Turing Machine: 1-Tape with Trace - Exercise

Problem:

Recall that a Turing Machine that leads to a halt state is a computation. Consider the Turing Machine described below. Trace the input ab and determine whether or not the Turing Machine describes a computation.

δ (q_0, a) = (q_1, a, R),

δ (q_0, b) = (q_1, b, R),

δ (q_0, $\square$) = (q_1, $\square$, R),

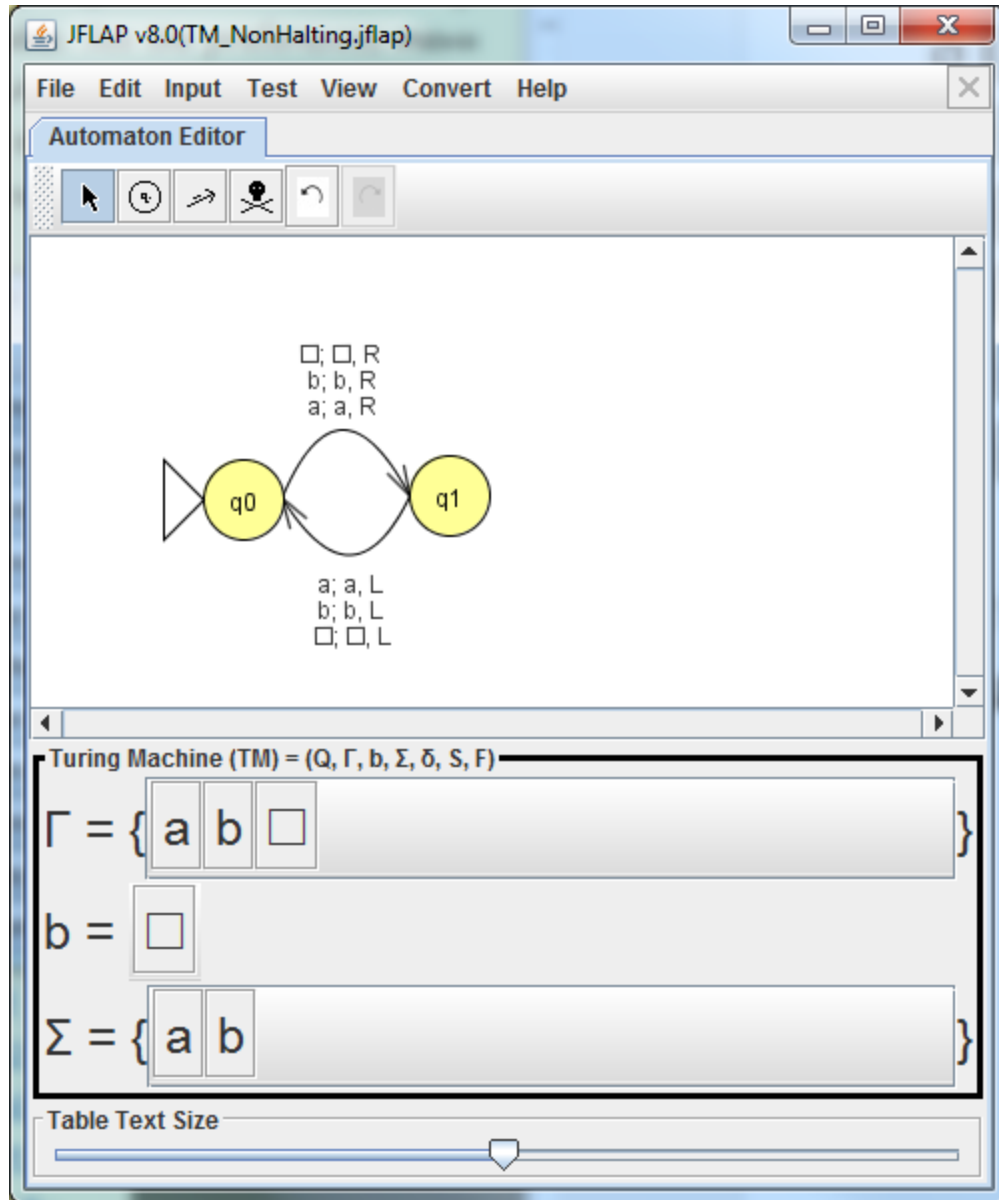δ (q_1, a) = (q_0, a, L),
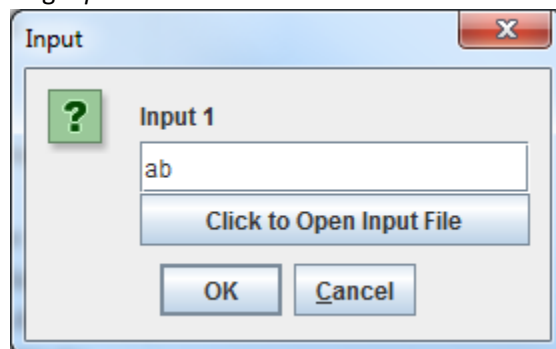
δ (q_1, b) = (q_0, b, L),

δ (q_1, $\square$) = (q_0, $\square$, L).
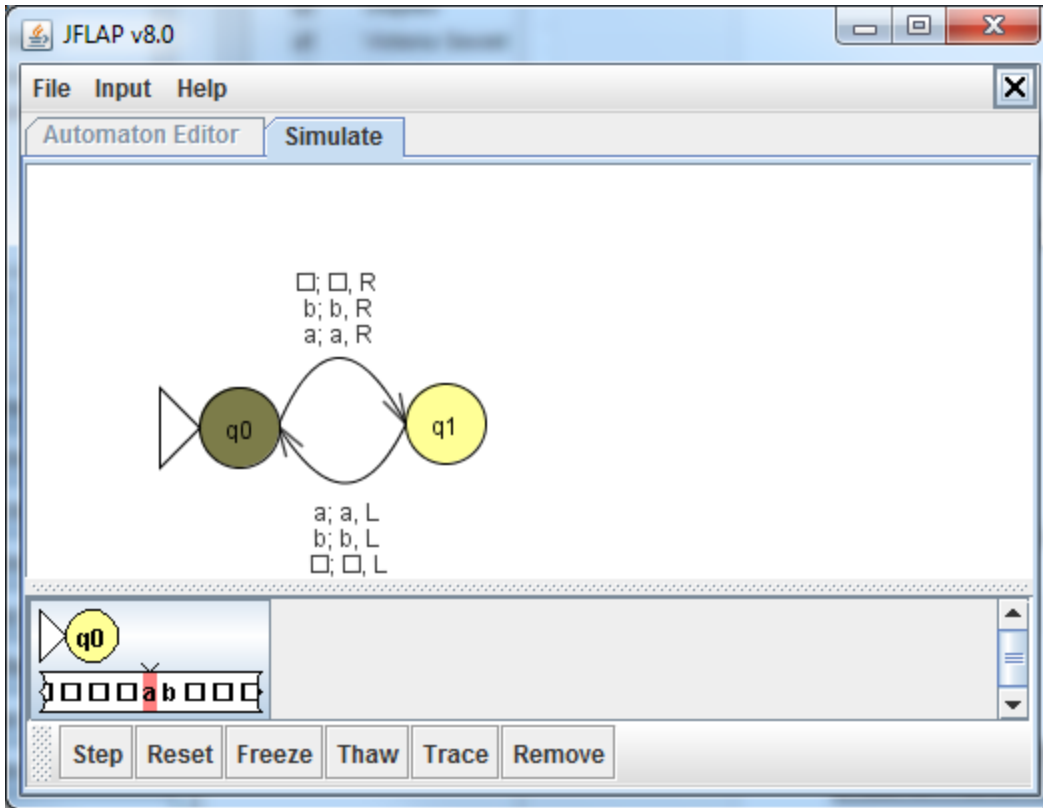
Solution:

We start by creating the Turing Machine provided on JFLAP. Open JFLAP, click on *Multi-Tape Turing Machine*, and then choose "1" as its number of tapes. Create two states and add the transitions as shown:
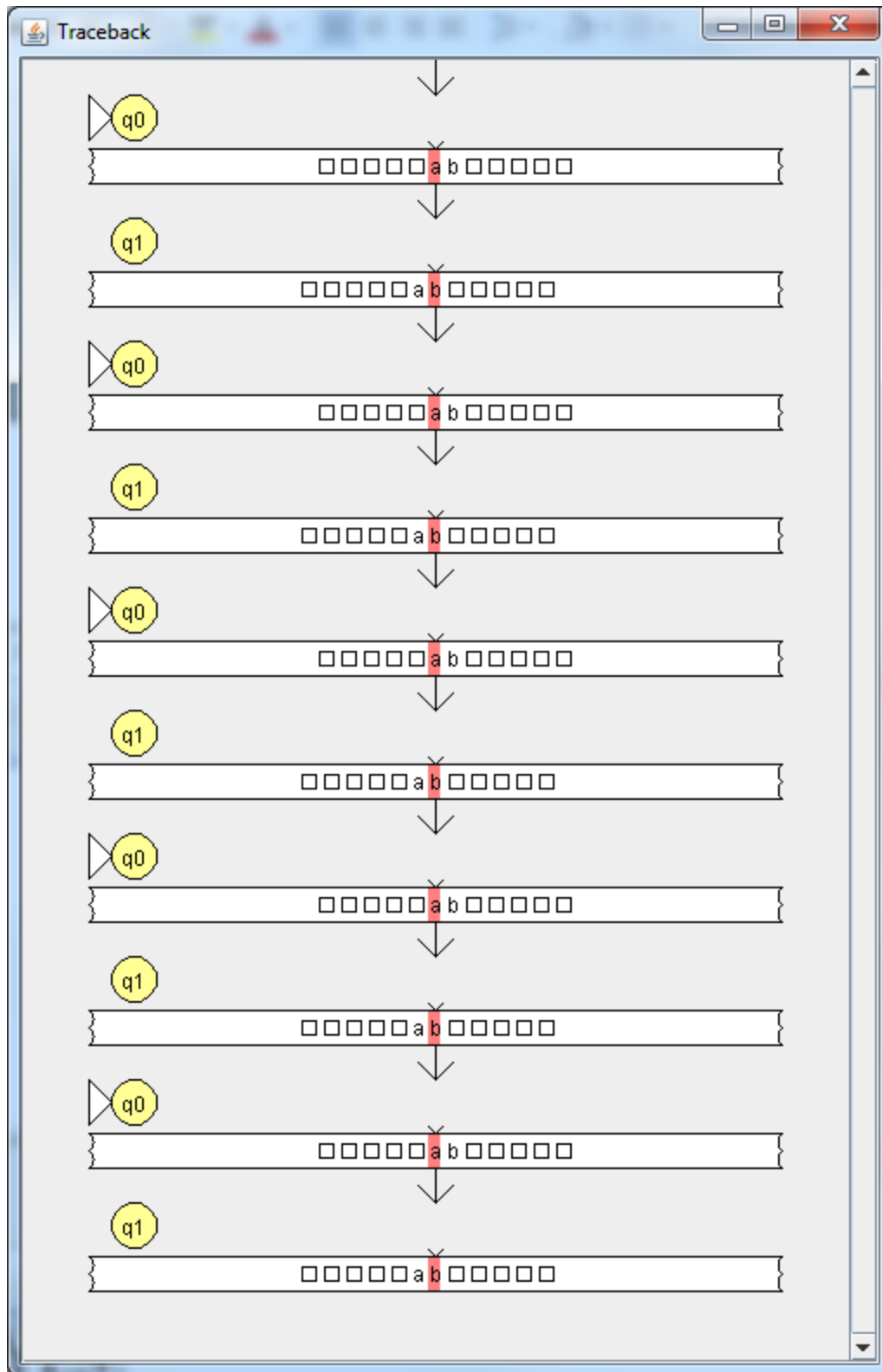
Enter the string ab as input using *Input*.

Upon clicking OK, JFLAP is now in simulation mode showing the first input symbol as the current symbol.

Click Step a few times (5 to 10). Next, select the configuration at the lower left corner and click *Trace*.

One would notice here that the trace is showing an infinite loop with only 2 unique configurations: q_0ab aq_1b q_0ab.

This is an example of an infinite loop and shows that the Turing Machine does not halt. Remember that those that halt describe a *computation*.