Convert Context-Free Grammar to Nondeterministic Pushdown Automata - Exercise

Problem:

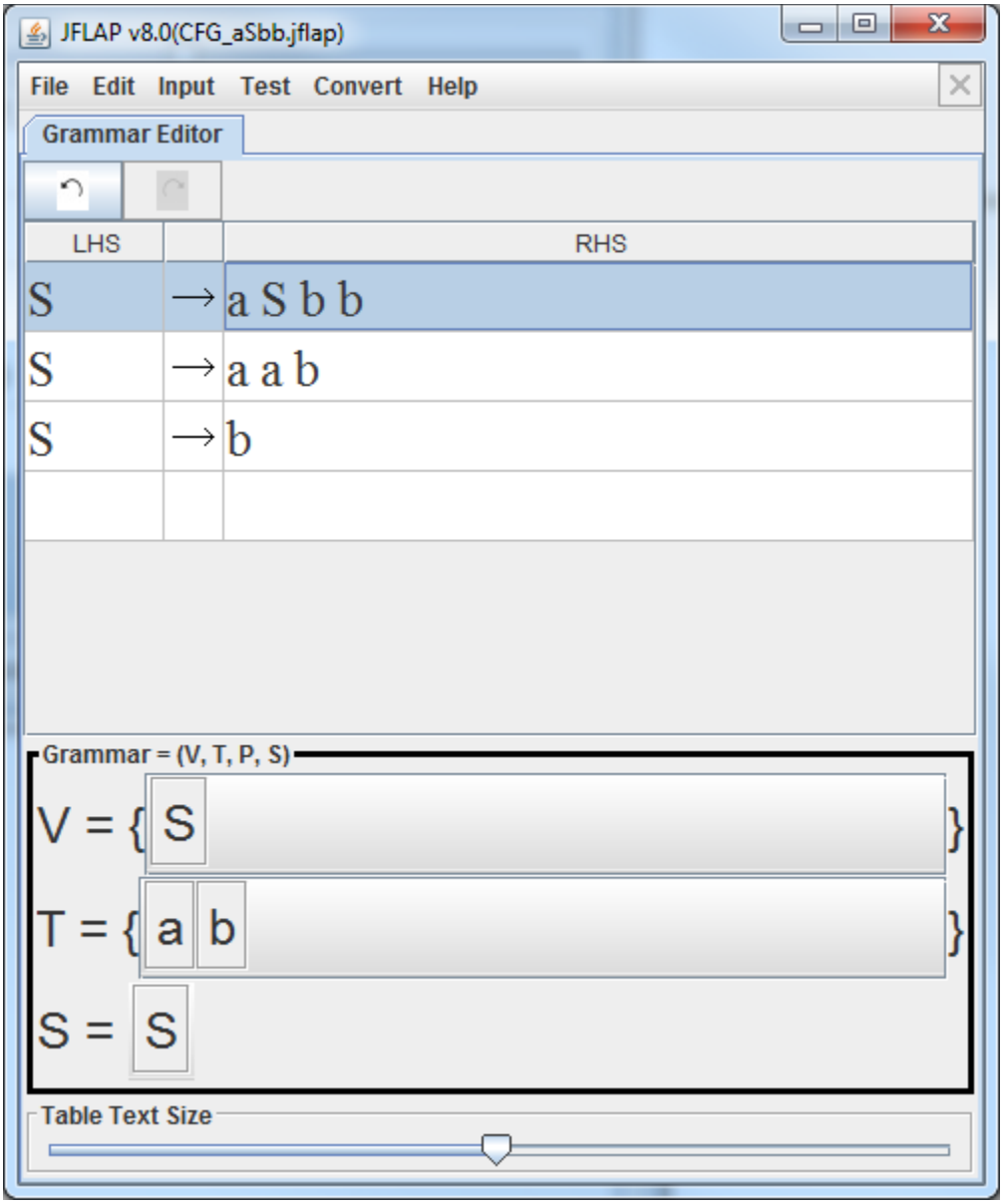
Given the context-free grammar

S → aSbb | aab | b,

build its equivalent nondeterministic pushdown automata using the LL parsing method.

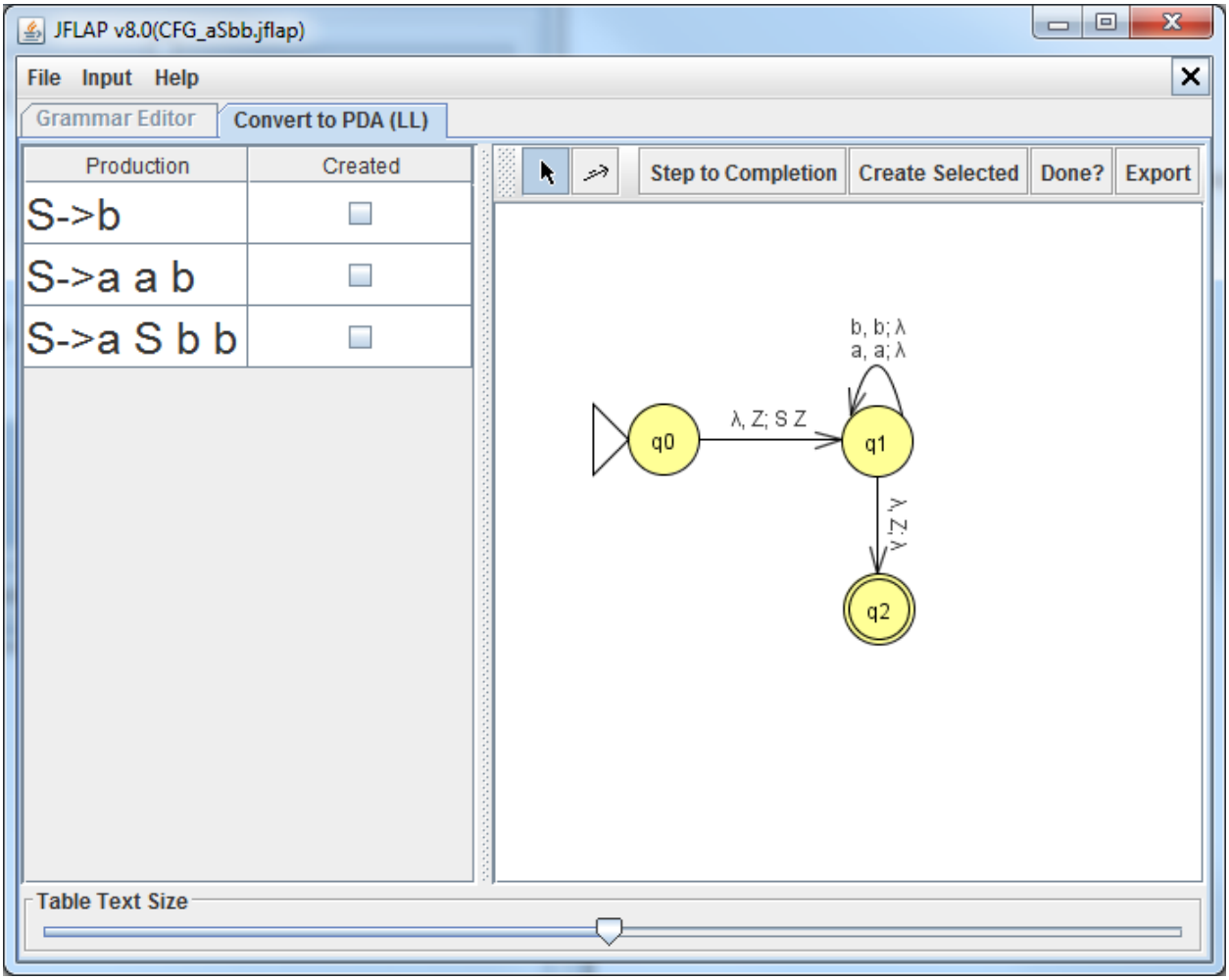
Solution:

To start, we create a JFLAP file for the given grammar.



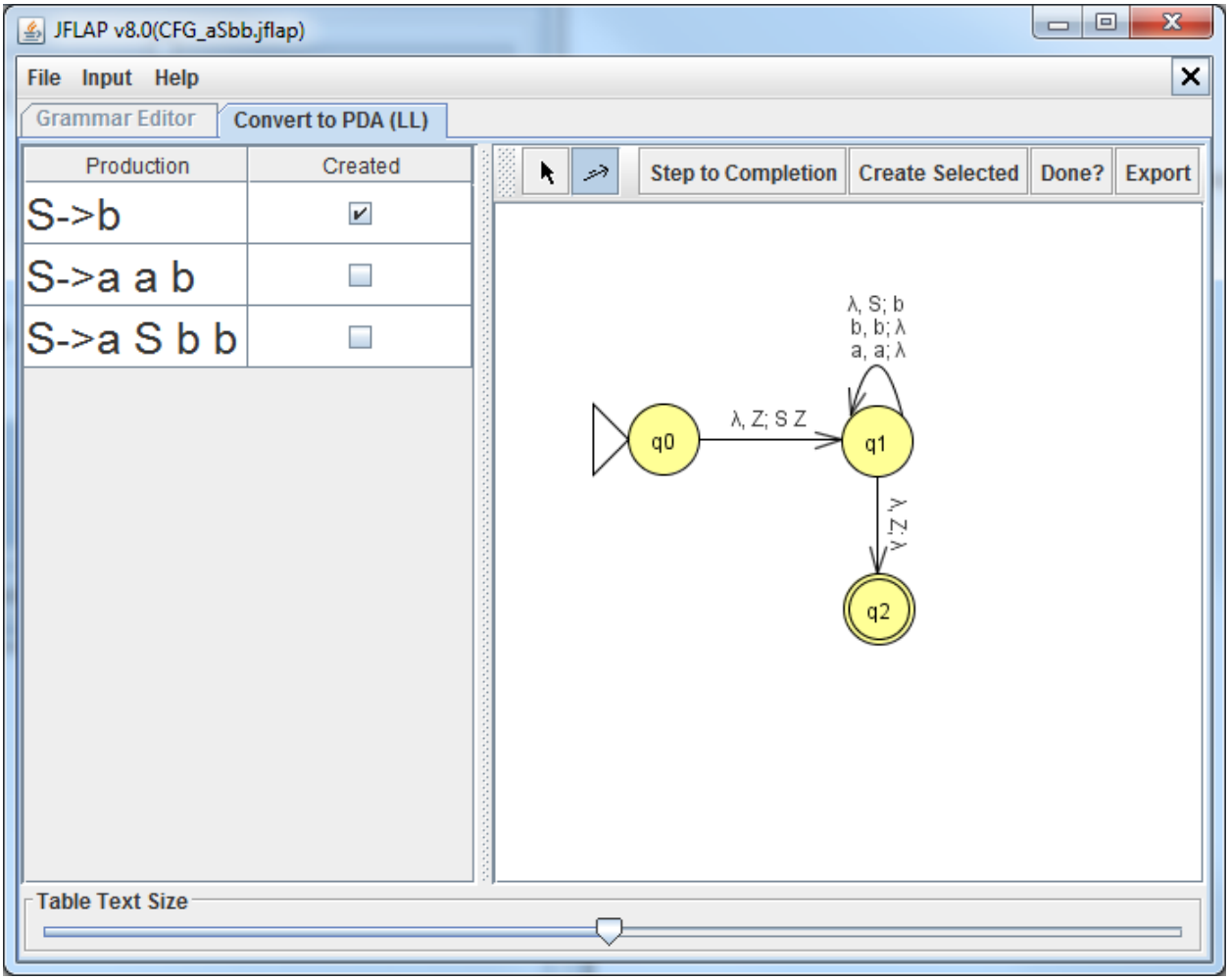
Once that is created, click *Convert* > *Convert CFG to PDA (LL)* on JFLAP.

This generates a partially completed pushdown automaton on the right side of the window. Rearrange the states so that it is visually easier to follow.



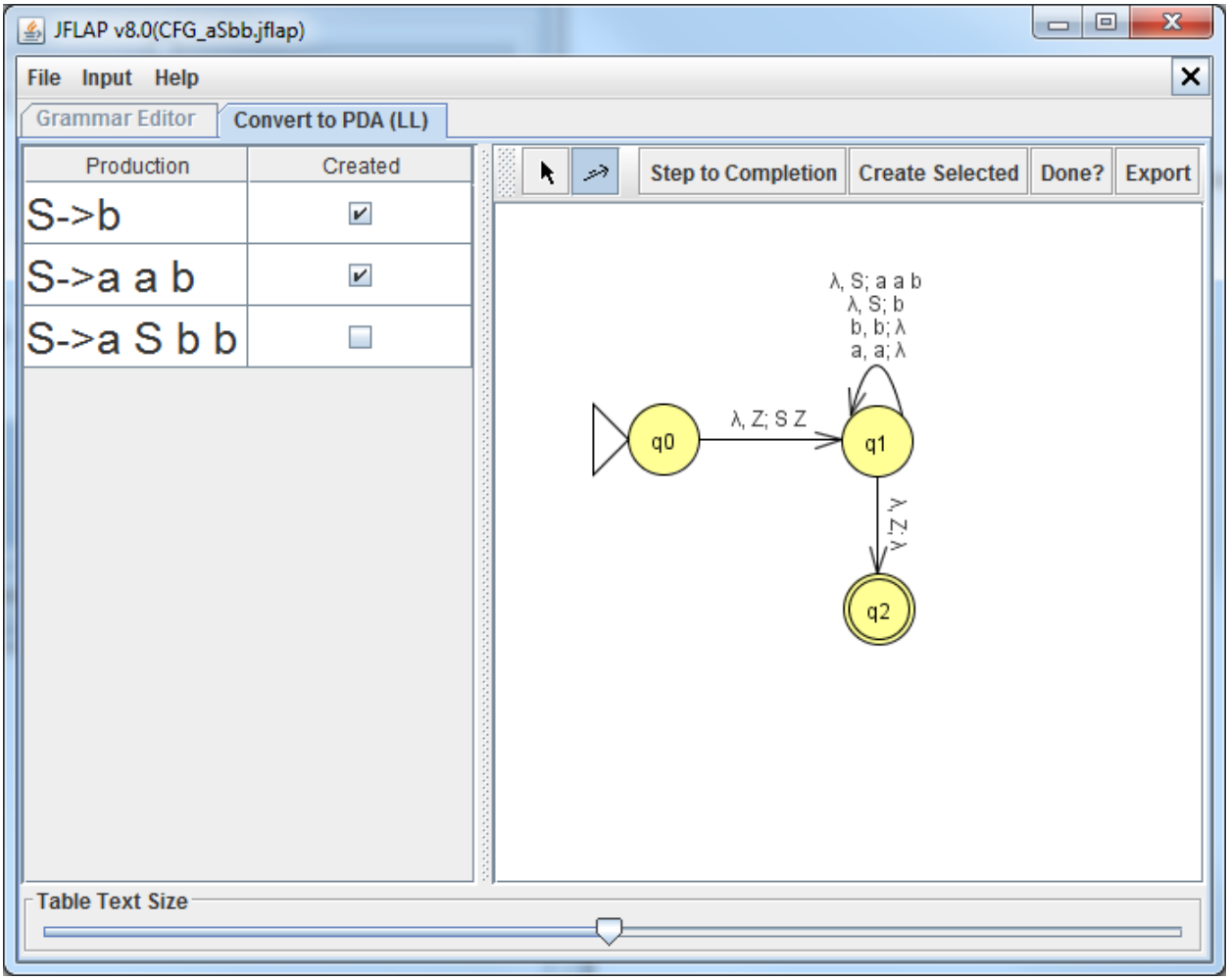
All production rules have been included in the partially complete automaton except for the rules that appear on the left side. For each of these rules (three in the example above), we will create loop transitions around state q1.

1. For S → b, add the transition using "λ, S; b".

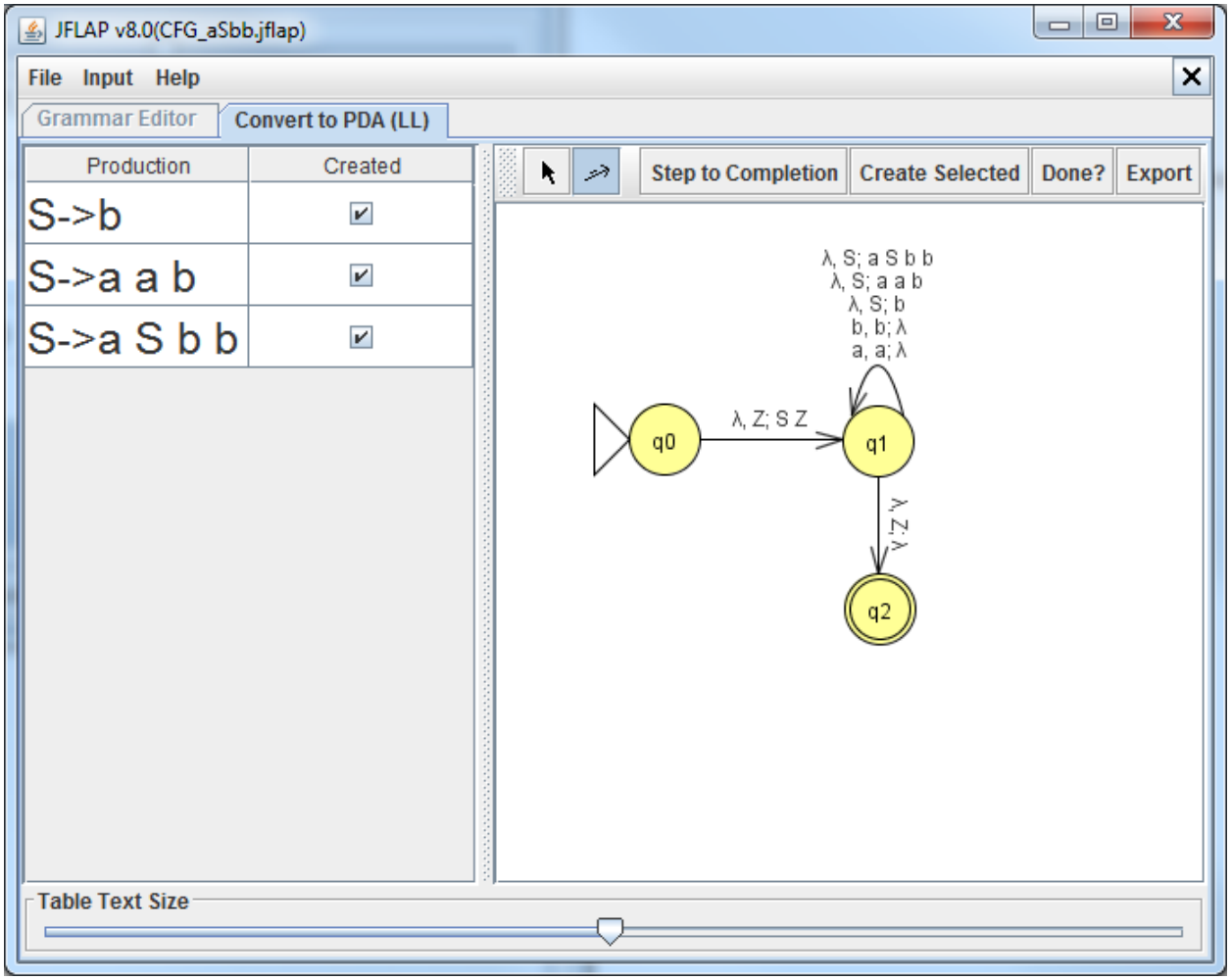


Note how the S → b rule on the left pane is checked automatically by JFLAP.

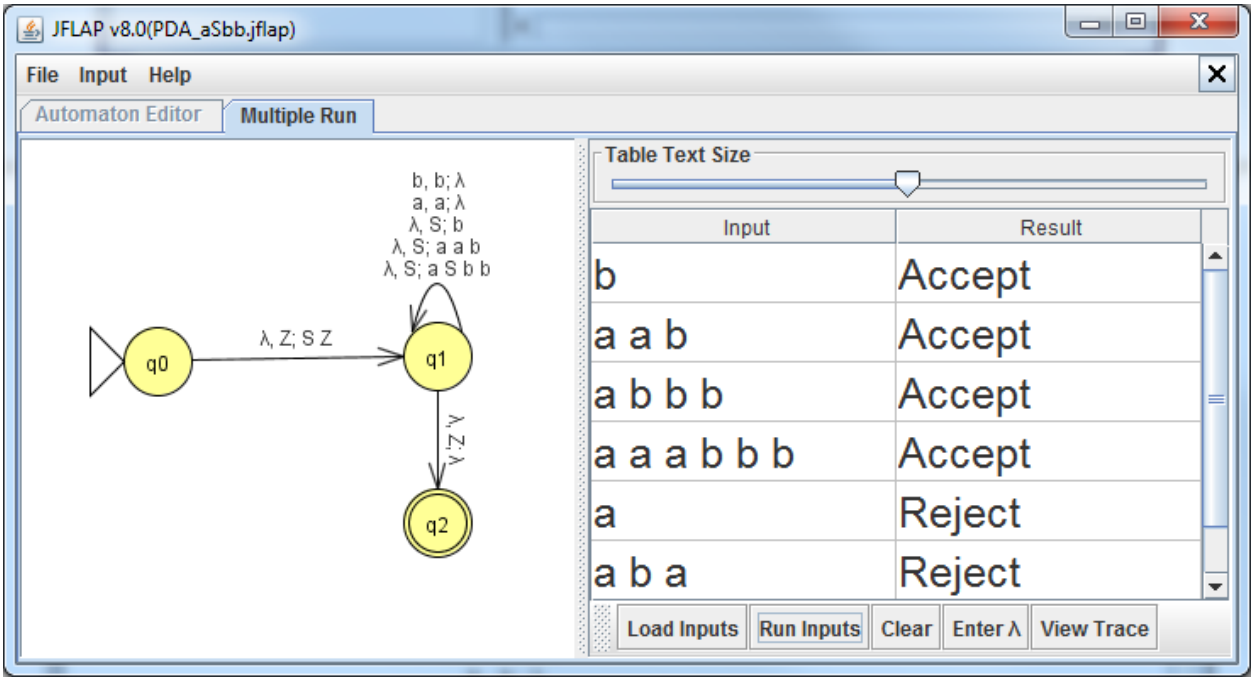
2. Add the transition "λ, S; aab" for S → aab.



3. Add the transition "λ, S; aSBB" for S → aSBB.



We have now transformed the context-free grammar to a pushdown automaton. Export the automaton to its own JFLAP file by clicking *Export*. Run some test strings using *Test* > *Multiple Run*. Verify the results against expected answers.


JFLAP v8.0(PDA_aSbb.jflap)
File Input Help
Automaton Editor
Multiple Run
b, b; λ
a, a; λ
λ, S; b
λ, S; a a b
λ, S; a S b b
q0
λ, Z; S Z
q1
λ, Z; λ
q2
Table Text Size
Input
Result
b
Accept
a a b
Accept
a b b b
Accept
a a a b b b
Accept
a
Reject
a b a
Reject
Load Inputs
Run Inputs
Clear
Enter λ
View Trace