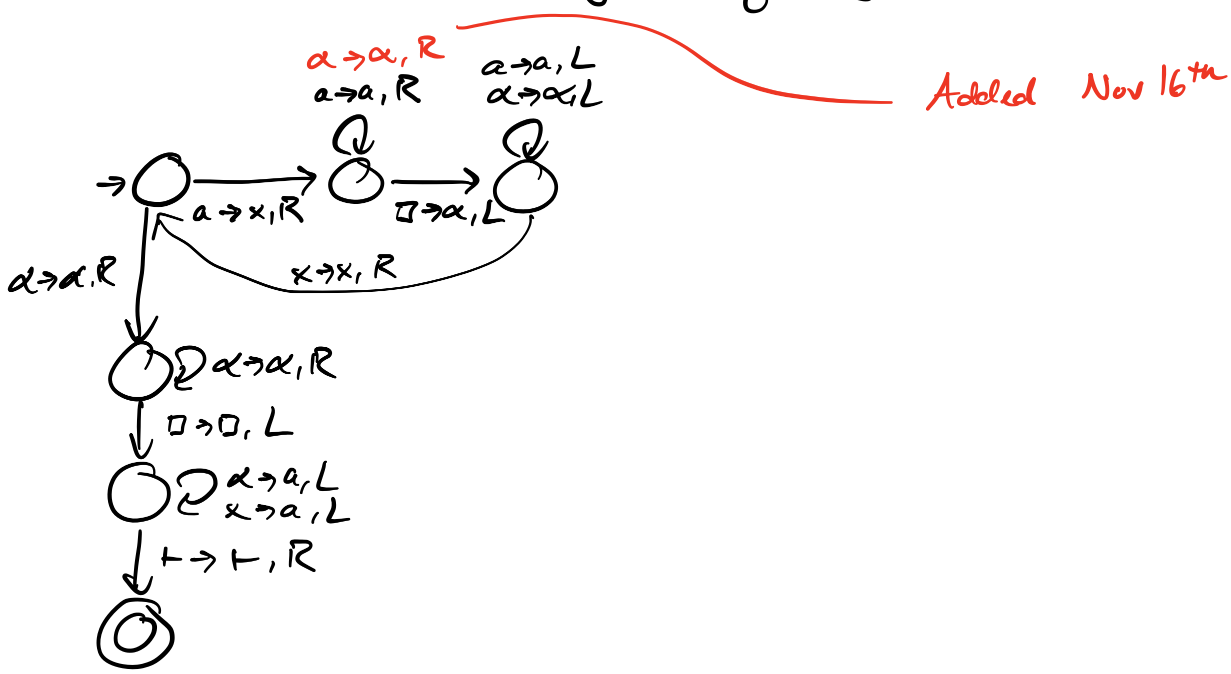
State transition diagram of copy(w)



Refining the definition of IC for TMs to account for edge cases:

Def An IC of a TM M is a string from $\{\vdash\} \cdot \Gamma^* \cdot Q \cdot \Gamma^* \cdot \{\square\}$
$\cup\, Q \cdot \{\vdash\} \cdot \Gamma^* \cdot \{\square\}$ (Edge case).

Def (Next-1 config relation $\xrightarrow[M]{1}$) Let M be a TM.
$q, p \in Q$, $u, v \in \Gamma^*$, $a, b, c \in \Gamma$

$\vdash u a q b v \square \xrightarrow[M]{1} \vdash u p a c v \square$ if $\delta(q, b) = (p, c, L)$

$\vdash u a q b v \square \xrightarrow[M]{1} \vdash u a c p v \square$ if $\delta(q, b) = (p, c, R)$

Edge cases : $\cdots q \square \xrightarrow[M]{1} \cdots b p \square$

$\vdash q w \xrightarrow[M]{1} q \vdash w$ → Only time, but must go R after

$\vdash q\, b v \square \xrightarrow[M]{} \vdash c\, p\, v \square$ if $\delta(q,b) = (p,c,R)$

$\vdash q\, b v \square \xrightarrow[M]{1} p \vdash c v \square$ if $\delta(q,b) = (p,c,L)$

new $\square$

$\vdash u a q \square \xrightarrow[M]{1} \vdash u p a b \square$ if $\delta(q,\square) = (p,b,L)$

$\vdash u a q \square \xrightarrow[M]{1} \vdash u a b p \square$ if $\delta(q,\square) = (p,b,R)$

new $\square$

$\vdash q \square \xrightarrow[M]{1} \vdash b q \square$ if $\delta(q,\square) = (p,b,R)$

$\vdash q \square \xrightarrow[M]{1} p \vdash b \square$ if $\delta(q,\square) = (p,b,L)$

$q \vdash v \square \xrightarrow[M]{1} \vdash q v \square$ if $\delta(q,\vdash) = (\underline{p,\vdash,R})$

only allowed transition.