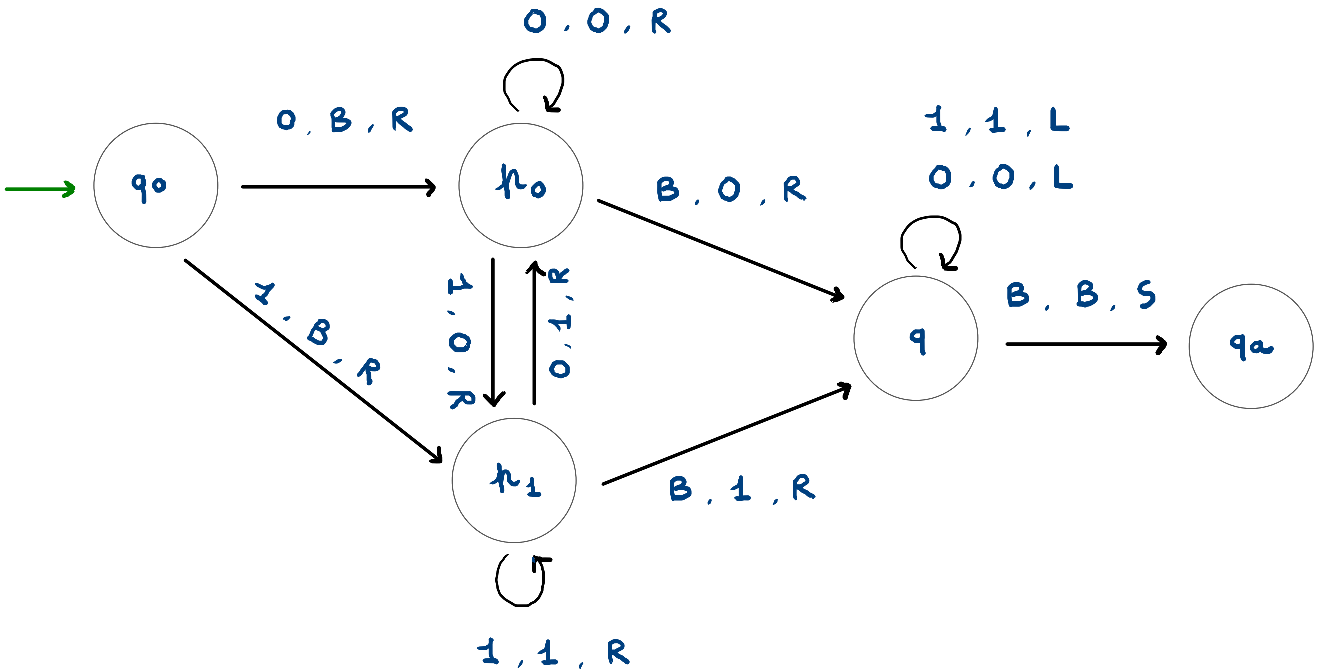
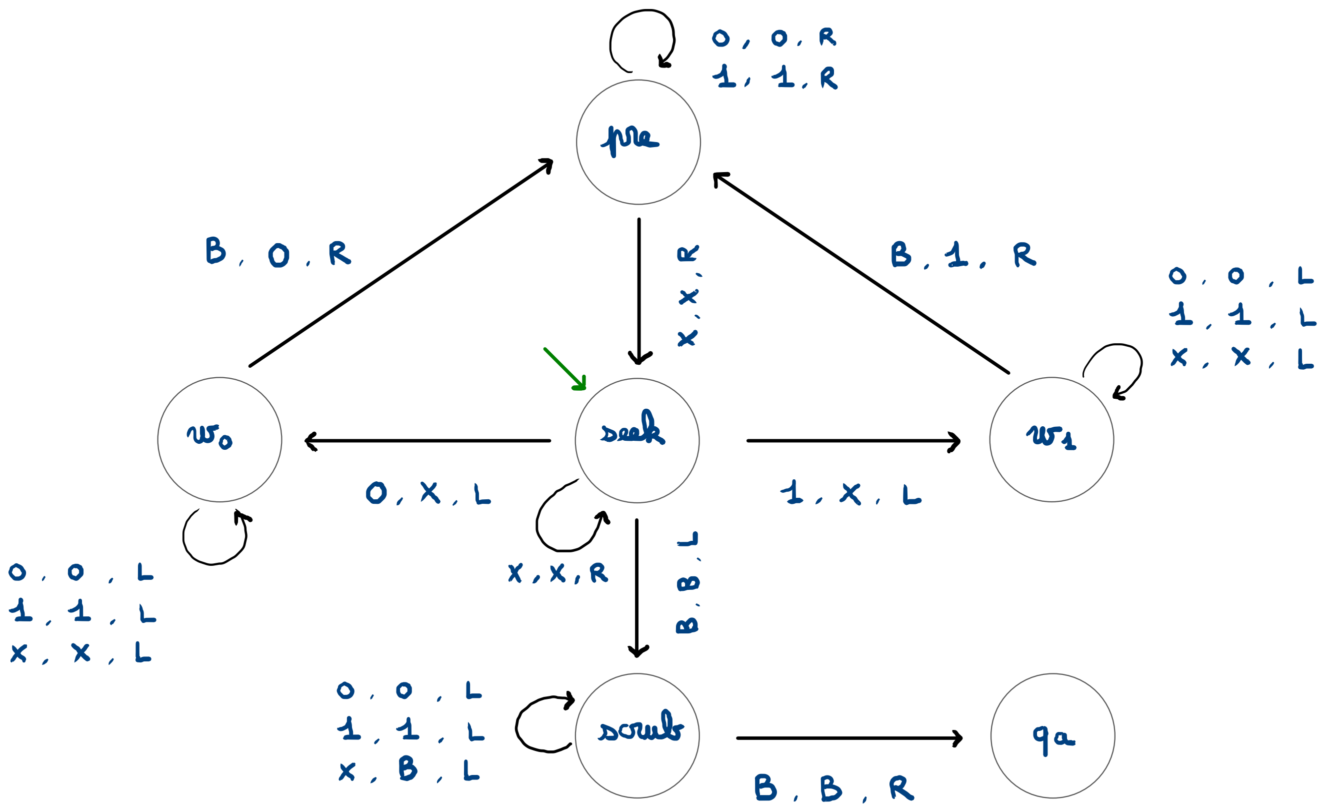
n° 1 . 1



n° 1 . 2


pre
seek
w0
w1
scrub
qa
0 , 0 , R
1 , 1 , R
B , 0 , R
B , 1 , R
X , X , R
0 , 0 , L
1 , 1 , L
X , X , L
0 , X , L
1 , X , L
X , X , R
B , B , L
0 , 0 , L
1 , 1 , L
X , X , L
0 , 0 , L
1 , 1 , L
X , B , L
B , B , R

n° 1 . 3

x_{-2} x_{-1} $\underset{\substack{\uparrow \\ q}}{x_0}$ x_1 x_2 becomes $\perp$ $\underset{\substack{\uparrow \\ q^+}}{\overset{x_0}{x_{-1}}}$ $\overset{x_1}{x_{-2}}$ $\dots$

positive universe
negative universe
$\perp$ end of tape

. $\Gamma' = \Gamma^2 \cup \{\perp\}$ 2 sub. cells per cells

. $Q' = Q^+ \cup Q^- \cup \{q_a\}$ two copies of Q

. if $\delta(q, x) = (q', y, L)$ then $\forall \alpha \in \Gamma$

$\delta'\left(q_+, \genfrac{}{}{0pt}{}{x}{\alpha}\right) = \left(q'_+, \genfrac{}{}{0pt}{}{y}{\alpha}, L\right)$

$\delta'\left(q_-, \genfrac{}{}{0pt}{}{\alpha}{x}\right) = \left(q'_-, \genfrac{}{}{0pt}{}{\alpha}{y}, R\right)$ reversed in the negative world

- $\forall q \in Q / \{q_a\}$

  $\delta'(q_+, \perp) = (q_-, \perp, R)$

  $\delta'(q_-, \perp) = (q_+, \perp, R)$

  switch worlds

- $\delta'(q_a^+, .) = (q_a, ., S)$

  $\delta'(q_a^-, .) = (q_a, ., S)$

  only one final state

- $q_0' = q_0^+$