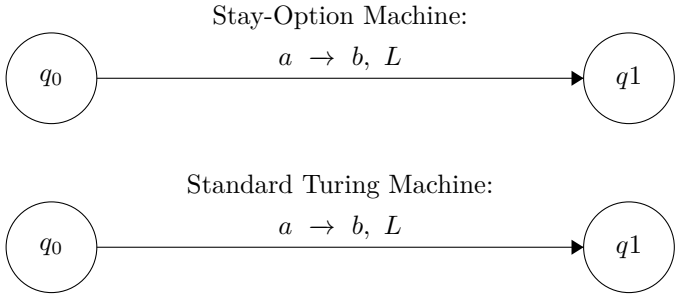
6. Proof that Turing machine where
δ: Q x $\Gamma^k \rightarrow$ Q x Γ^k x $\{L, R\}^k$
equals Turing machine where
δ: Q x $\Gamma^k \rightarrow$ Q x Γ^k x $\{L, R, S\}^k$

Trivially we can see that this should not affect the power of the machine as we can convert any Turing machine with the "stay" feature to one without it. We can do this by replacing every stay transition into two transitions: one that moves to the right and the second back to the left.

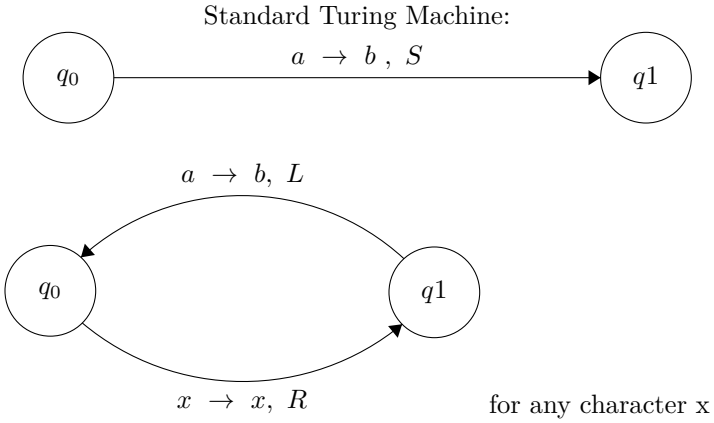
Proof:

Stay-option variant machines are at least as powerful as Standard Turing machines:
A standard Turing machine is also a stay-option variant it just never uses the S move.



The same argument applies here for right moves

Turing machines are at least as powerful as stay-option variant machines:



for any character x

Thus we have proven that a standard Turing machine is at least as powerful as the stay-option machine and that the stay-option machine is at least as powerful as the standard Turing machine proving that these machines will accept the same set of languages.