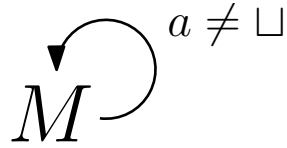
COMP3721 Tutorial 7

November 1, 2017

Problem 1

(1) Knowing that $M = (K, \Sigma, \delta, s, H)$, give the mathematical definition of the following Turing machine.



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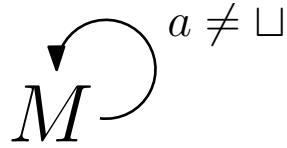

Solution:
$M' = (K', \Sigma, \delta', s, \{h'\})$ where

- $K' = K \cup \{h'\}$
- $\delta' = \delta \cup \{(h, a, s, a) : h \in H,\ a \neq \sqcup\} \cup \{(h, \sqcup, h', \sqcup)\}$

Problem 2

(2) Explain what this machine does on the input $\triangleright \sqcup w$.

$$>R \xrightarrow{a \neq \sqcup} R \xrightarrow{b \neq \sqcup} R_{\sqcup} a R_{\sqcup} b$$

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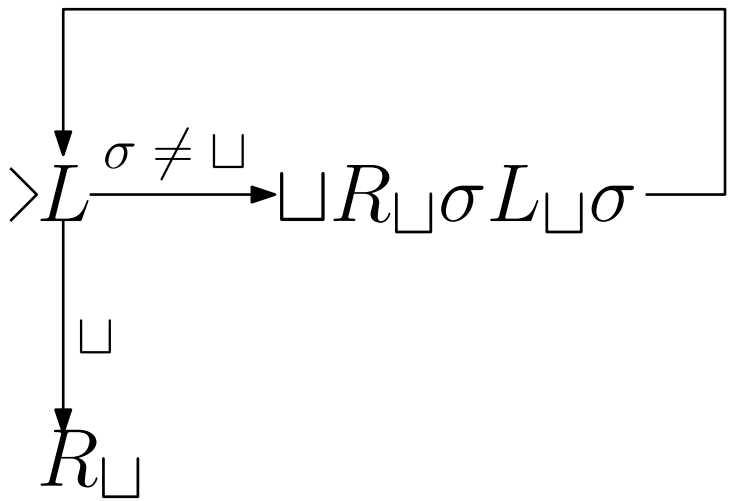
Solution:
If $|w| \geq 2$, then this machine copies the first two symbols of w, and paste them to the end of w.

Problem 3

(3) Trace the operation of the following Turing machine when started on $\triangleright\sqcup aabb\underline{\sqcup}$.



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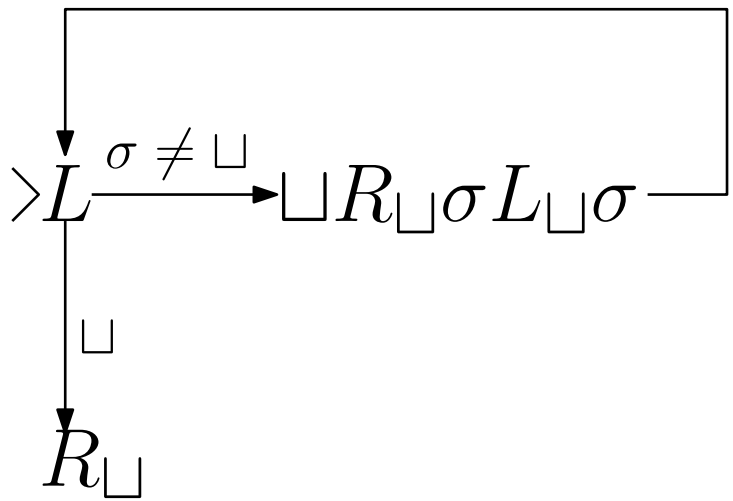

The output is $\triangleright\sqcup aabbbbaa\underline{\sqcup}$