Lecture 25 addendum

Copying machine C

Transforms:

<table>
<thead>
<tr>
<th>#</th>
<th>w</th>
<th>#</th>
</tr>
</thead>
</table>

(possibly empty)

Into

| # | w | # | w | # |


\[\begin{array}{c}
\text{L} \\
\text{R} \\
\text{R} \\
\text{L} \\
\text{L} \\
\text{R} \\
\text{L} \\
\hline
\text{a} \\
\text{a} \\
\text{a}
\end{array}\]

Left- and Right-Shifting TMs

\(S_L\) transforms \(#w#\) into \(w#\) (assumes \(w\) contains no blanks)

\(S_R\) transforms \(#w#\) into \(##w#\)

Note the starting position of the r/w head for each of the three machines just mentioned!!

Example. Design a TM that computes

\[f(n) = a^n b^n c^n, n \geq 1\] (where \(n\) is rep in unary)

sample initial config might be \(#111#\)
[Note: the TM given is almost right – but not quite. What’s wrong with it?]

Another example. How might you construct a multiplication machine?