Context Free Grammar Using User Control Parse$_{JP}$

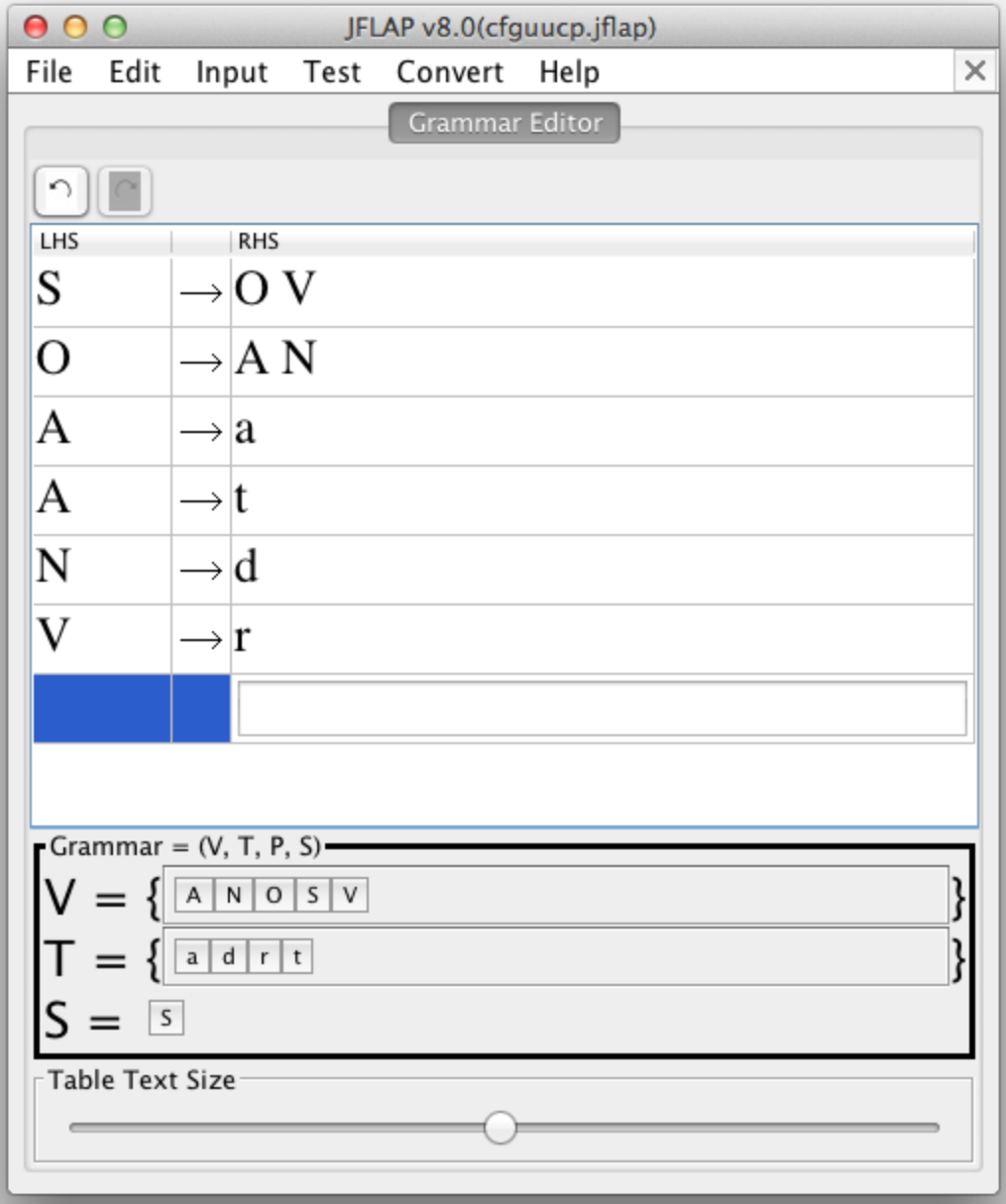
- Prerequisite knowledge:
  Context Free Grammar

JFLAP User Control Parse

Consider the following context-free grammar. (See: `cfguucp.jflap`)

V = { A, N, O, S, V }
T = { a, d, r, t }
S = S

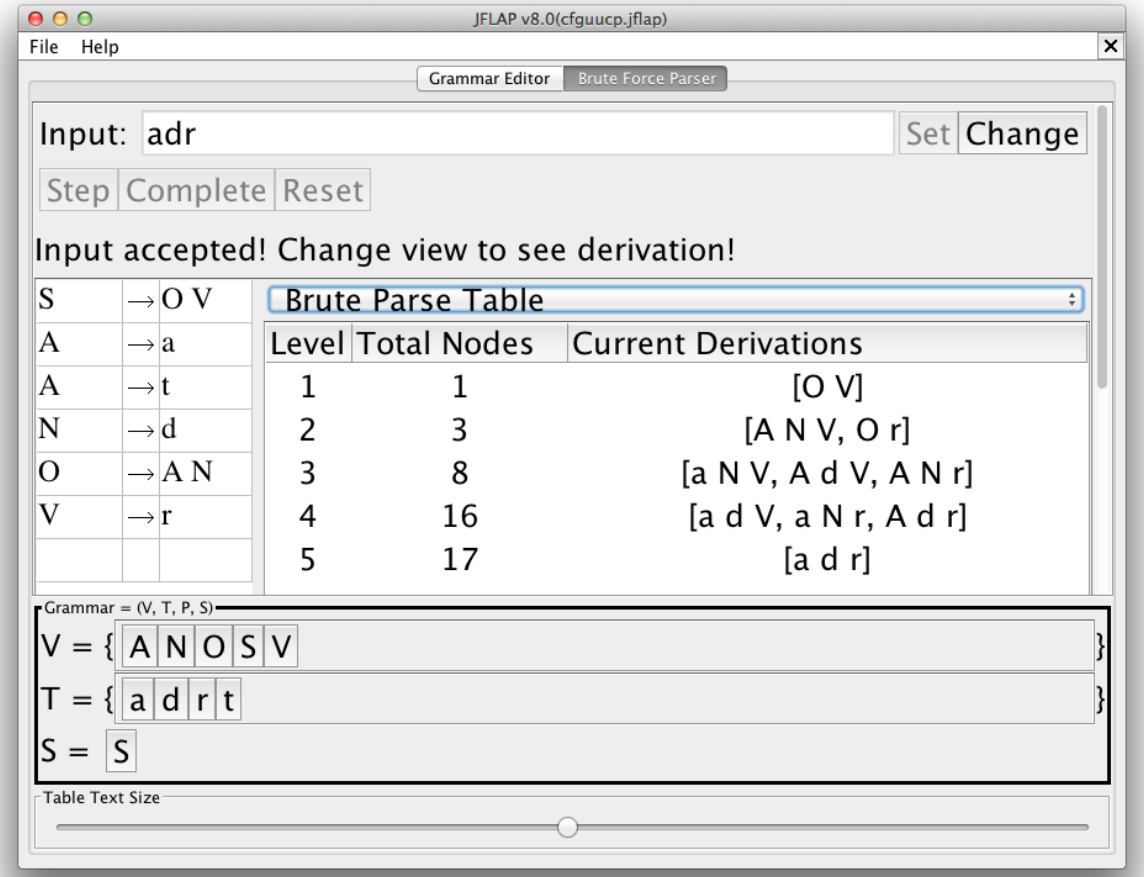
S → OV
O → AN
A → a
A → a
N → d
V → r

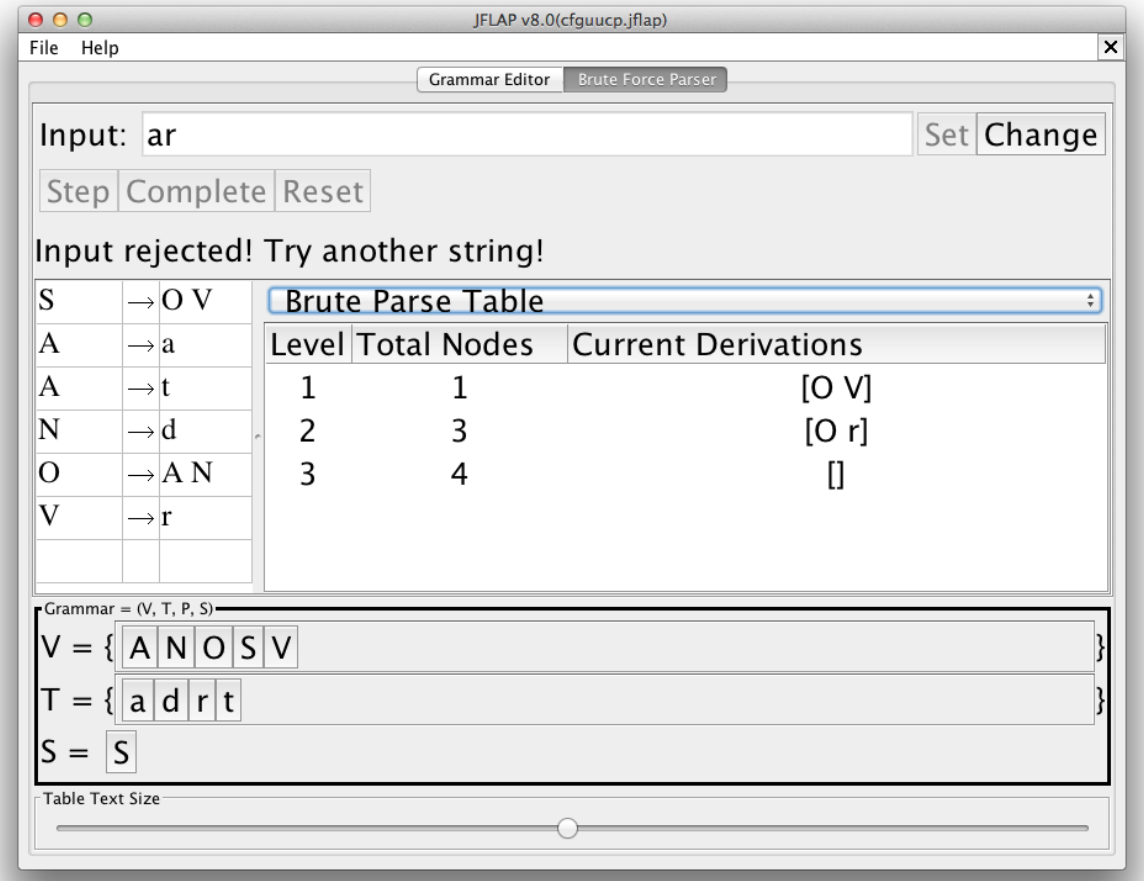


Use the Brute Force Parse to determine which of the following strings are in this language.

- adr
- tdr
- dr
- ar
- aadr

For example, here are the results for strings “adr” and “ar”.

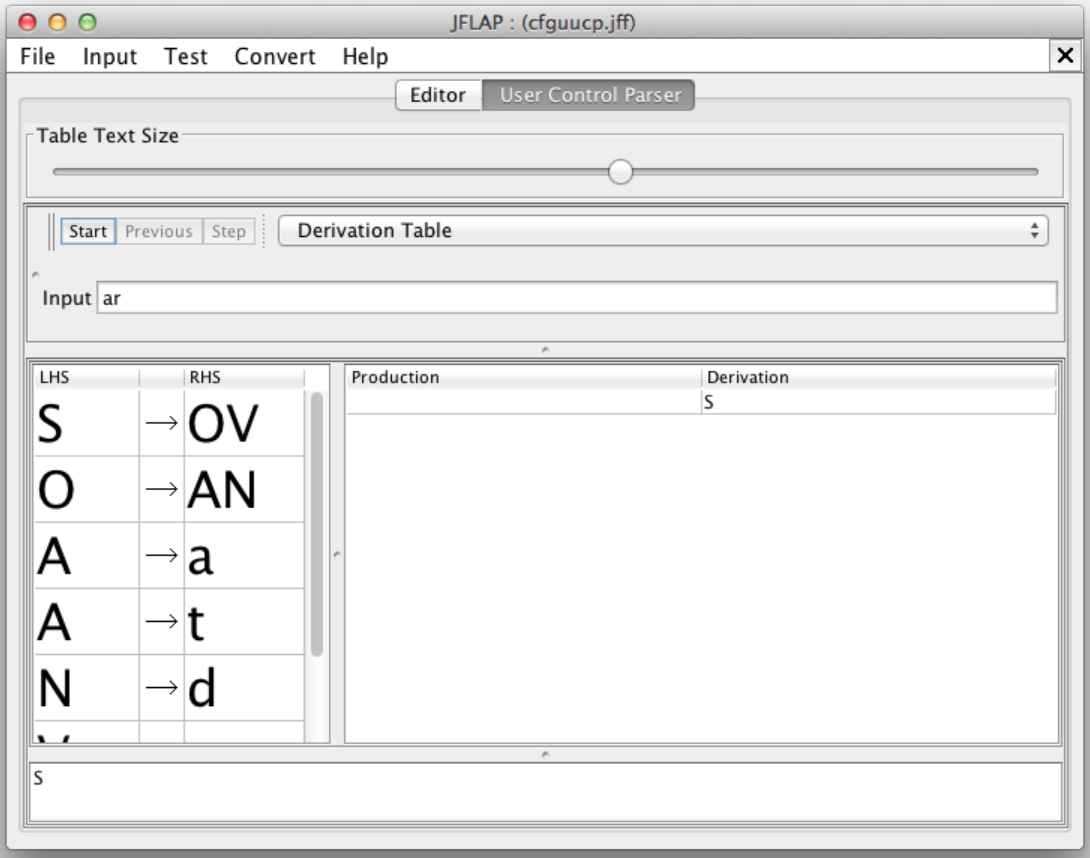

JFLAP v8.0(cfguucp.jflap)
File
Help
Grammar Editor
Brute Force Parser
Input: adr
Set
Change
Step
Complete
Reset
Input accepted! Change view to see derivation!
S → O V
A → a
A → t
N → d
O → A N
V → r
Brute Parse Table
Level
Total Nodes
Current Derivations
1
1
[O V]
2
3
[A N V, O r]
3
8
[a N V, A d V, A N r]
4
16
[a d V, a N r, A d r]
5
17
[a d r]
Grammar = (V, T, P, S)
V = { A N O S V }
T = { a d r t }
S = S
Table Text Size



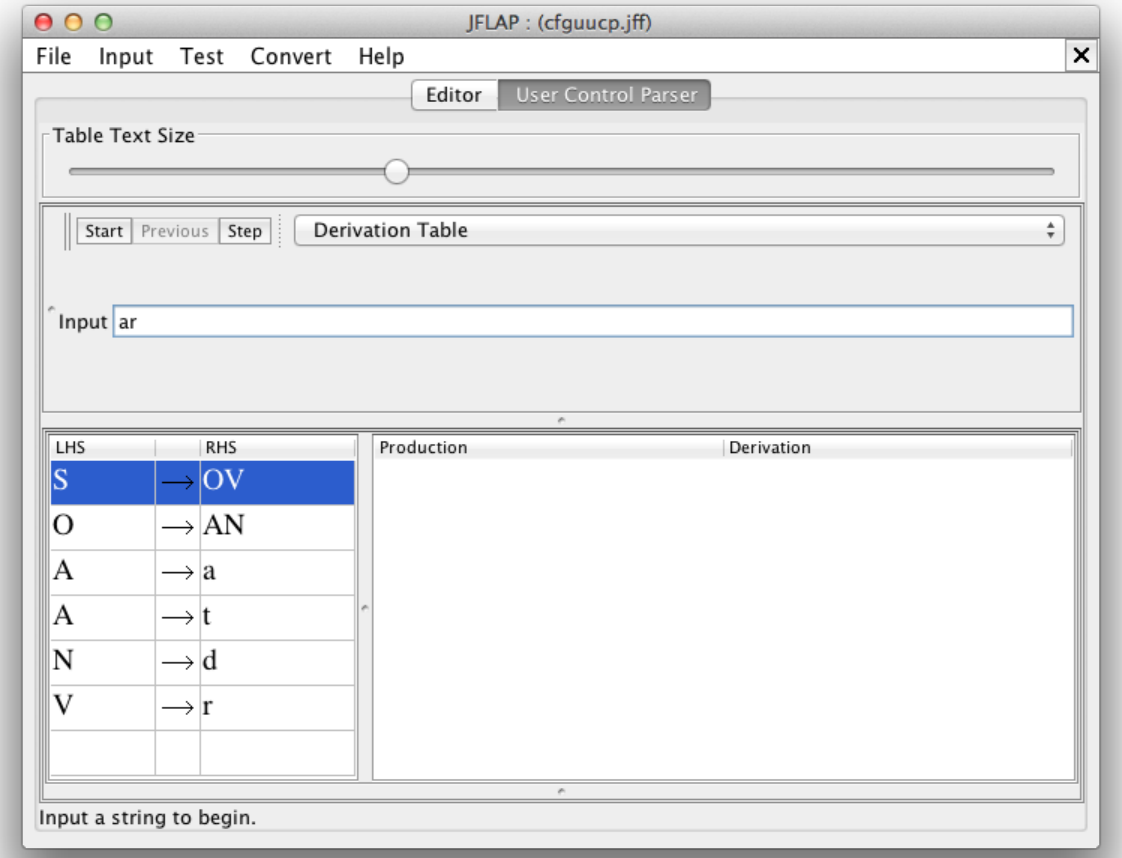
Consider the rejected string “ar”. Why is that string rejected?

JFLAP provides the User Control Parse feature to facilitate exploration of string derivations.

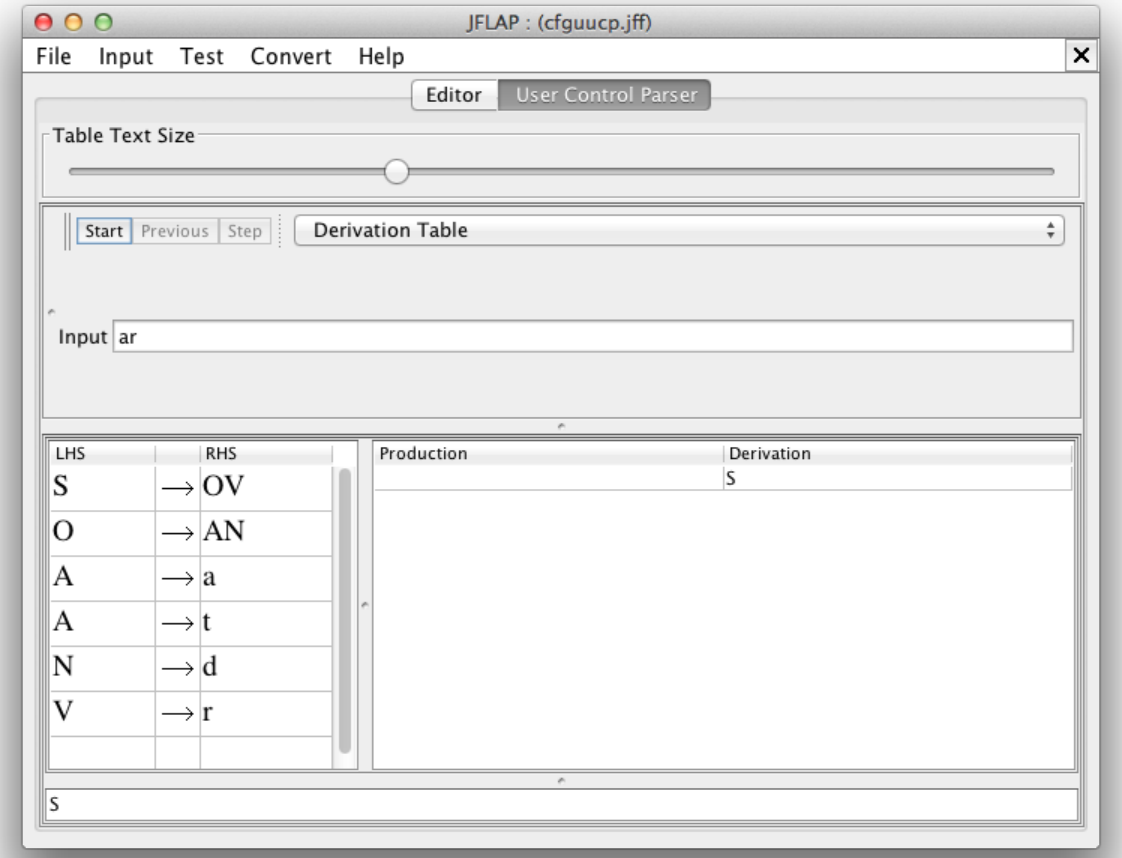
Return to the Grammar Editor and choose Input > User Control Parse.


JFLAP : (cfguucp.jff)
File
Input
Test
Convert
Help
Editor
User Control Parser
Table Text Size
Start
Previous
Step
Derivation Table
Input
ar
LHS
RHS
S → OV
O → AN
A → a
A → t
N → d
Production
Derivation
S
S

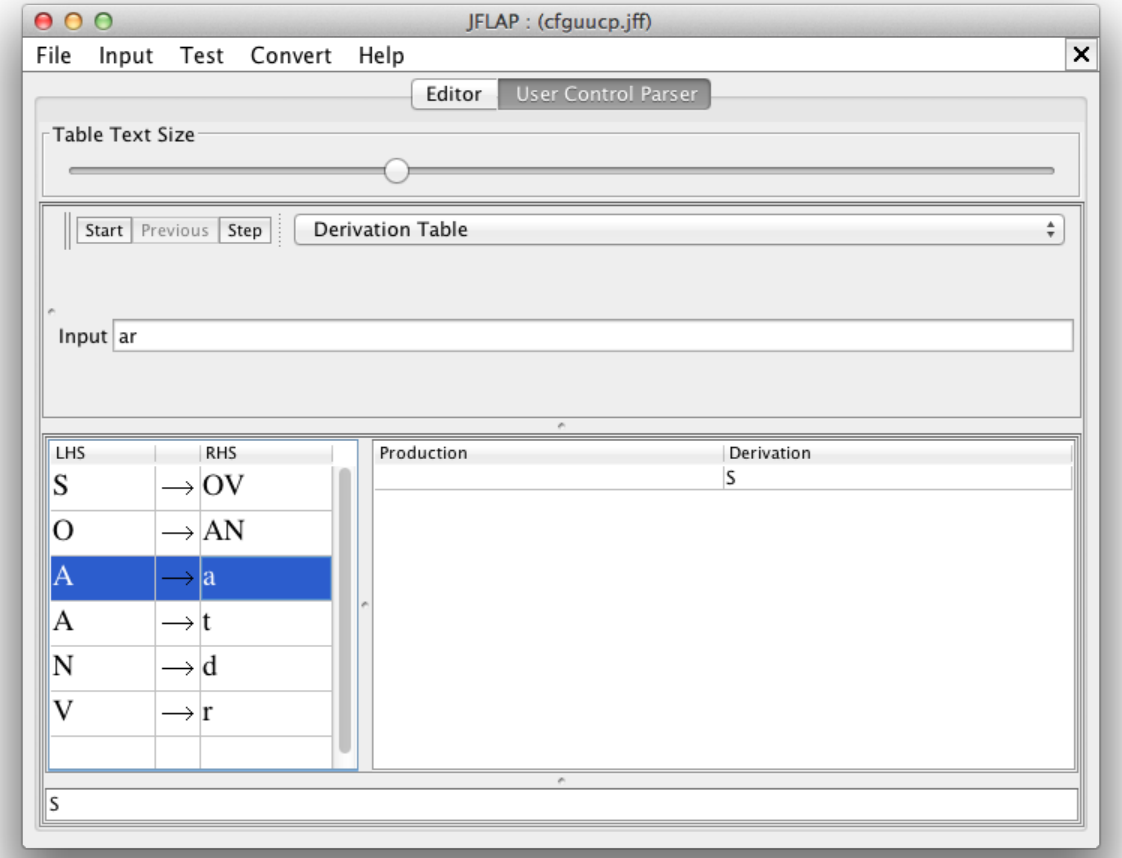
To begin, choose the rule with the start symbol on the left and click Start.

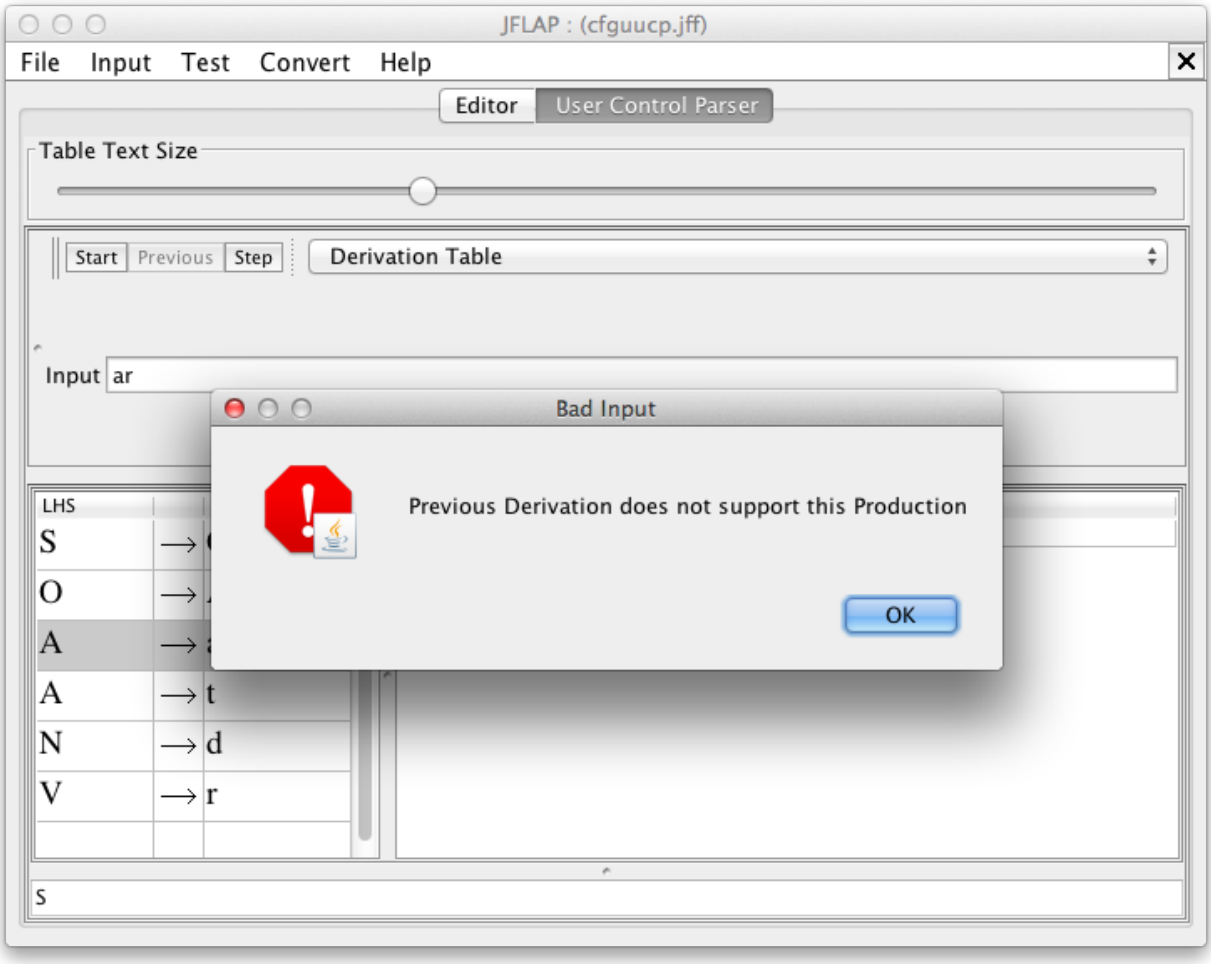


This results in showing the current state of the derivation, which is just S.

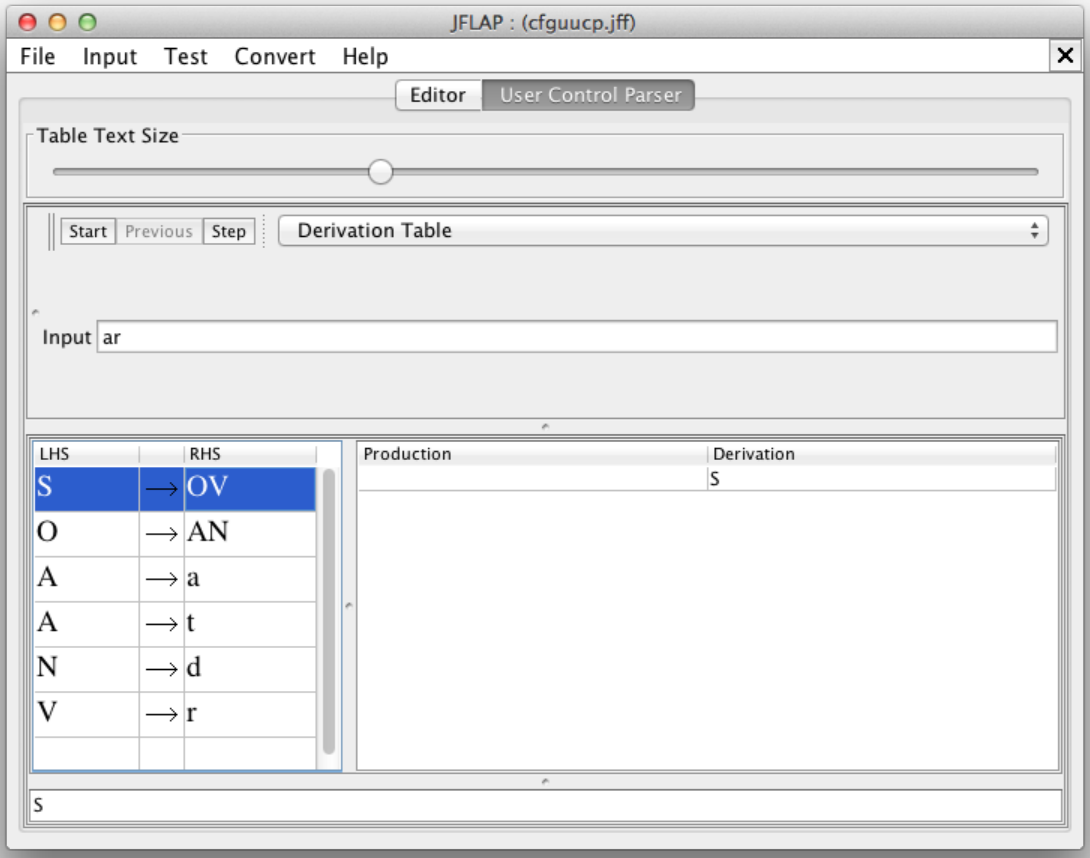


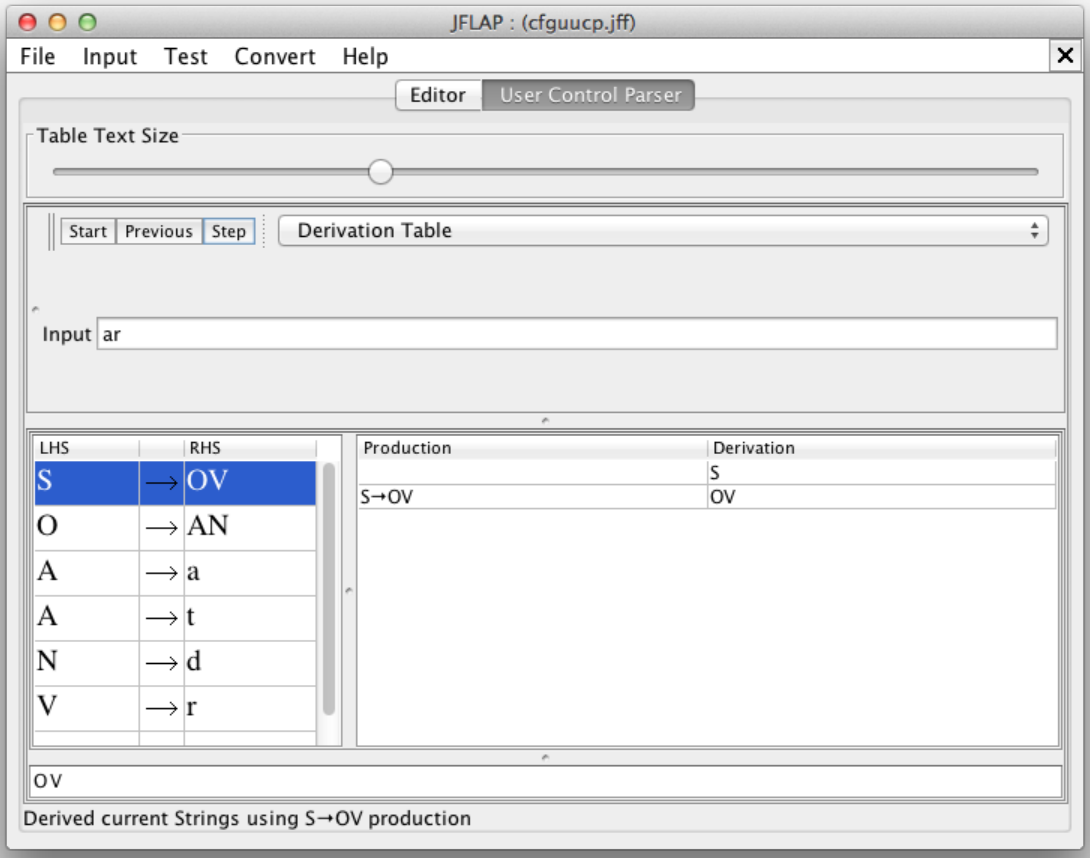
To continue the derivation, select a rule and click on Step. Note that selecting a rule that is not applicable will result in an error message, as shown in the next two images.

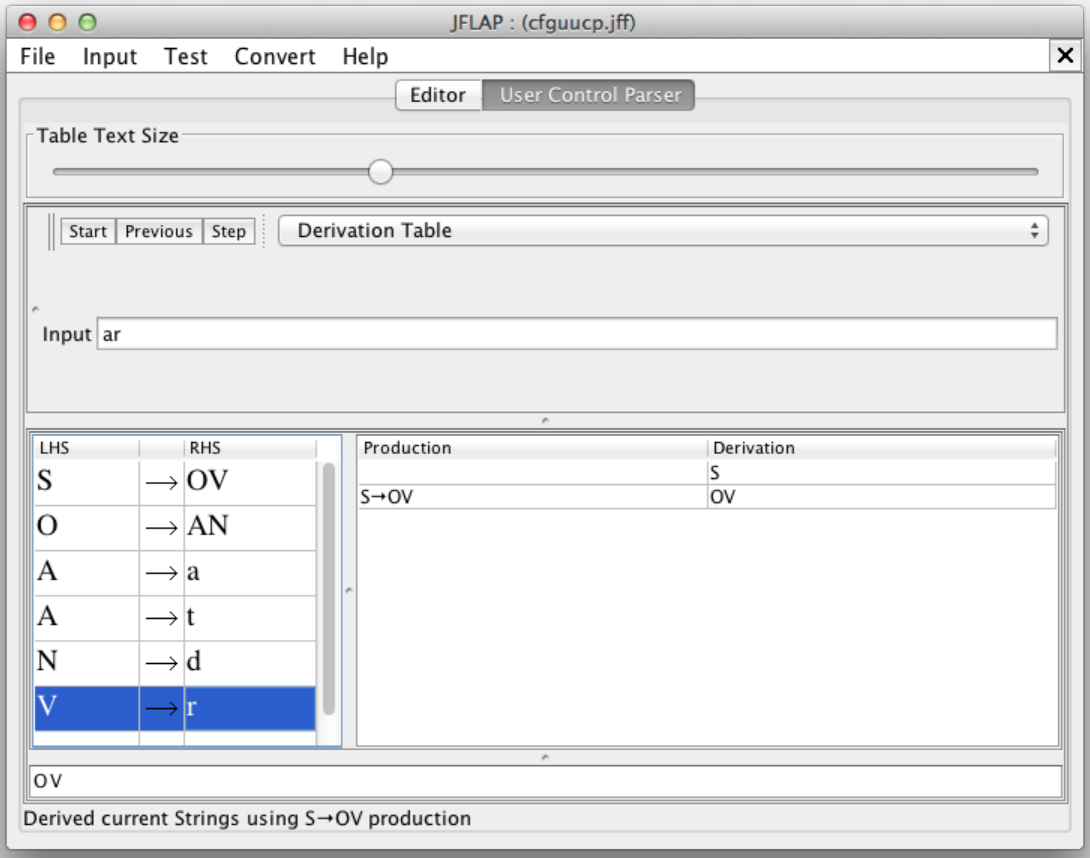


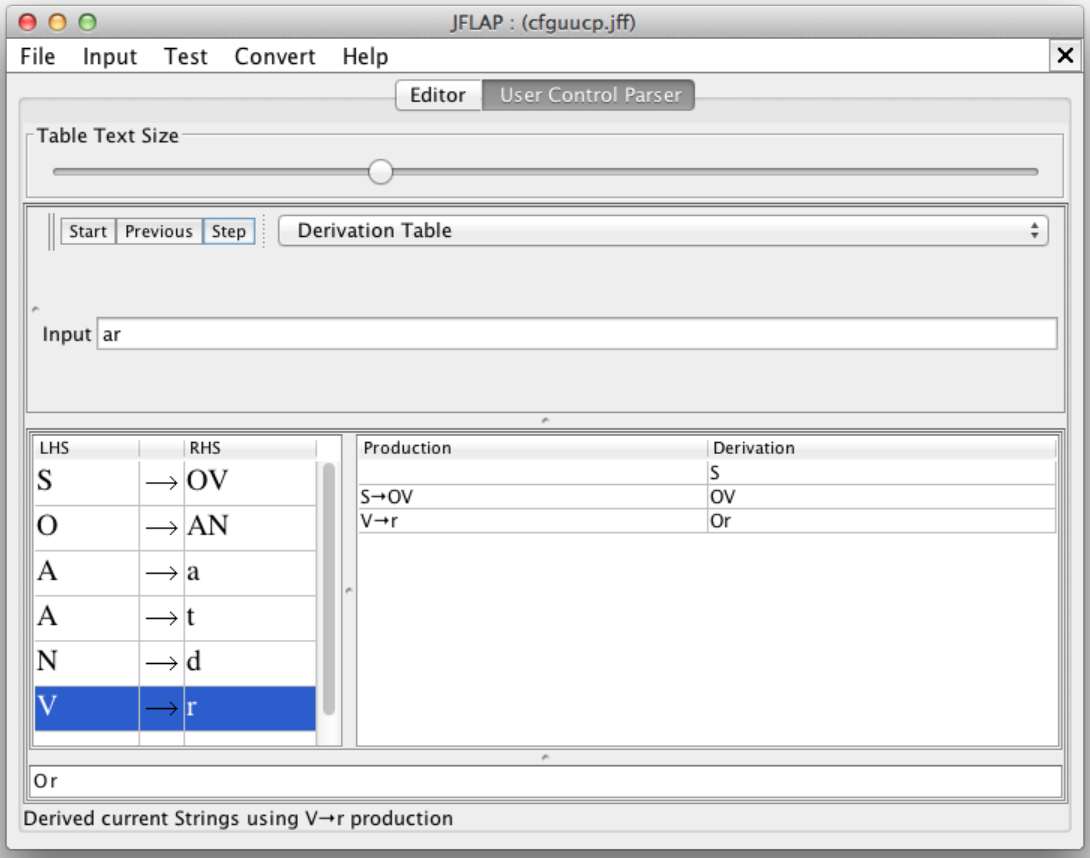


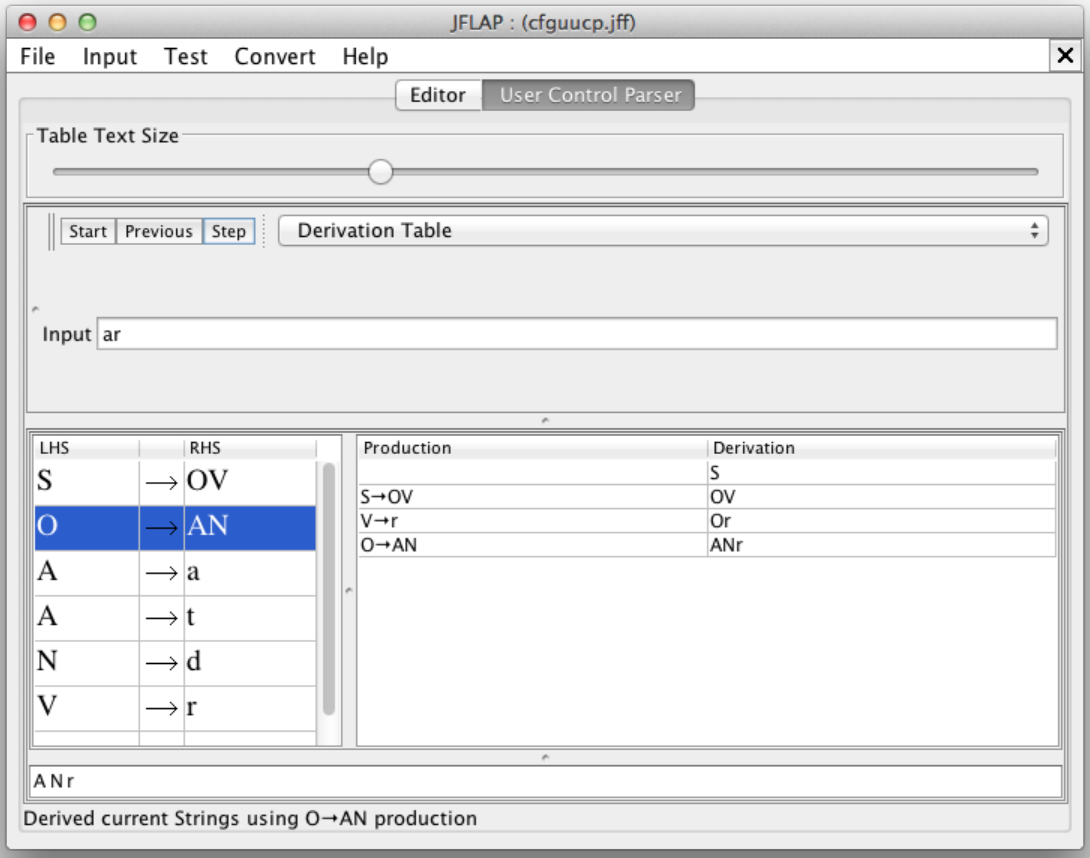
The following sequence of images demonstrates a potential derivation sequence.

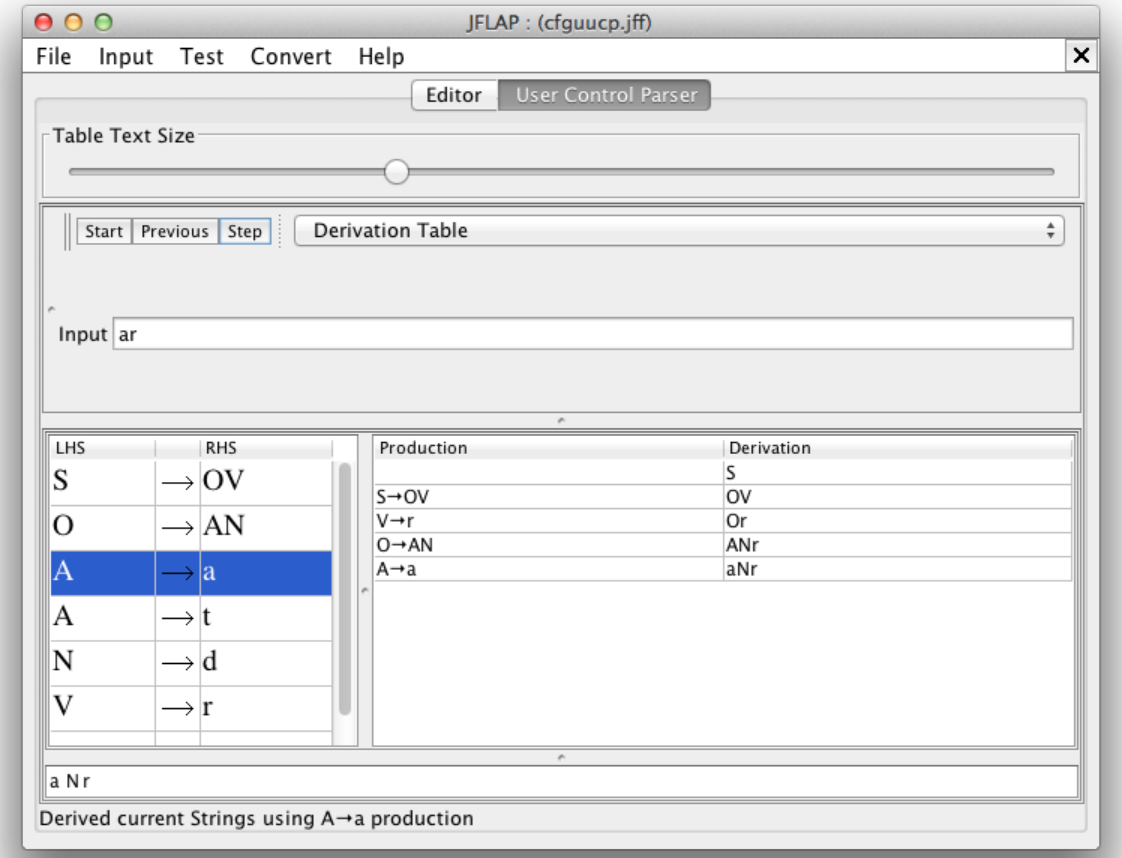

JFLAP : (cfguucp.jff)
File
Input
Test
Convert
Help
Editor
User Control Parser
Table Text Size
Start
Previous
Step
Derivation Table
Input
ar
LHS
RHS
S → OV
O → AN
A → a
A → t
N → d
V → r
Production
Derivation
S
S


JFLAP : (cfguucp.jff)
File
Input
Test
Convert
Help
Editor
User Control Parser
Table Text Size
Start
Previous
Step
Derivation Table
Input
ar
LHS
RHS
S
⟶
OV
O
⟶
AN
A
⟶
a
A
⟶
t
N
⟶
d
V
⟶
r
Production
Derivation
S
S→OV
OV
OV
Derived current Strings using S→OV production

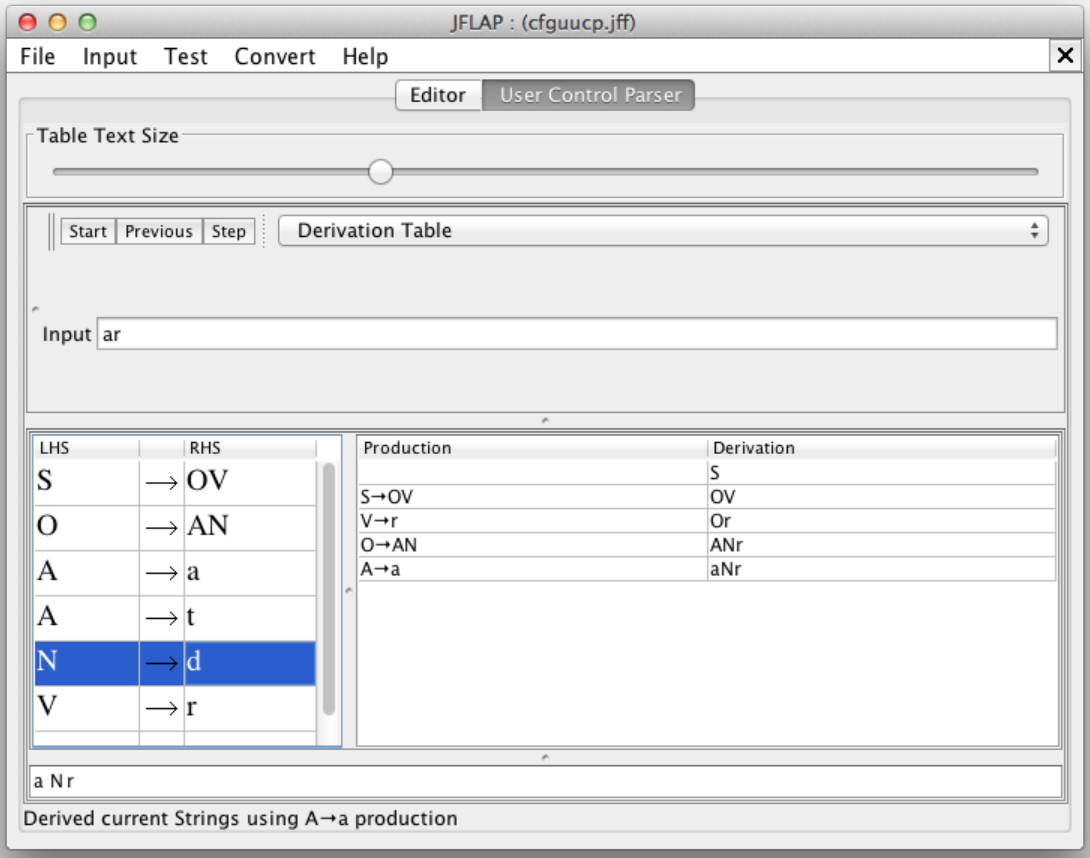

JFLAP : (cfguucp.jff)
File
Input
Test
Convert
Help
Editor
User Control Parser
Table Text Size
Start
Previous
Step
Derivation Table
Input
ar
LHS
RHS
S → OV
O → AN
A → a
A → t
N → d
V → r
Production
Derivation
S
S→OV
OV
OV
Derived current Strings using S→OV production


JFLAP : (cfguucp.jff)
File
Input
Test
Convert
Help
Editor
User Control Parser
Table Text Size
Start
Previous
Step
Derivation Table
Input
ar
LHS
RHS
S → OV
O → AN
A → a
A → t
N → d
V → r
Production
Derivation
S
S→OV
OV
V→r
Or
Or
Derived current Strings using V→r production

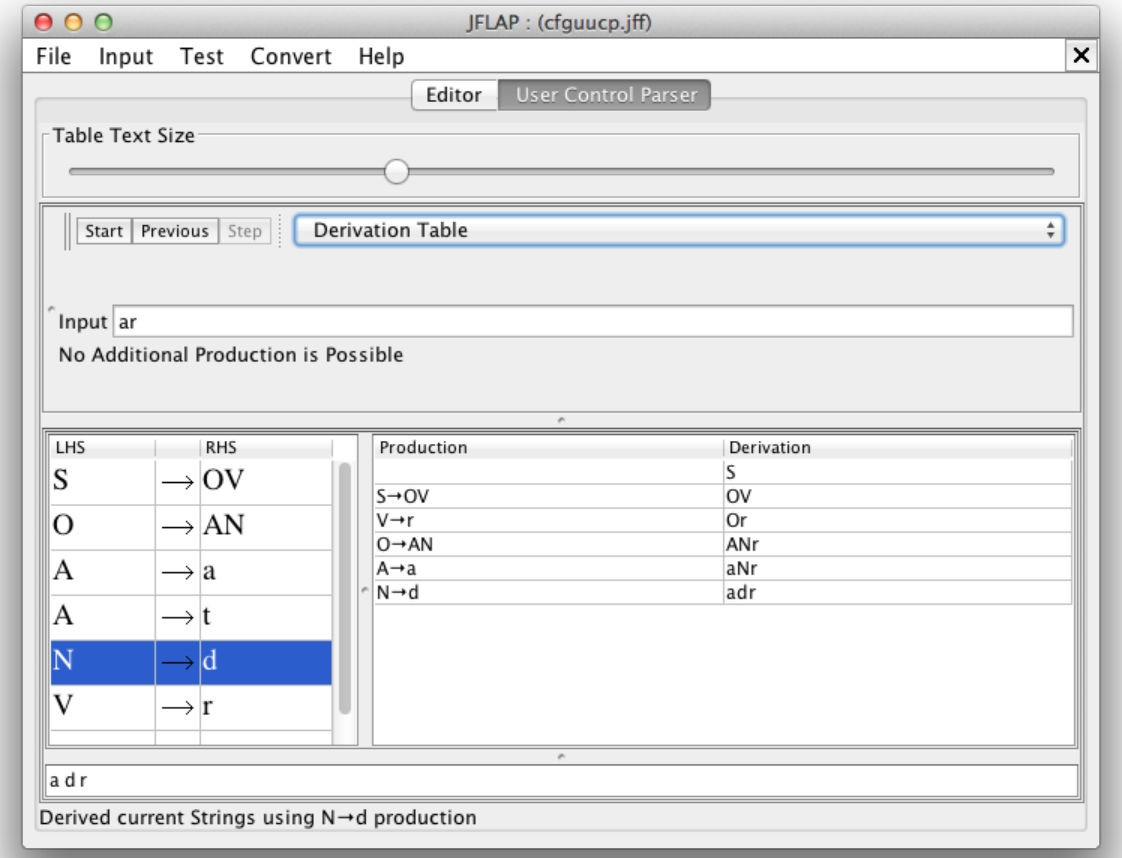

JFLAP : (cfguucp.jff)
File
Input
Test
Convert
Help
Editor
User Control Parser
Table Text Size
Start
Previous
Step
Derivation Table
Input
ar
LHS
RHS
S → OV
O → AN
A → a
A → t
N → d
V → r
Production
Derivation
S
S→OV
OV
V→r
Or
O→AN
ANr
A N r
Derived current Strings using O→AN production



Note that at this point, both terminals, a and r, have been produced, but there is a remaining non-terminal, N. There is only one production rule applicable, with N on the LHS.


JFLAP : (cfguucp.jff)
File
Input
Test
Convert
Help
Editor
User Control Parser
Table Text Size
Start
Previous
Step
Derivation Table
Input
ar
LHS
RHS
S → OV
O → AN
A → a
A → t
N → d
V → r
Production
Derivation
S
S→OV
OV
V→r
Or
O→AN
ANr
A→a
aNr
a N r
Derived current Strings using A→a production

After applying that rule, as shown in the following image, there are no additional productions possible.



Questions to Think About

1. What causes each of the rejected strings from the previously specified set to be rejected?
2. What changes would you make to JFLAP to facilitate exploring rejected strings?