

Theory of Computation

homework 1
Due: 9/30/2014

Problem 1 Why can't the input of a Turing Machine contain \sqcup s?

Ans: Otherwise, one will not know where the input ends. ■

Problem 2 The TM on p. 28 of the slides halts with a “yes” if and only if the input string contains two consecutive 1's. That program assumes the input alphabet $\Sigma = \{0, 1, \sqcup, \triangleright\}$. Now, write a TM program for the same problem when $\Sigma = \{0, 1, 2, \sqcup, \triangleright\}$.

Ans: Assume $M = (K, \Sigma, \delta, s)$, where $K = (s, s_1, h)$, $\Sigma = \{0, 1, 2, \sqcup, \triangleright\}$. Then

$p \in K$	$\sigma \in \Sigma$	$\delta(p, \sigma)$
s	\triangleright	$(s, \triangleright, \rightarrow)$
s	0	$(s, 0, \rightarrow)$
s	1	$(s_1, 1, \rightarrow)$
s	2	$(s, 2, \rightarrow)$
s_1	0	$(s, 0, \rightarrow)$
s_1	1	$(s_1, 1, -)$
s_1	2	$(s, 2, \rightarrow)$
s	\sqcup	$(h, \sqcup, -)$
s_1	\sqcup	$(h, \sqcup, -)$

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