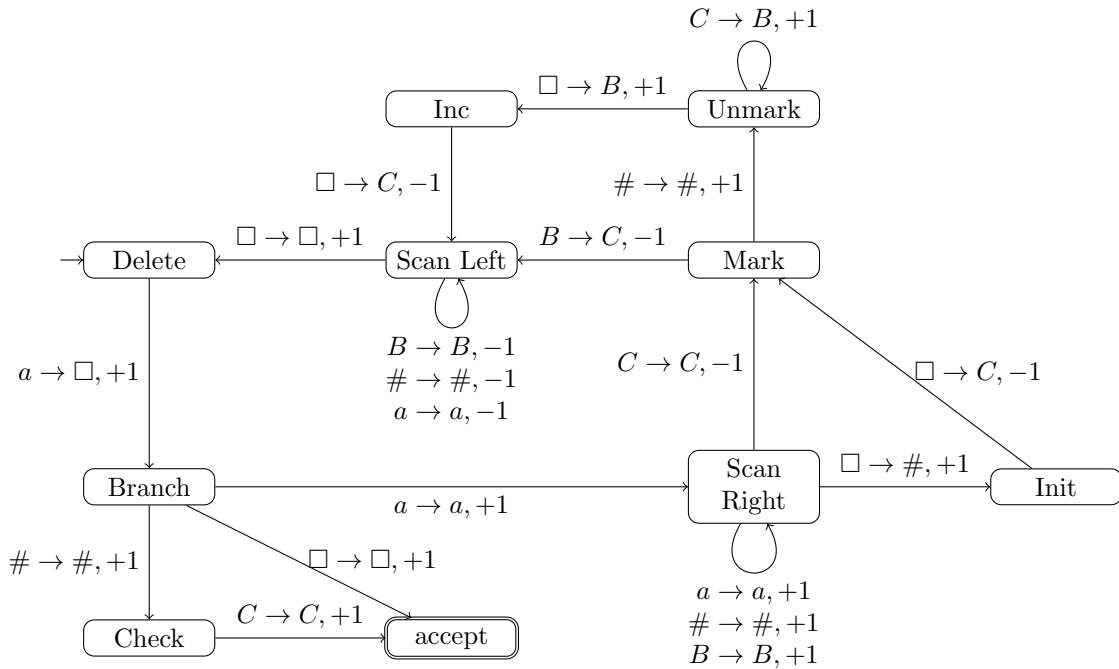# CS 374 Lab 8: Turing Machines

Date: February 9, 2018.

Problem 1. [Category: Comprehension] Consider the following Turing machine M over the input alphabet $\Sigma = \{a\}$. The reject state q_{rej} is not shown, and all "missing" transitions are assumed to go to q_{rej} as per

our convention.

1. Describe the computation of M on input $aaaa$ (4 a's) as a sequence of configurations.

2. What language does M recognize? Outline an informal justification for your answer. *Hint:* Recall that, $1 + 3 + 5 + \cdots + (2k - 1) = k^2$.

Problem 2. [Category: Design] Design a TM to recognize the language $\{a^i b^j c^k \mid k = i * j\}$.

Problem 3. [Category: Design] **Shifting symbols:** Design a TM M_k such that given input $w \in \Sigma^*$, M halts with the tape containing $\square^k w$.