is no unmarked 0, go to stage 5.
2. Move on and mark the next unmarked 0. If there is not any on the tape, reject. Otherwise, move the head back to the front of the tape.
3. Scan the tape and mark the first 1 which has not been marked. If there is no unmarked 1, reject.
4. Move the head back to the front of the tape and repeat stage 1.
5. Move the head back to the front of the tape. Scan the tape to see if there are any unmarked 1's. If there is not, accept. Otherwise, reject.

Problem 1



Problem 2

Design a DTM that computes $x - y$ if $x > y$, 0 otherwise on unary strings of 1.

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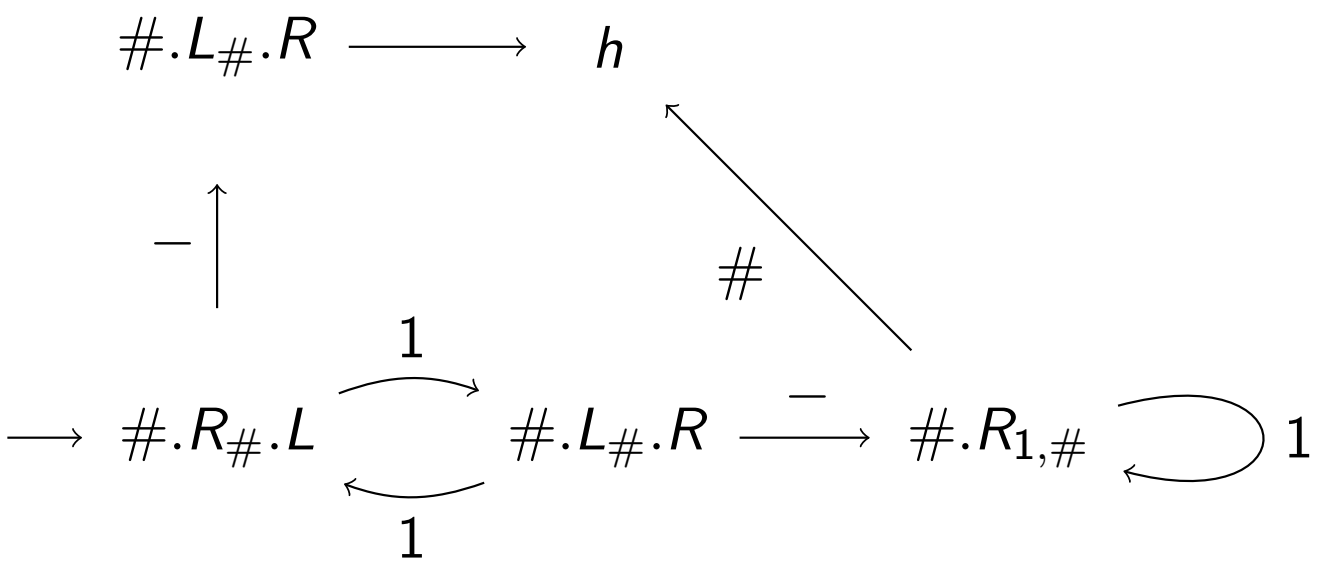
1. Scan the tape until finding a # and make left. If it is $-$, go to stage 4. Otherwise, put a #.
2. Move the head back to the front of the tape and make right. If it is 1, put a # and go to stage 1.
3. Put a # and scan the tape until finding a 1. If there are no 1s, halt. Otherwise, repeat this stage.
4. Put a #. Scan the tape until finding a # and make right. Halt.

Problem 2



Problem 3

Design a DTM accepts the language $L = \{w = 0^{2^n} \mid n \geq 0\}$

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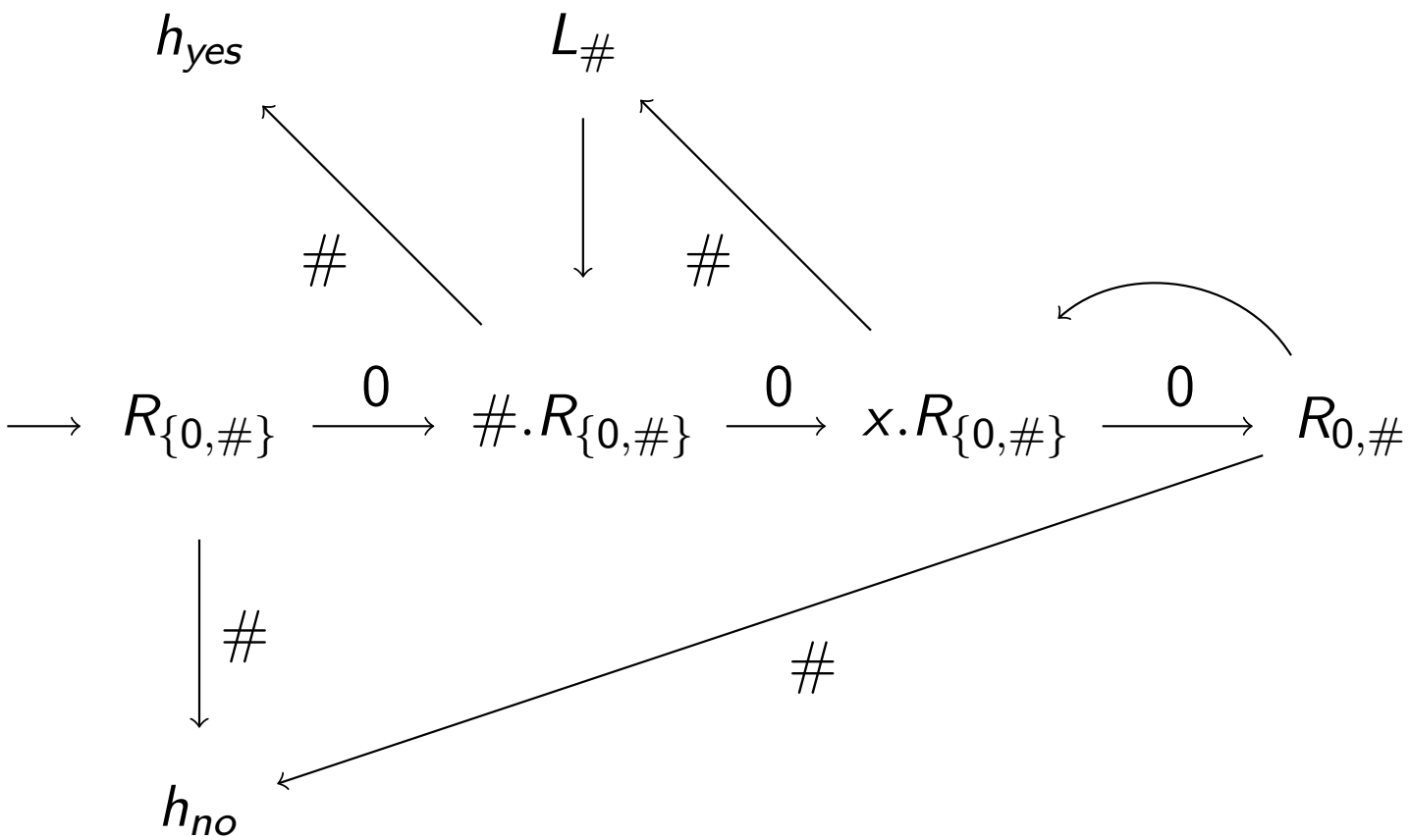
1. Sweep left to right across the tape, crossing off every other 0.
2. If in stage 1 the tape contained a single 0, accept.
3. If in stage 1 the tape contained more than a single 0 and the number of 0s was odd, reject.
4. Return the head to the left-hand end of the tape.
5. Go to stage 1.

Problem 3


h_{yes}
$L_{\#}$
$\#$
$\#$
$\longrightarrow$ $R_{\{0,\#\}}$ $\xrightarrow{0}$ $\#.R_{\{0,\#\}}$ $\xrightarrow{0}$ $x.R_{\{0,\#\}}$ $\xrightarrow{0}$ $R_{0,\#}$
$\#$
$\#$
h_{no}