

Prof. Giovanni Pani

Dott.ssa Vita Santa Barletta

JFLAP

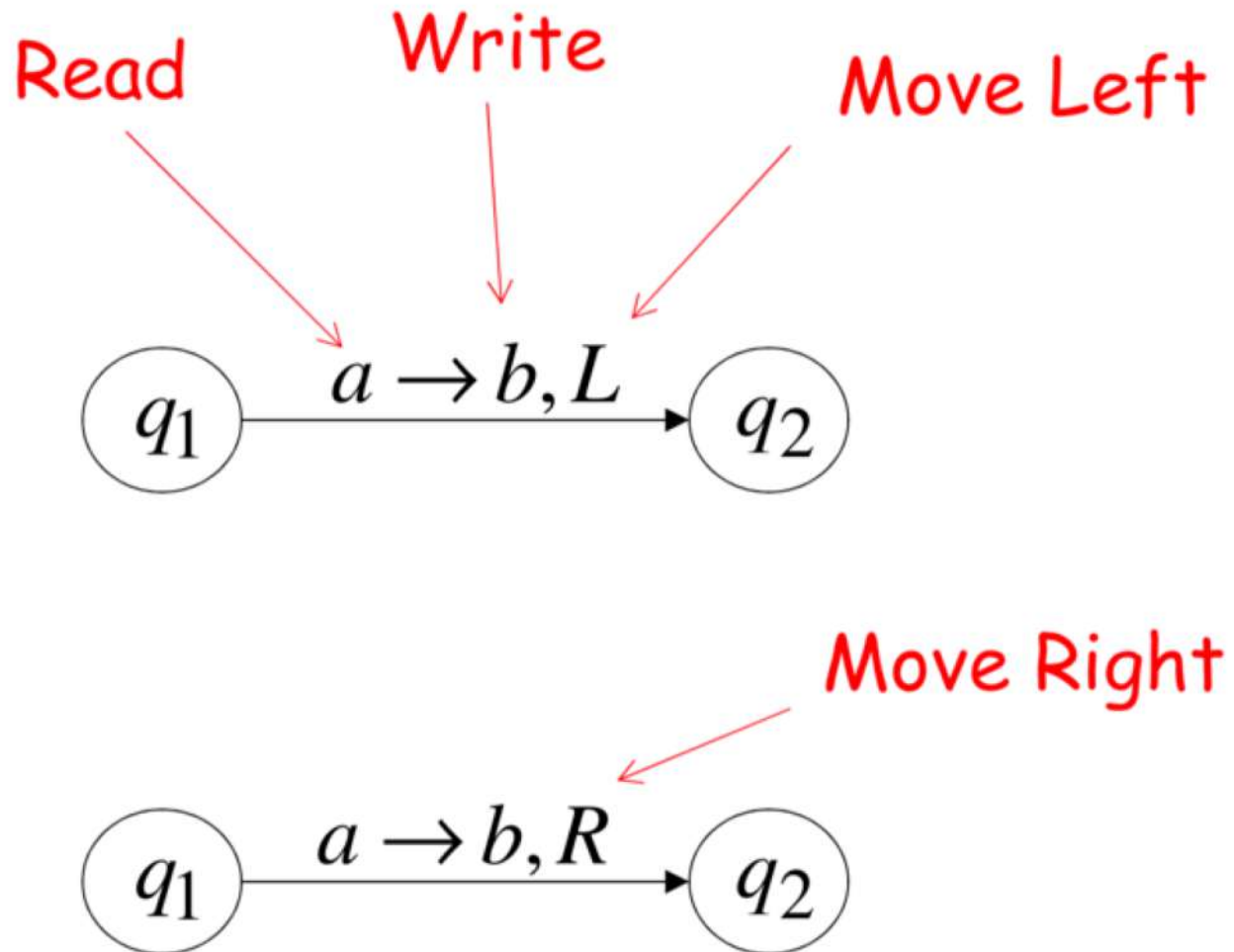
Macchine di TURING

Macchina di Turing

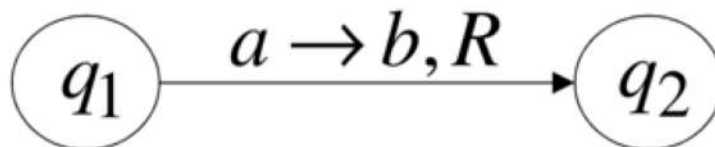
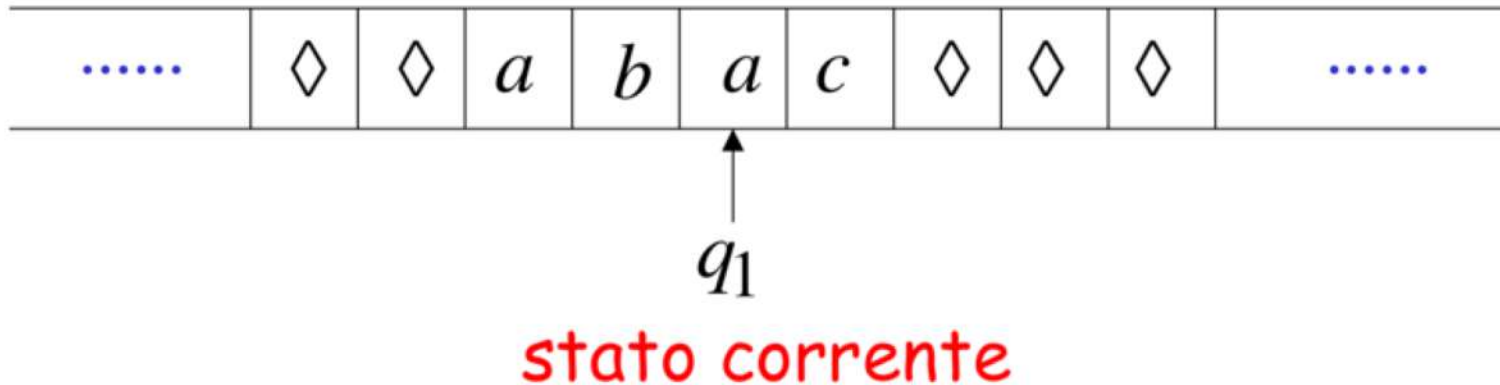
$$M = (Q, \Sigma, \Gamma, \delta, q_0, \diamond, F)$$

- Q : insieme finito e non vuoto di stati
- Σ : alfabeto di input
- Γ : alfabeto dei simboli di nastro
- δ : funzione di transizione
- q_0 : stato iniziale
- \diamond : simbolo di blank
- F : insieme degli stati finali

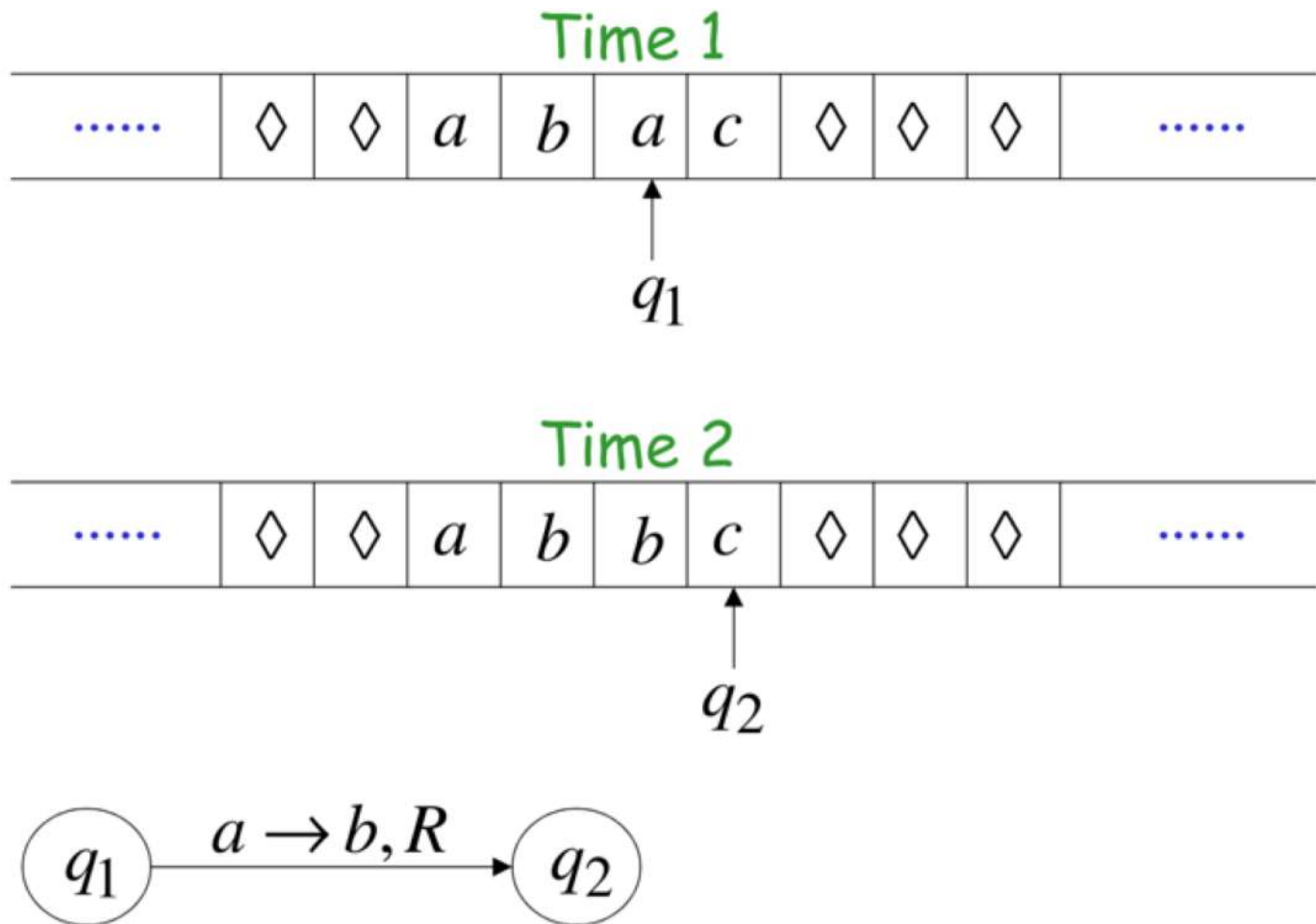
Macchina di Turing



Macchina di Turing

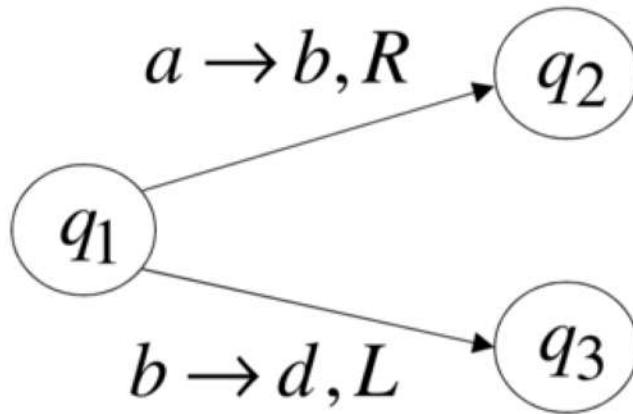


Macchina di Turing

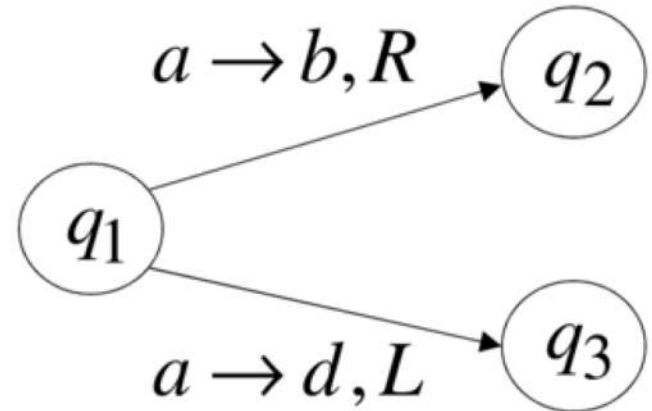


Macchina di Turing: deterministiche

permesso



Non permesso



Macchina di Turing



permesso



Non permesso

Esercizio 1

- Data una stringa binaria x , produrre un stringa ordinata
 - Esempio se $x=010101101$, allora output 000011111

Esercizio 1

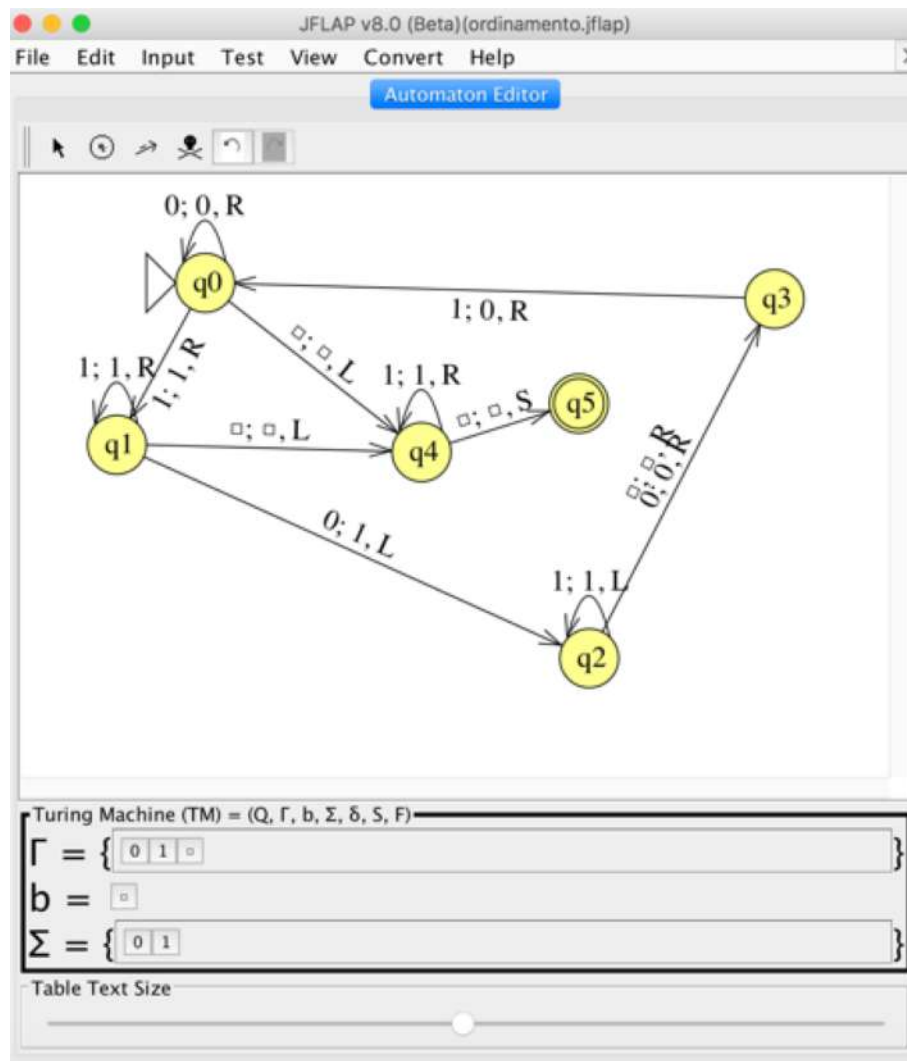
Algoritmo

- Cercare coppie di 0 e 1 non in ordine e invertibile
- input 0101011
 - Prima coppia: 0101011 -> 0011011
 - Seconda coppia: 001101101 -> 000111101
 - Terza coppia: 000111101 -> 000011111

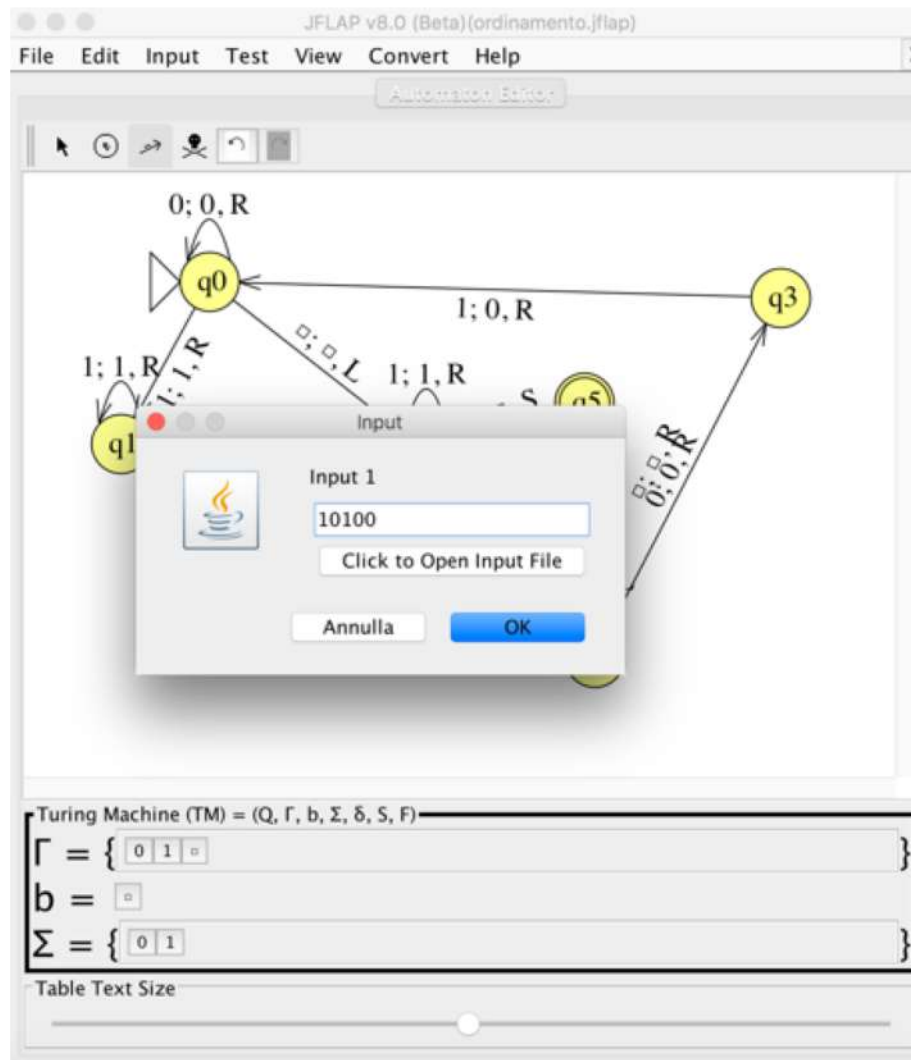
Esercizio 1

- Cerca il primo 1 a destra
 - Se non esiste, termina posizionando testina su primo simbolo
- Cerca 0 che segue
 - Se non esiste, termina posizionando testina su primo simbolo
- Complementa 0 e cerca 1 più a sinistra
- Complementa 1 e ricomincia

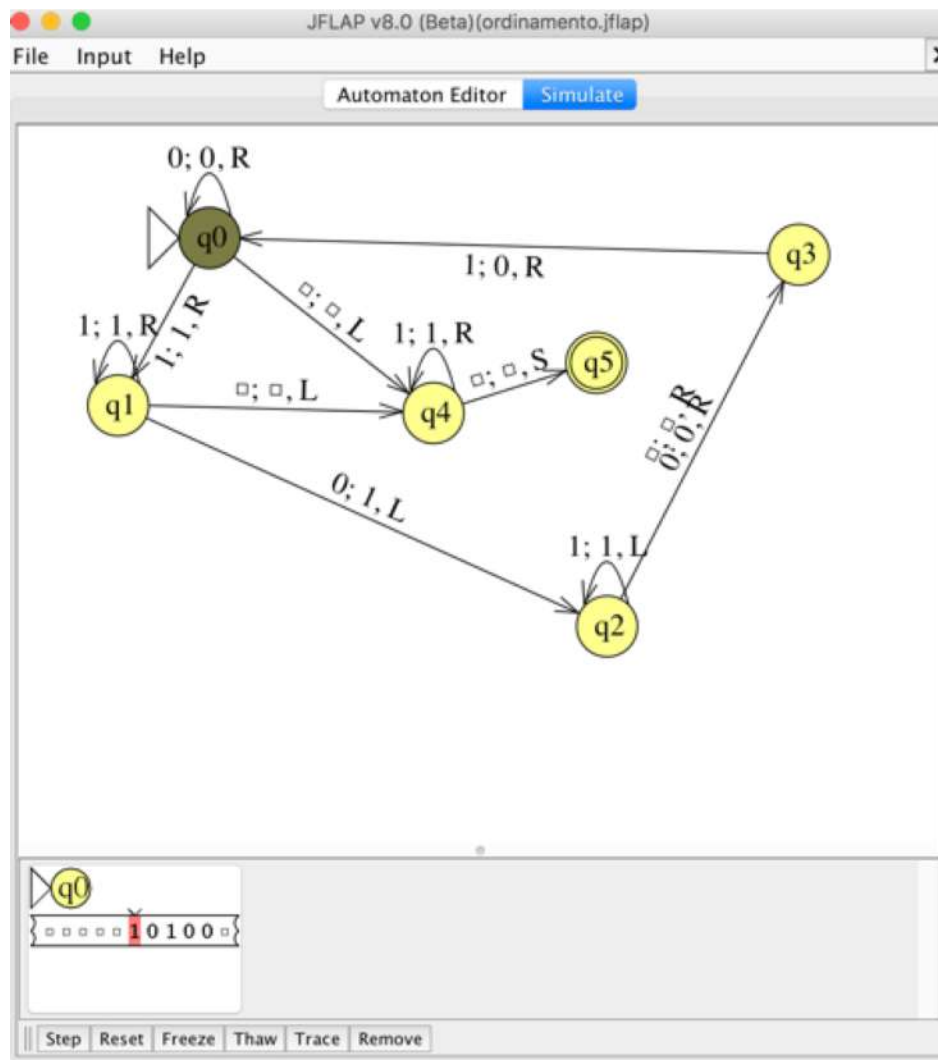
Step 1



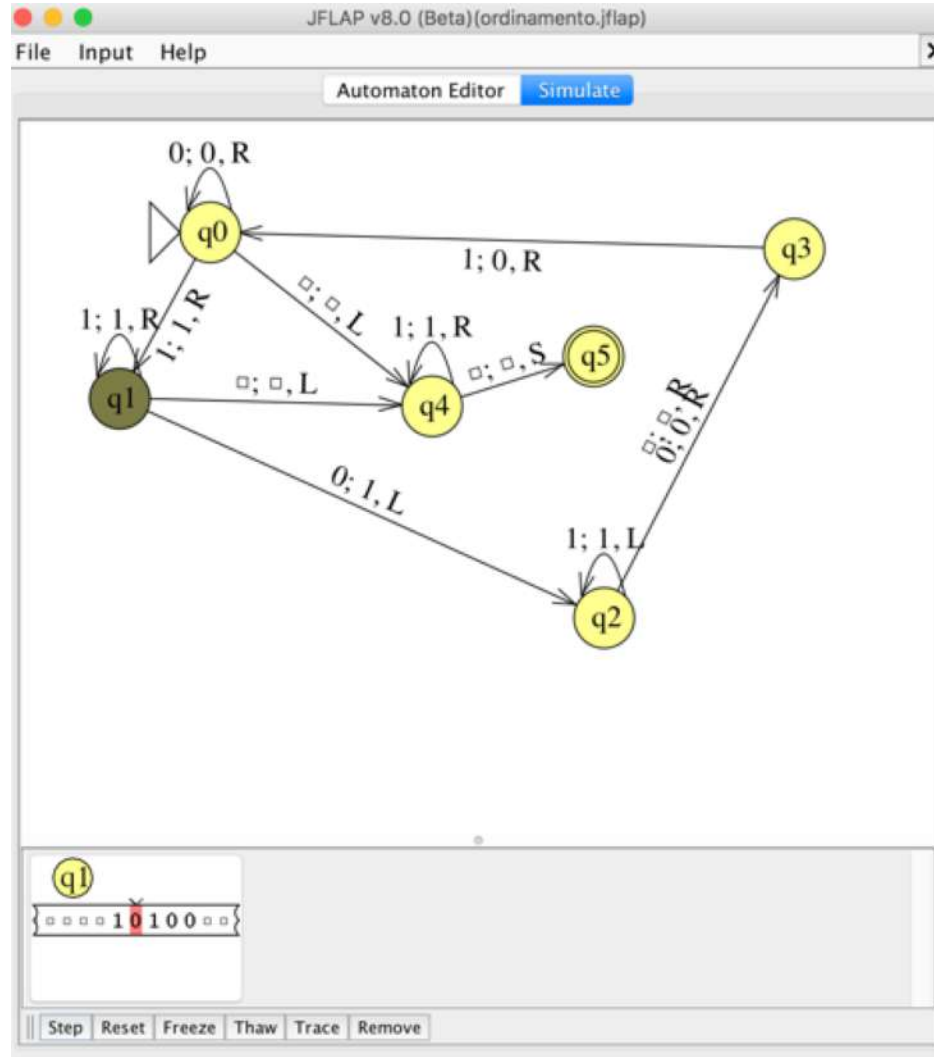
Step 2



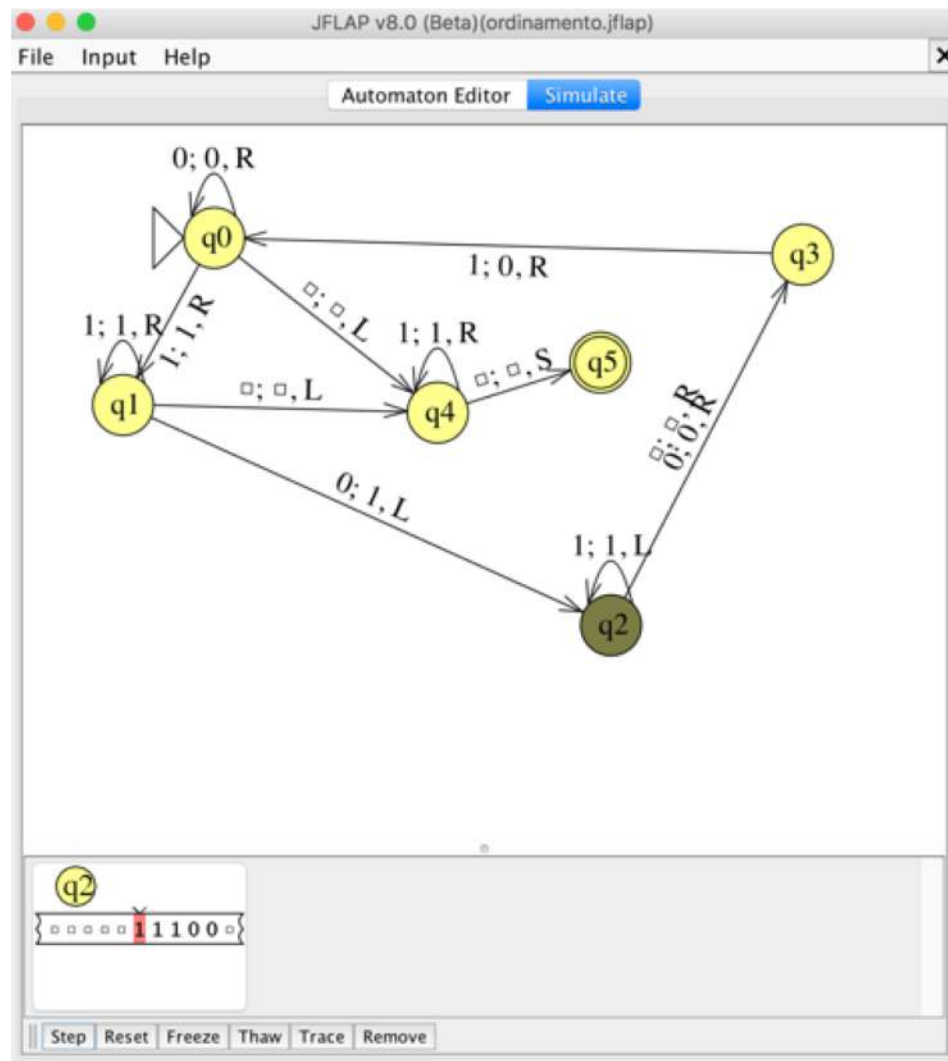
Step 3



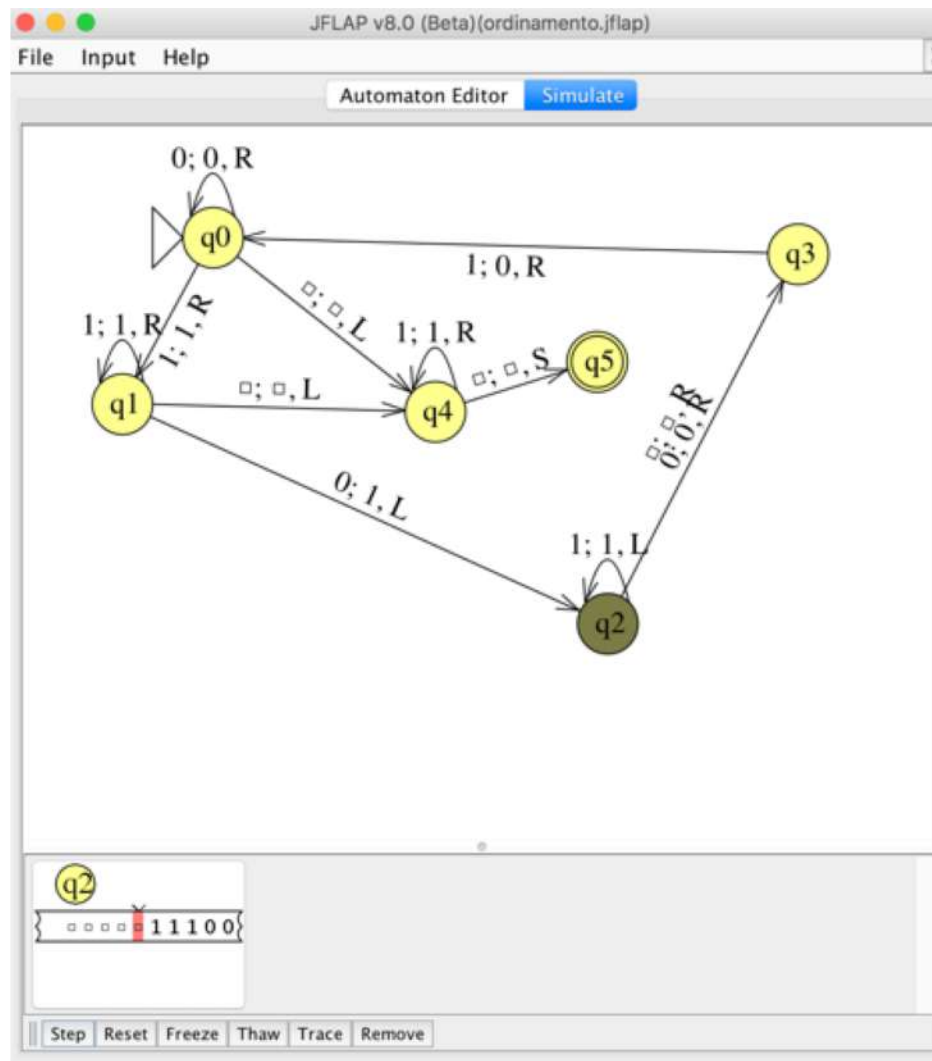
Step 4



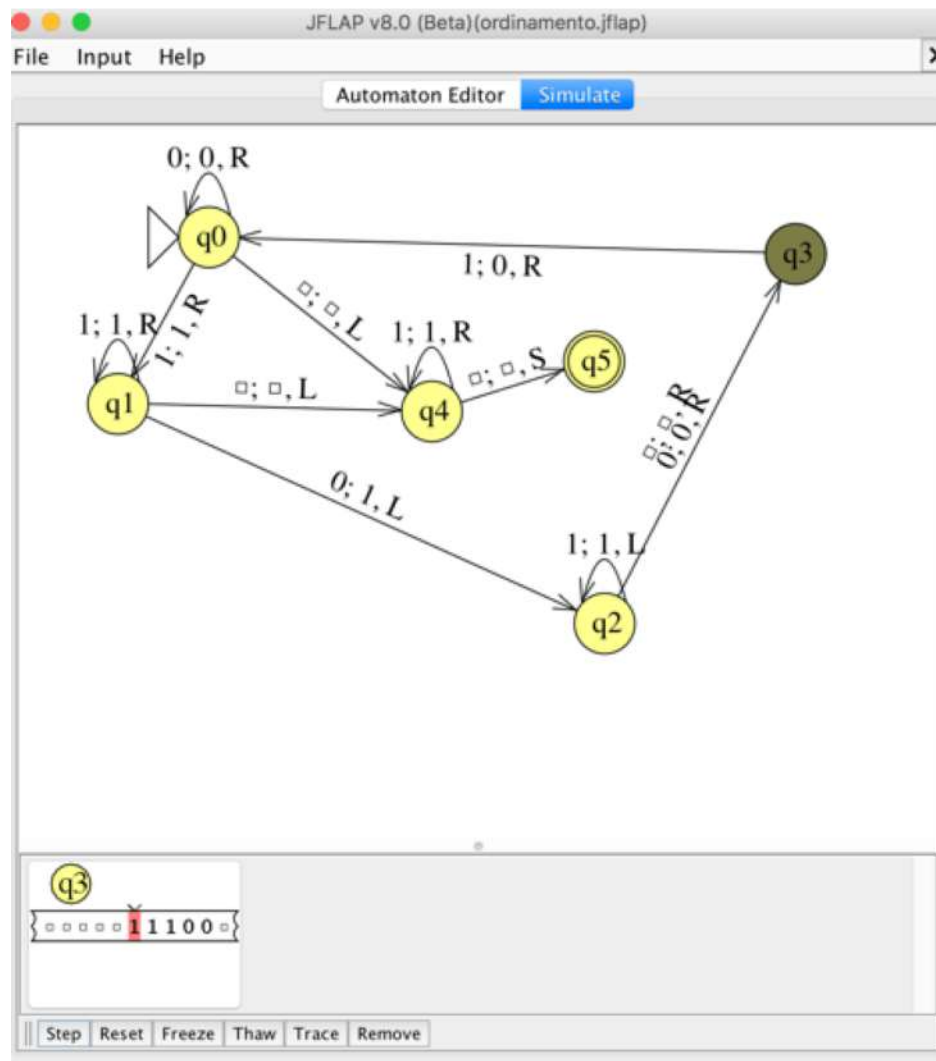
Step 5



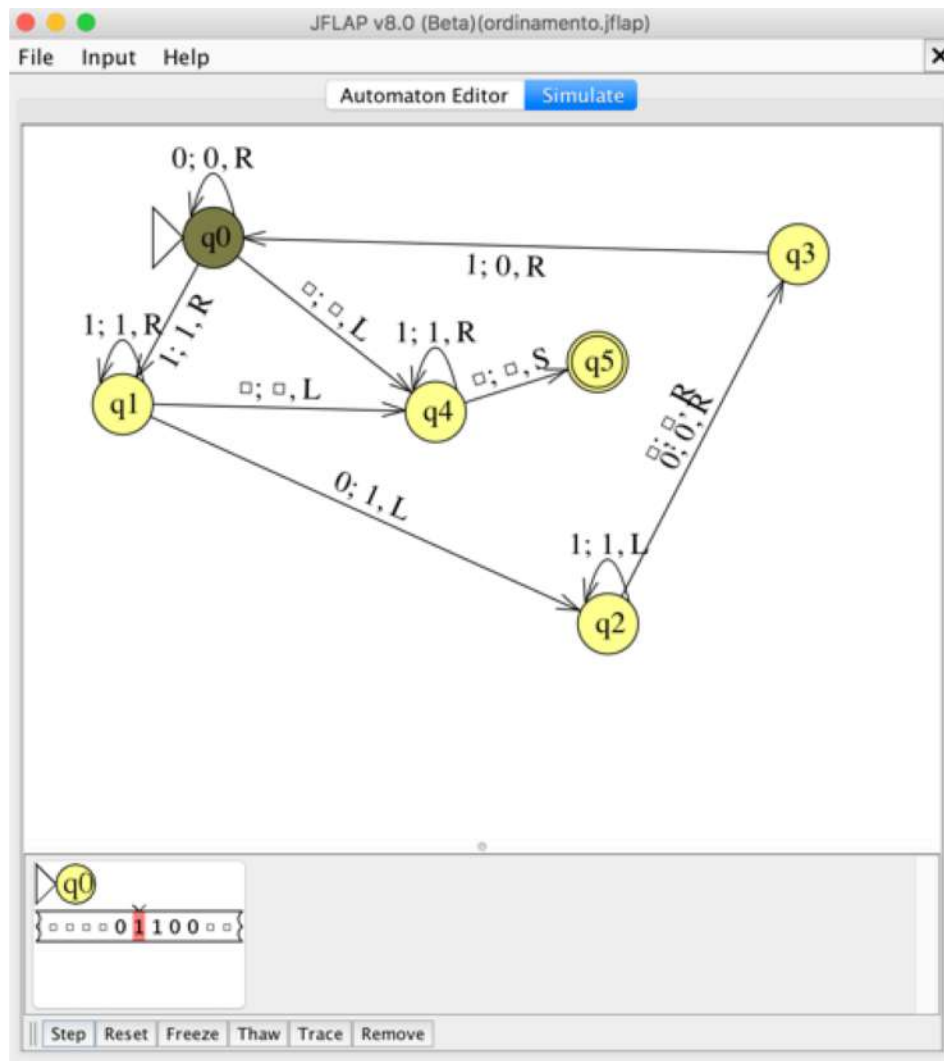
Step 6



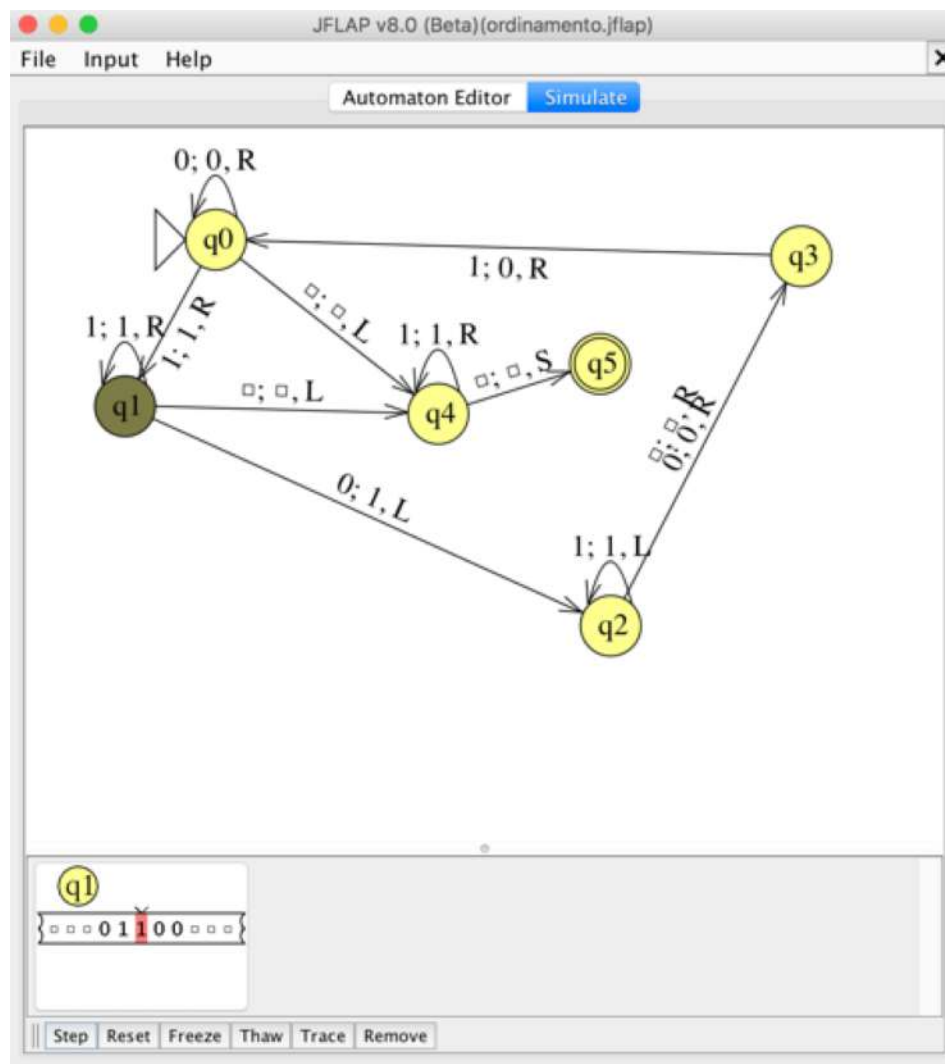
Step 7



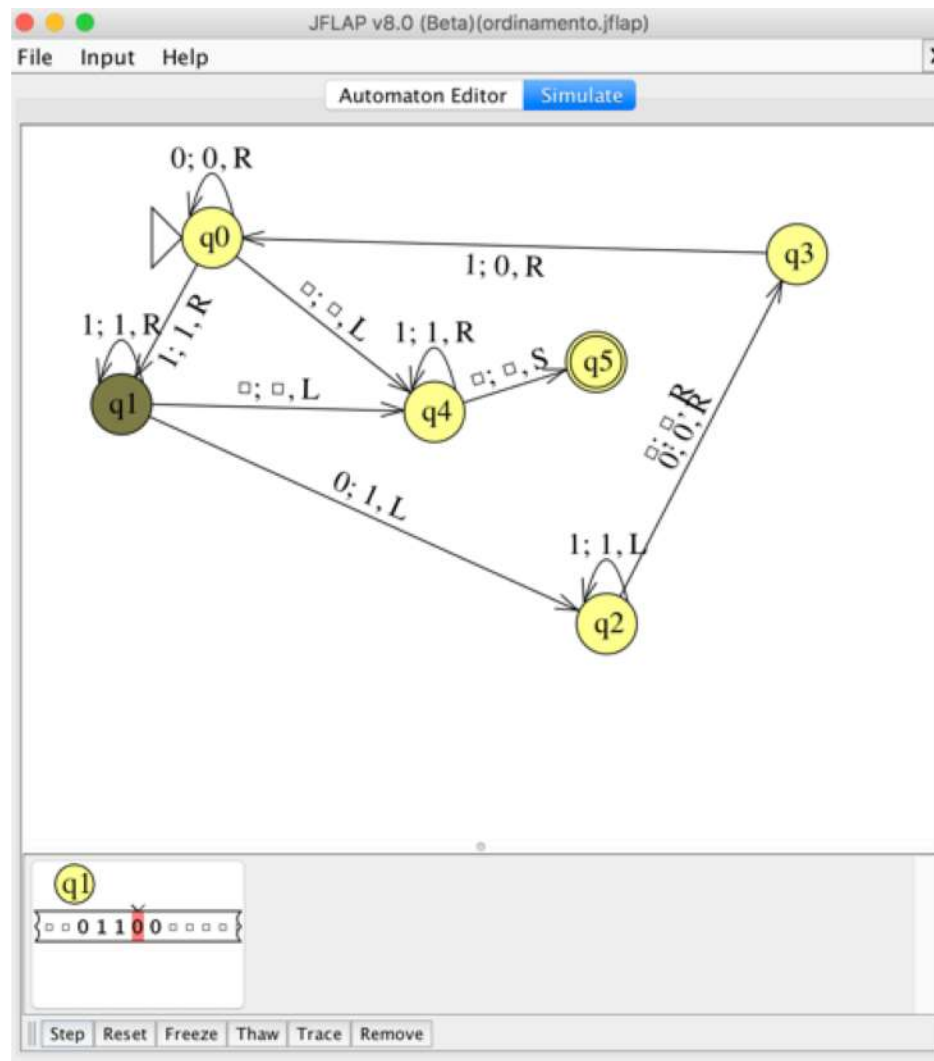
Step 8



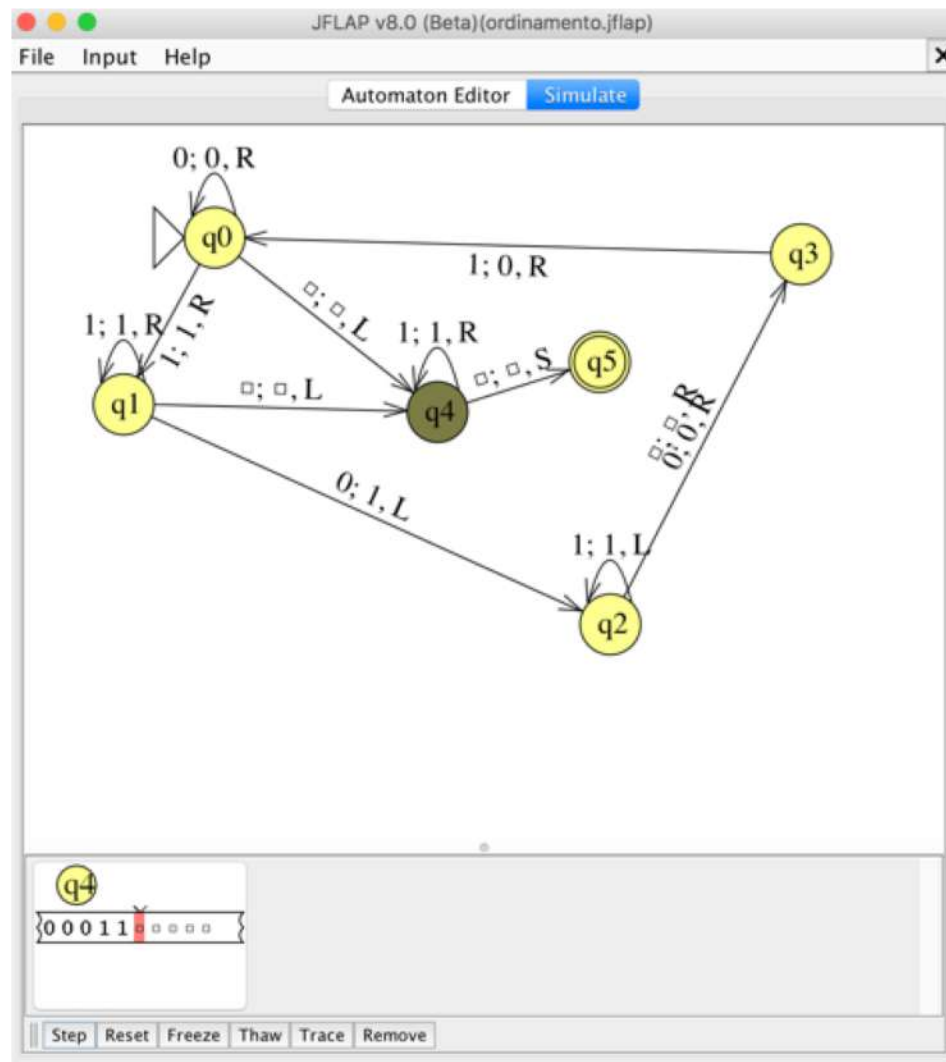
Step 9



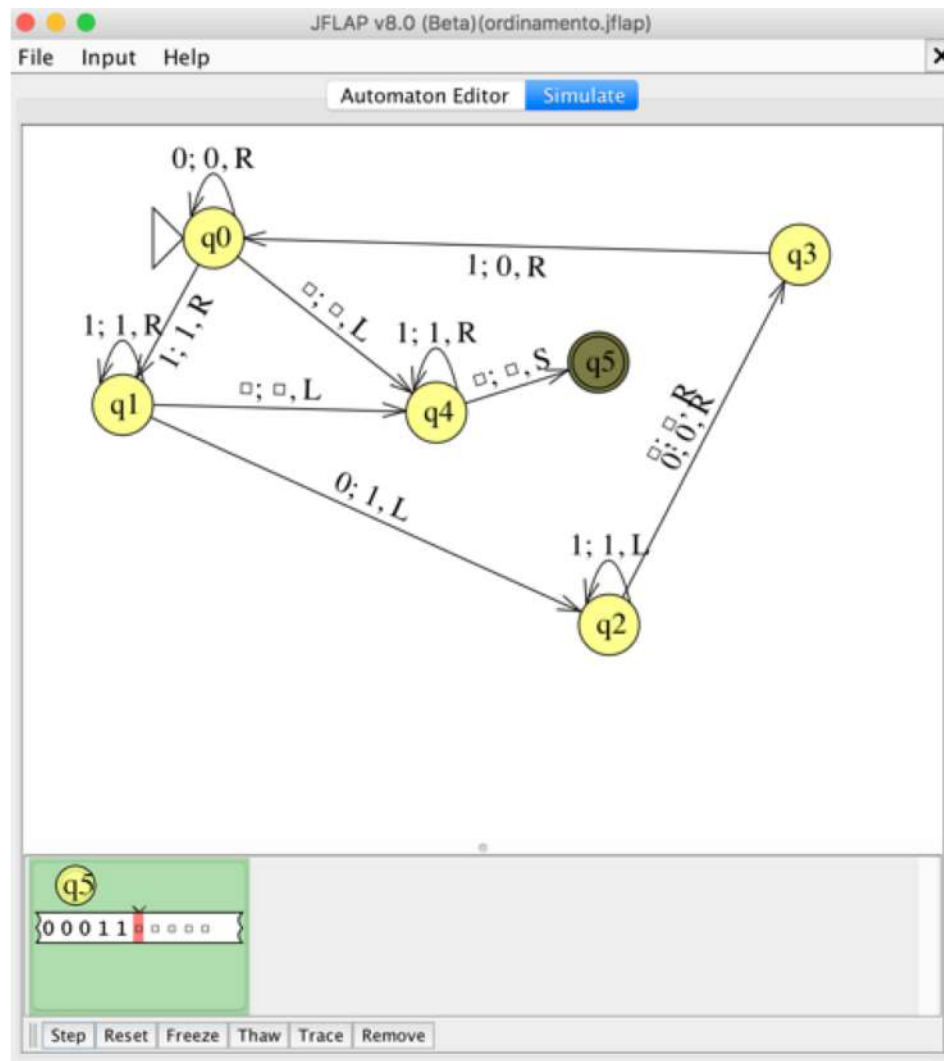
Step 10



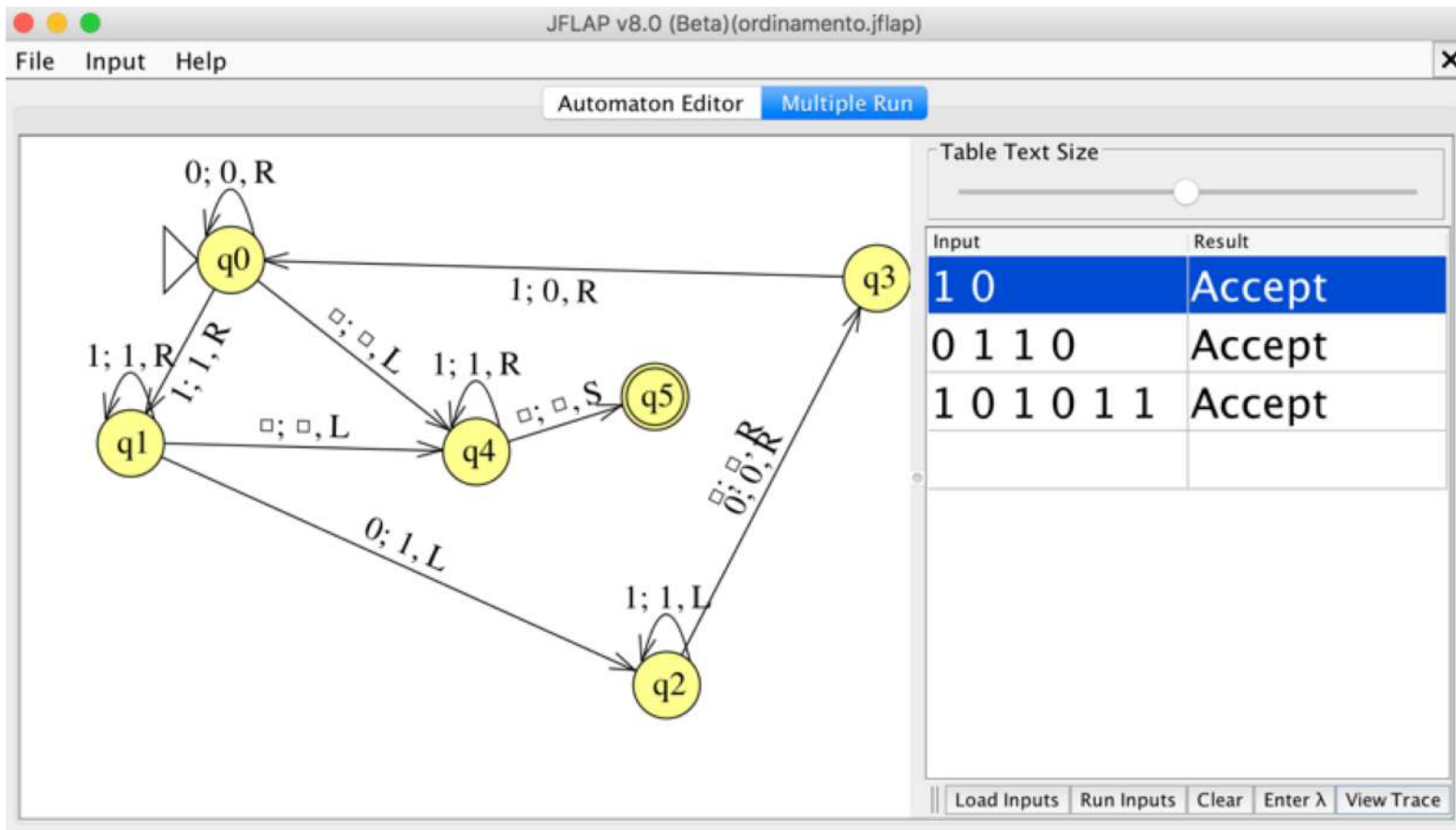
Step n-1



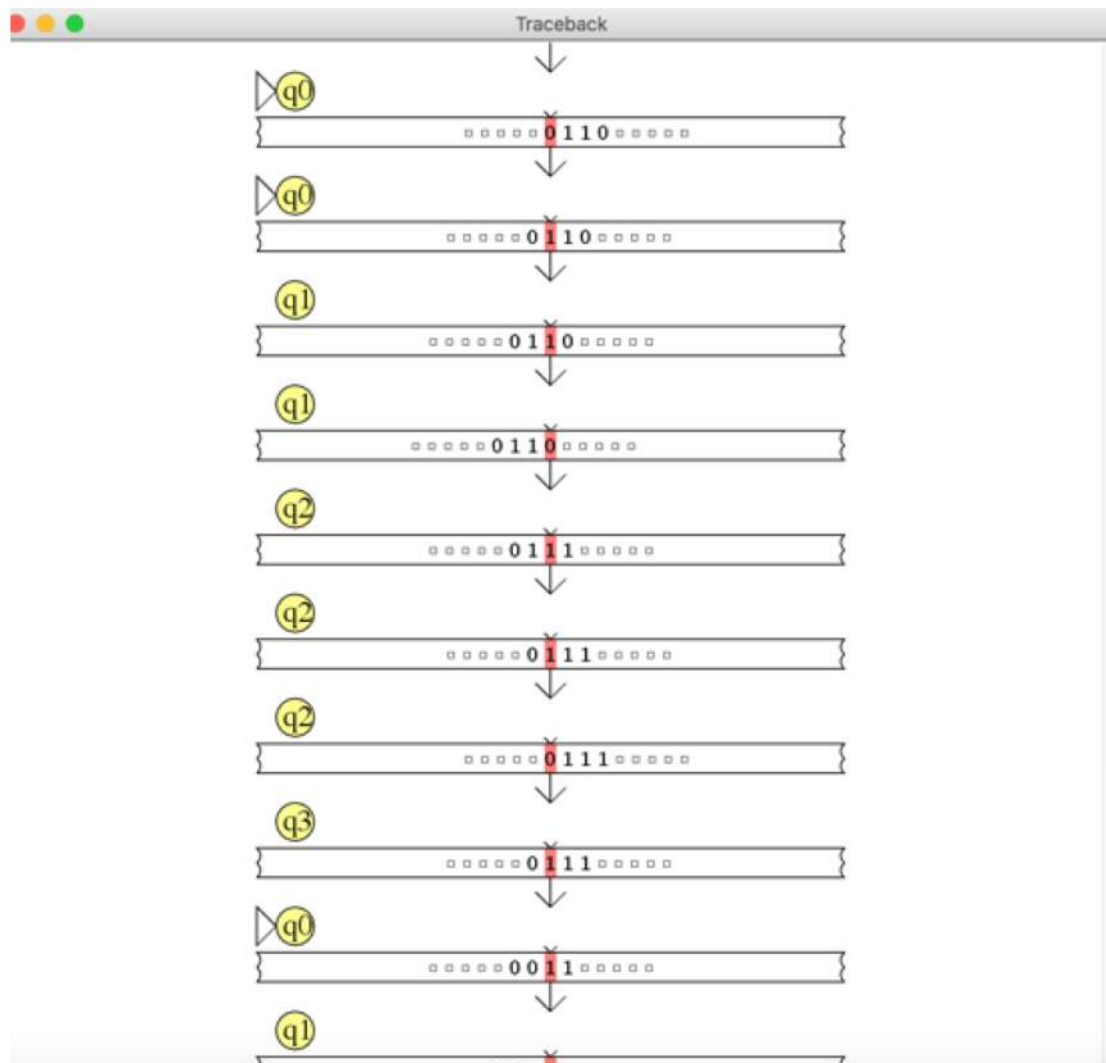
Step n



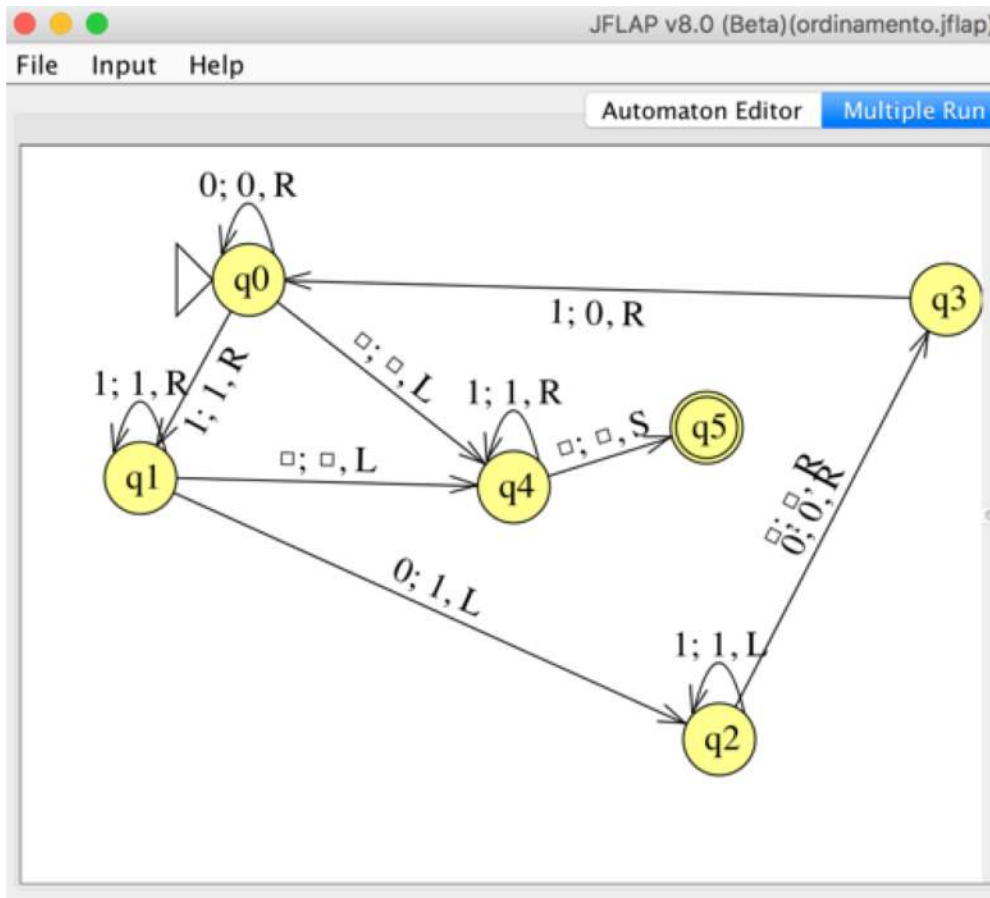
Esercizio 1



Esercizio 1

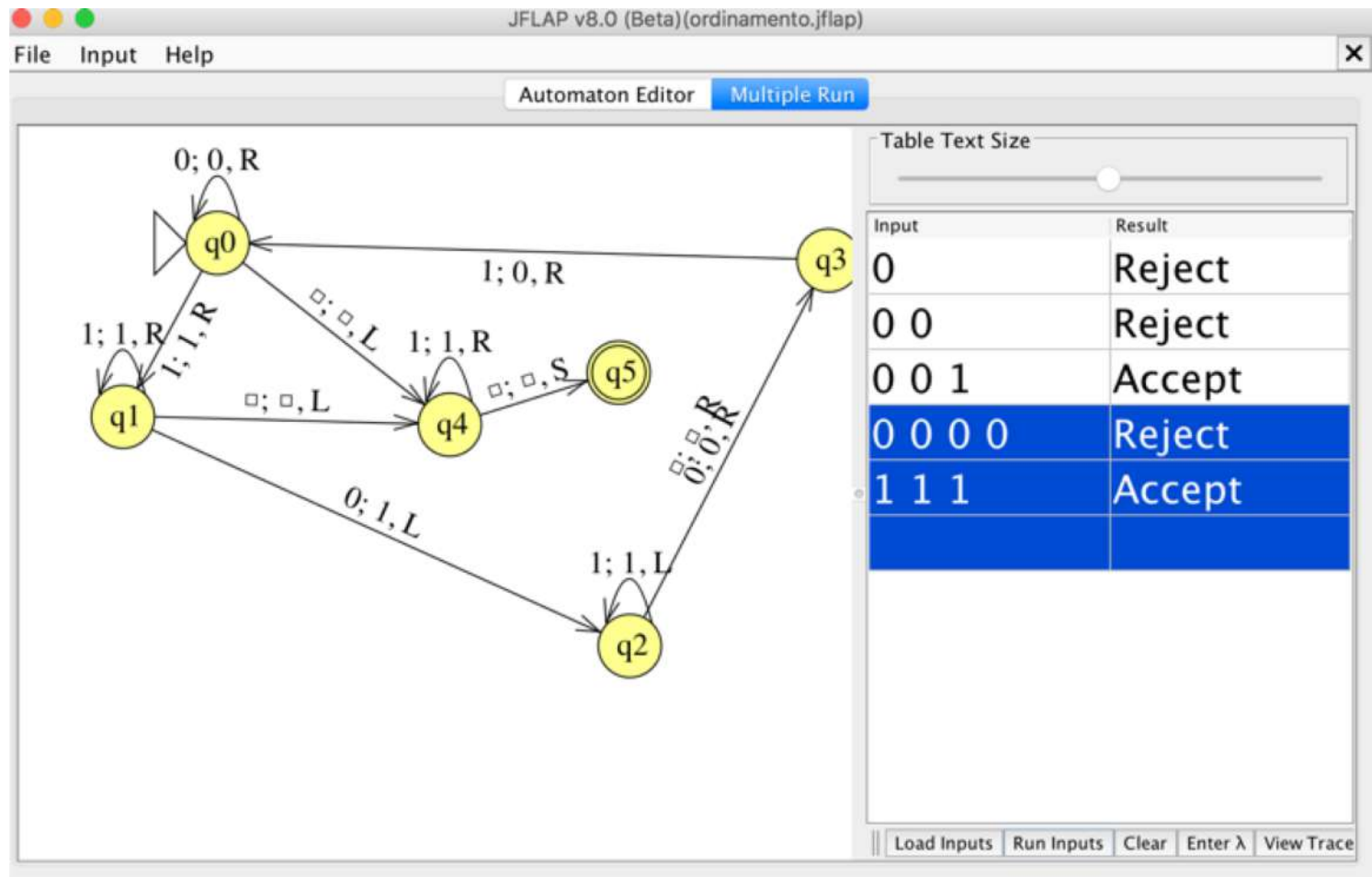


Esercizio 1: problema

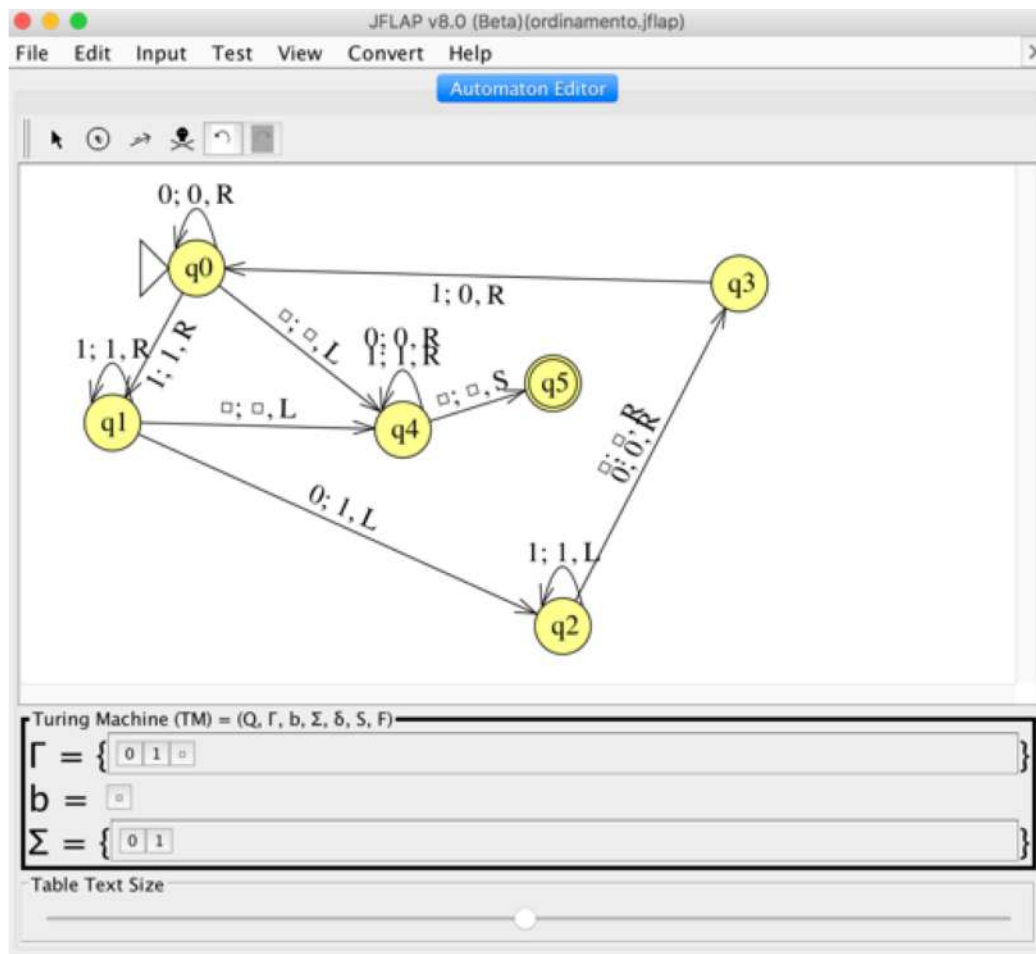


In caso di input
0000
la stringa non è
accettata

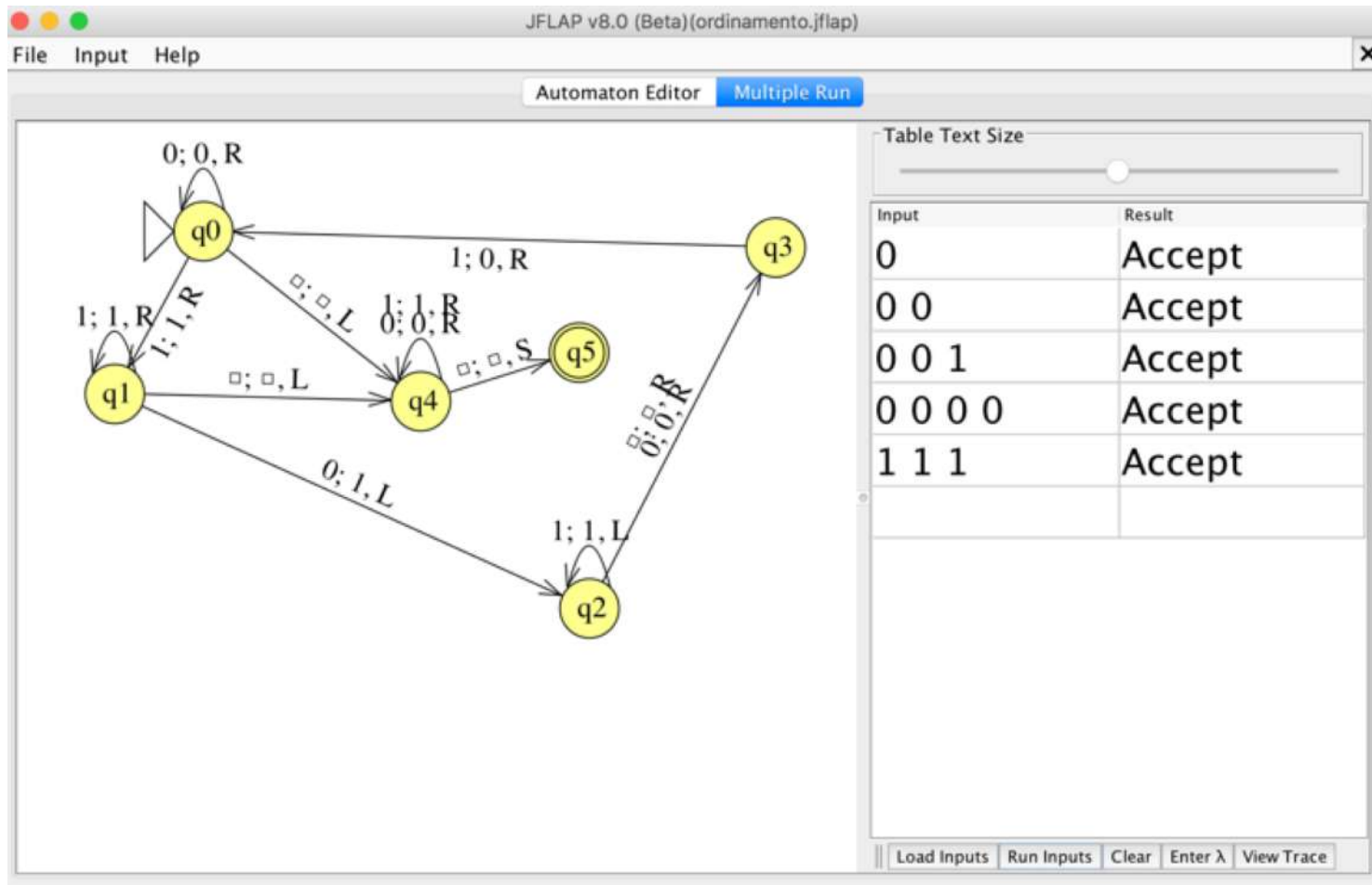
Esercizio 1: problema



Esercizio 1: soluzione



Esercizio 1: soluzione



Esercizio 2

- MdT per il complemento a due di un numero
 - Esempio
 - Sia $x:01101$
 - Complemento bit a bit: 10010
 - Somma di 1: 10011

Esercizio 3

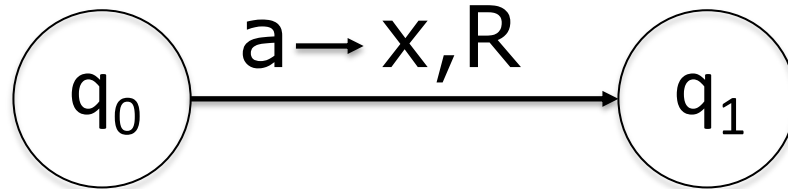
- $L = \{a^n b^n c^n\}$

Costruire una Macchina di Turing a nastro singolo

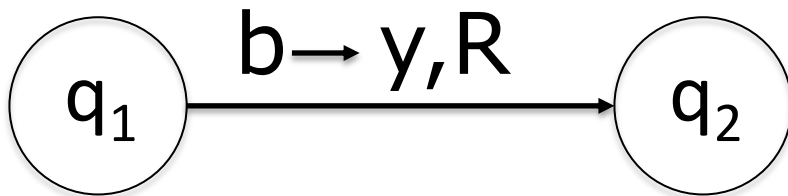
Esercizio 3

- In caso di input con lunghezza zero, $n=0$
 - Il programma passa immediatamente allo stato finale

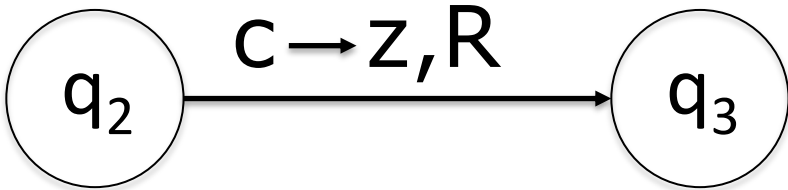
Esercizio 3



$$\delta(q_0, a) = (q_1, x, R)$$



$$\delta(q_1, b) = (q_2, y, R)$$

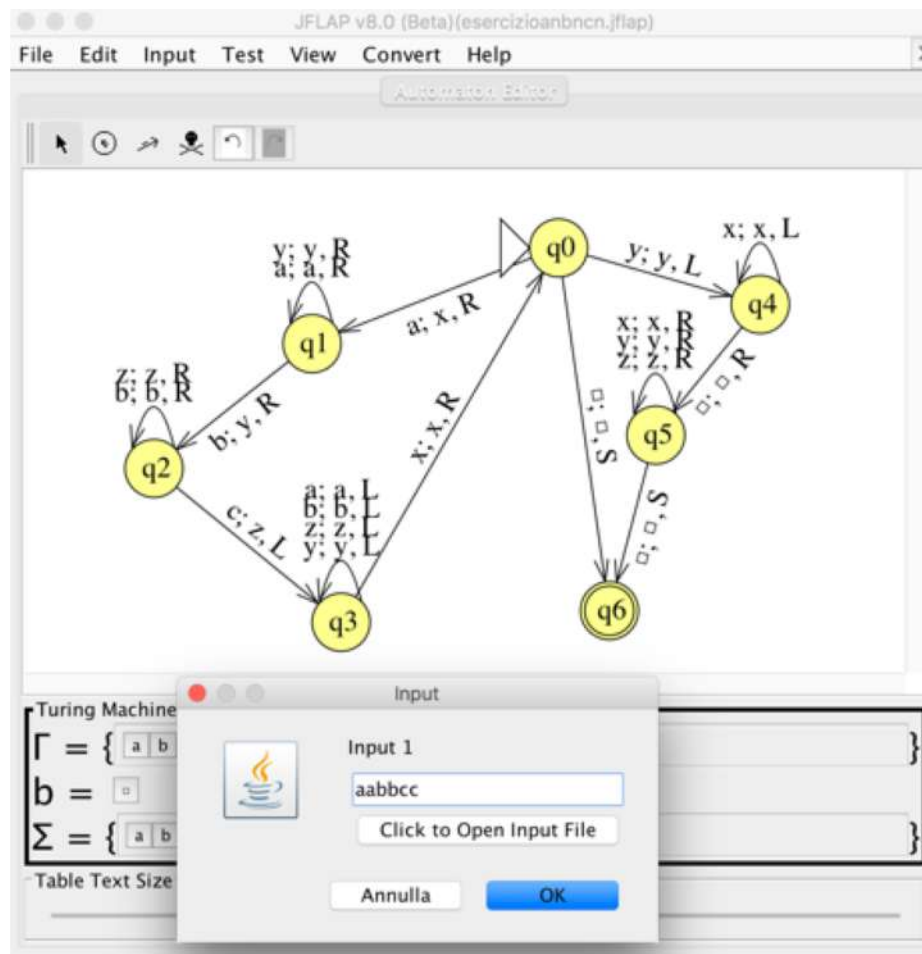


$$\delta(q_2, c) = (q_3, z, R)$$

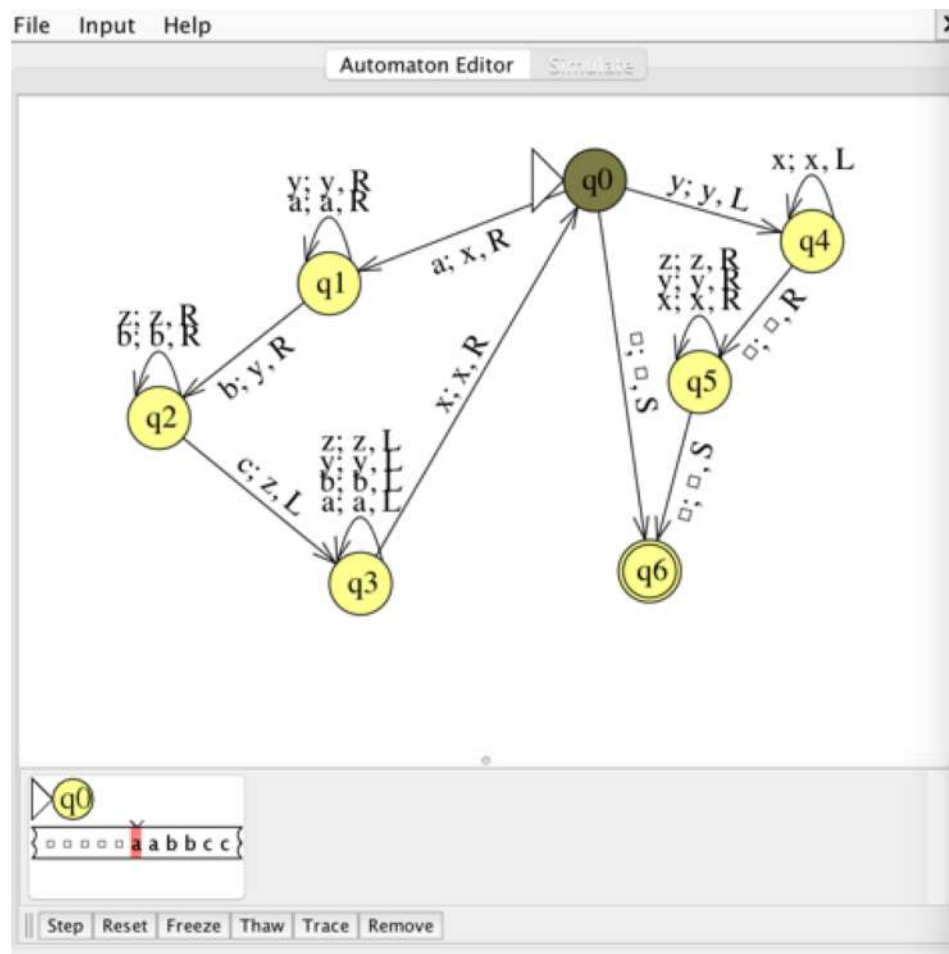
Esercizio 3

- Terminato il passo precedente mi assicuro che siano presenti solo 'x', 'y' e 'z' nell'ordine corretto

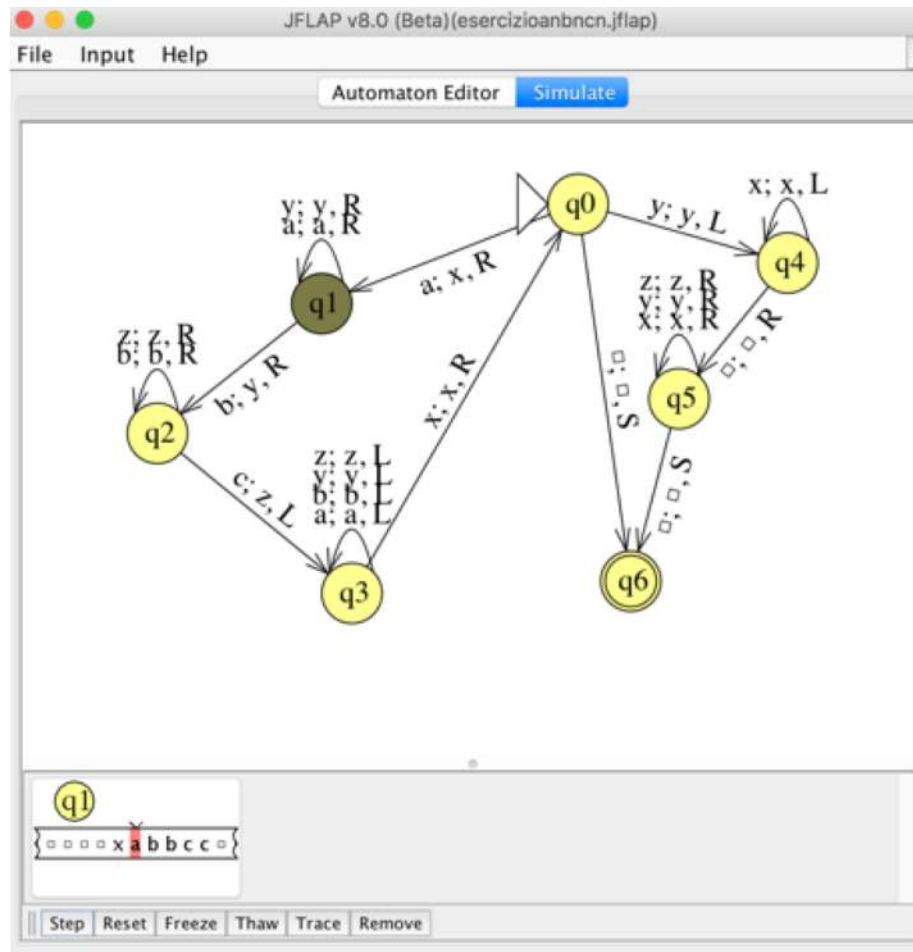
Esercizio 3



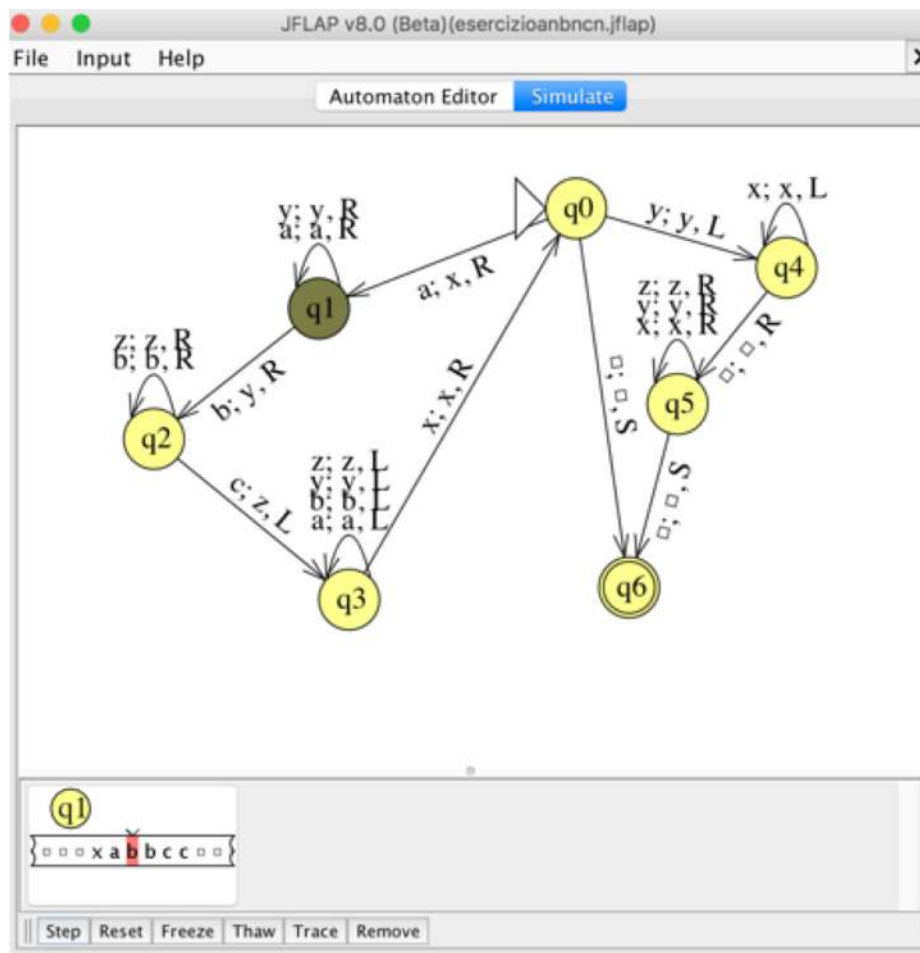
Esercizio 3



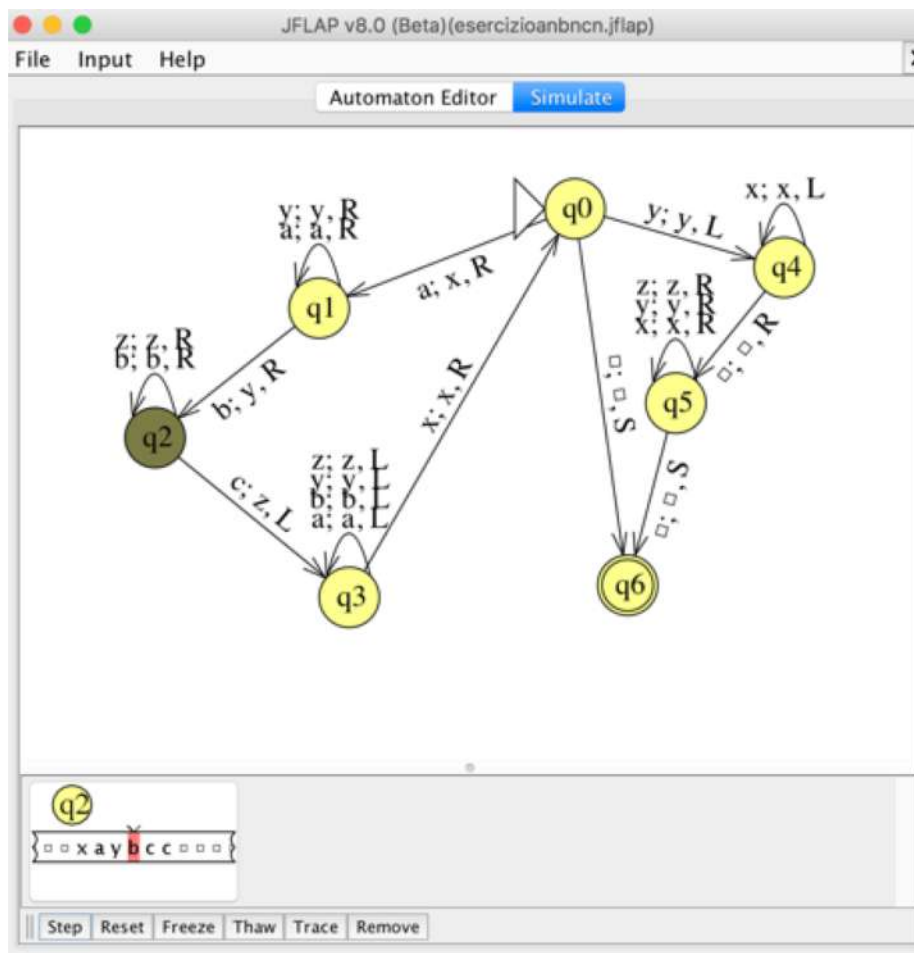
Esercizio 3



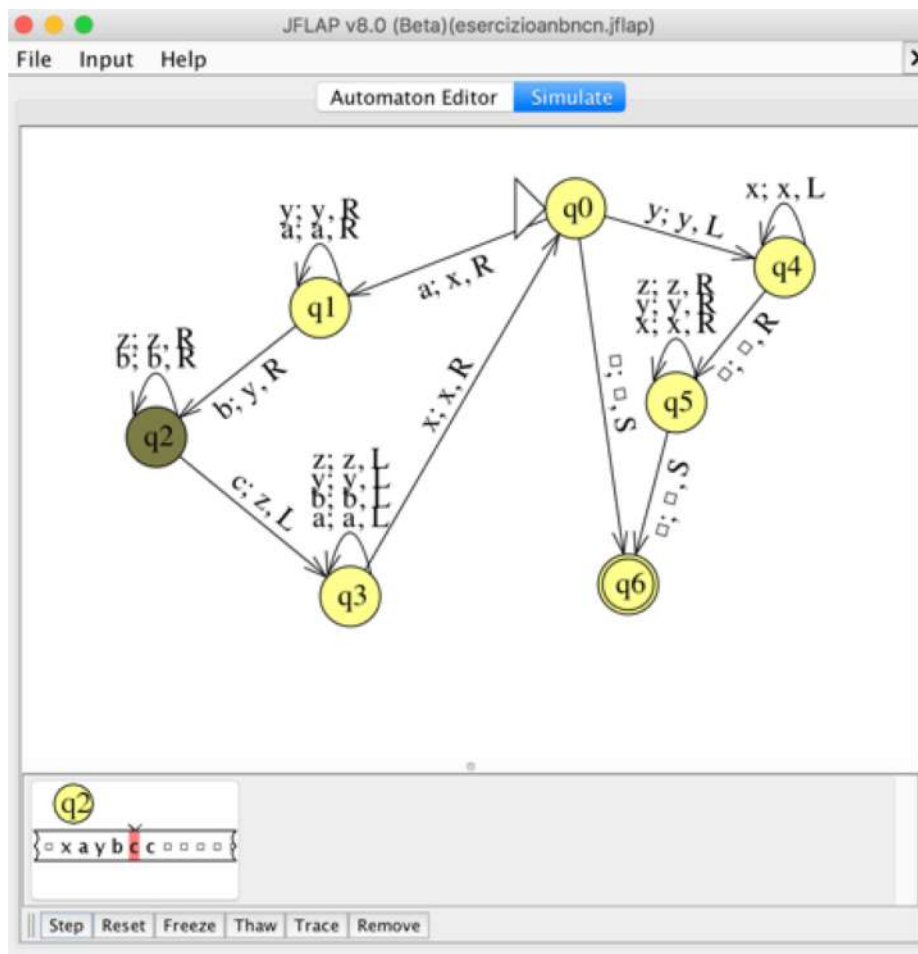
Esercizio 3



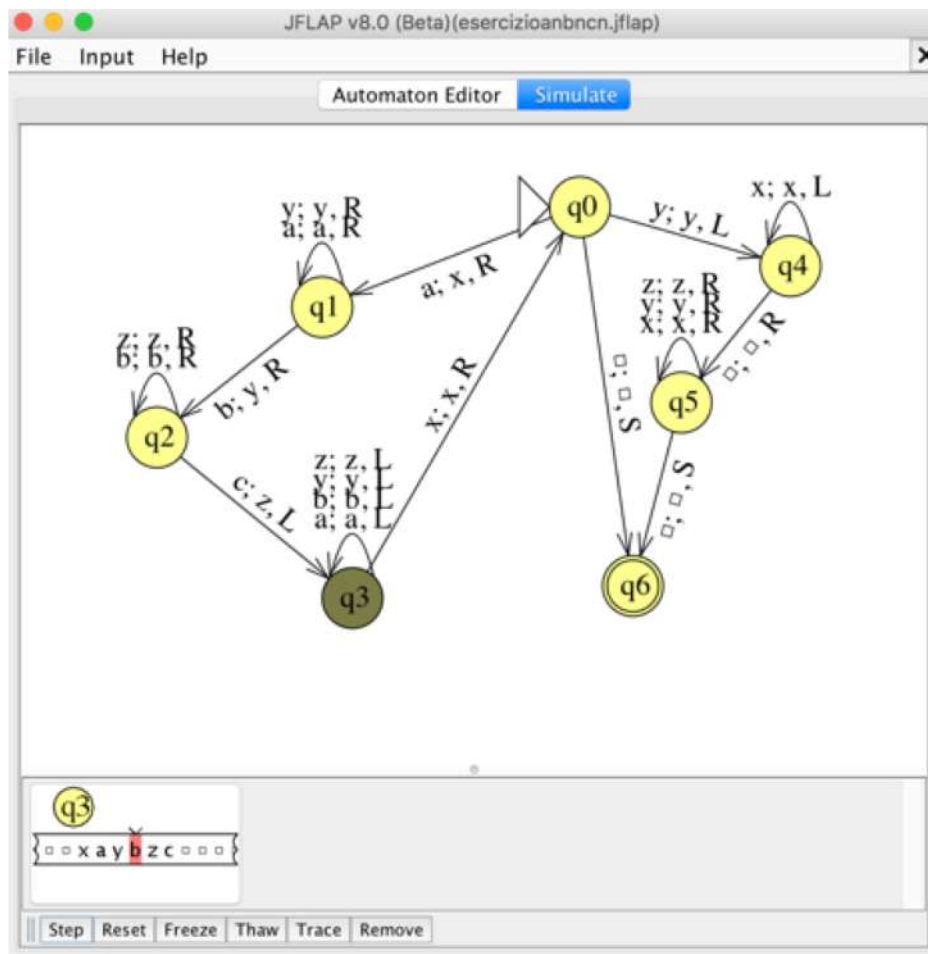
Esercizio 3



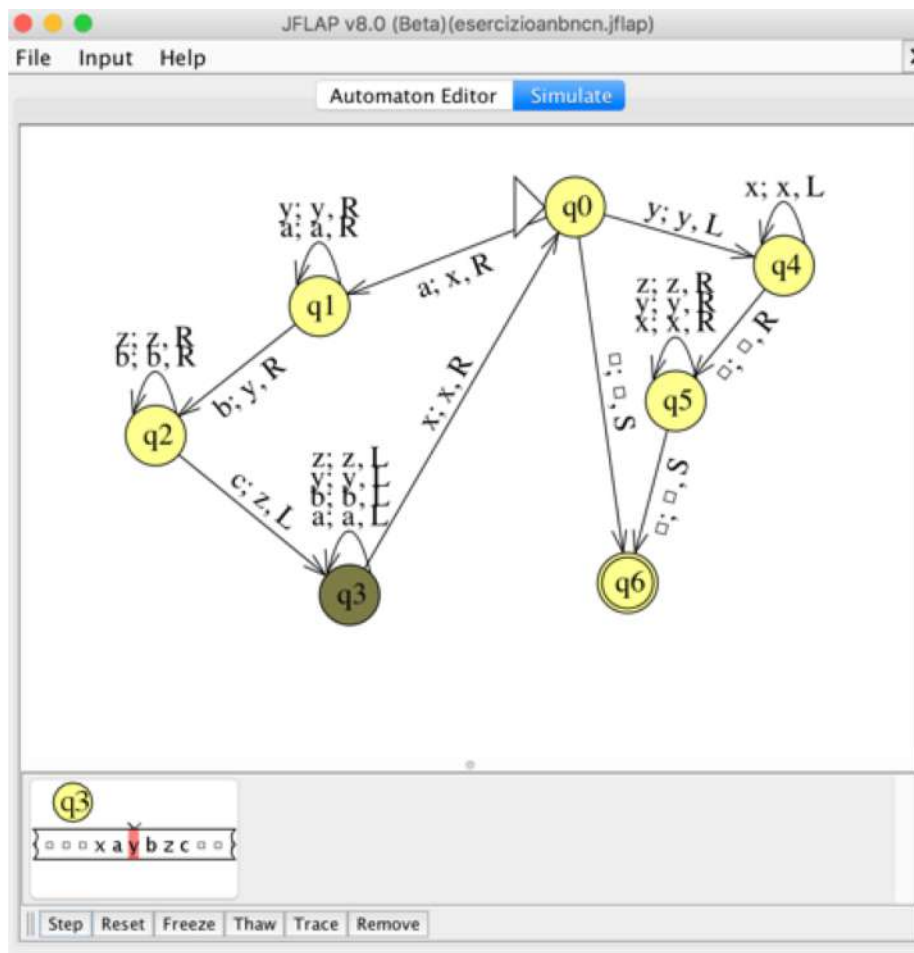
Esercizio 3



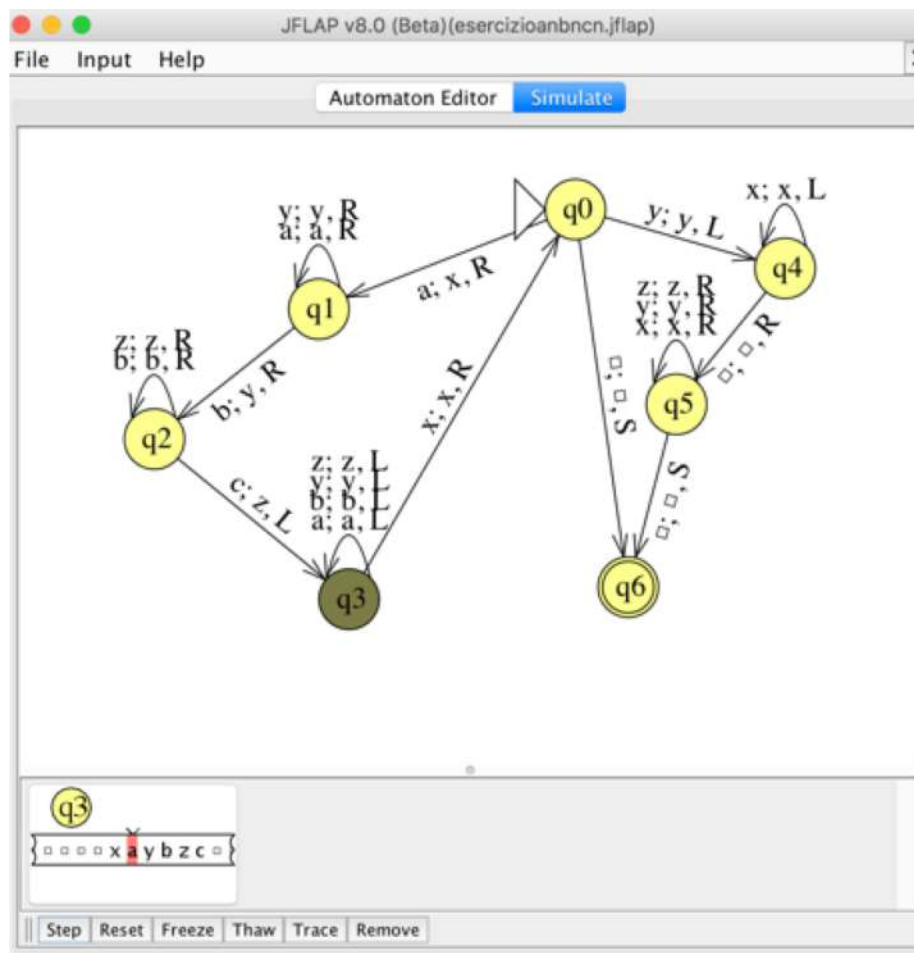
Esercizio 3



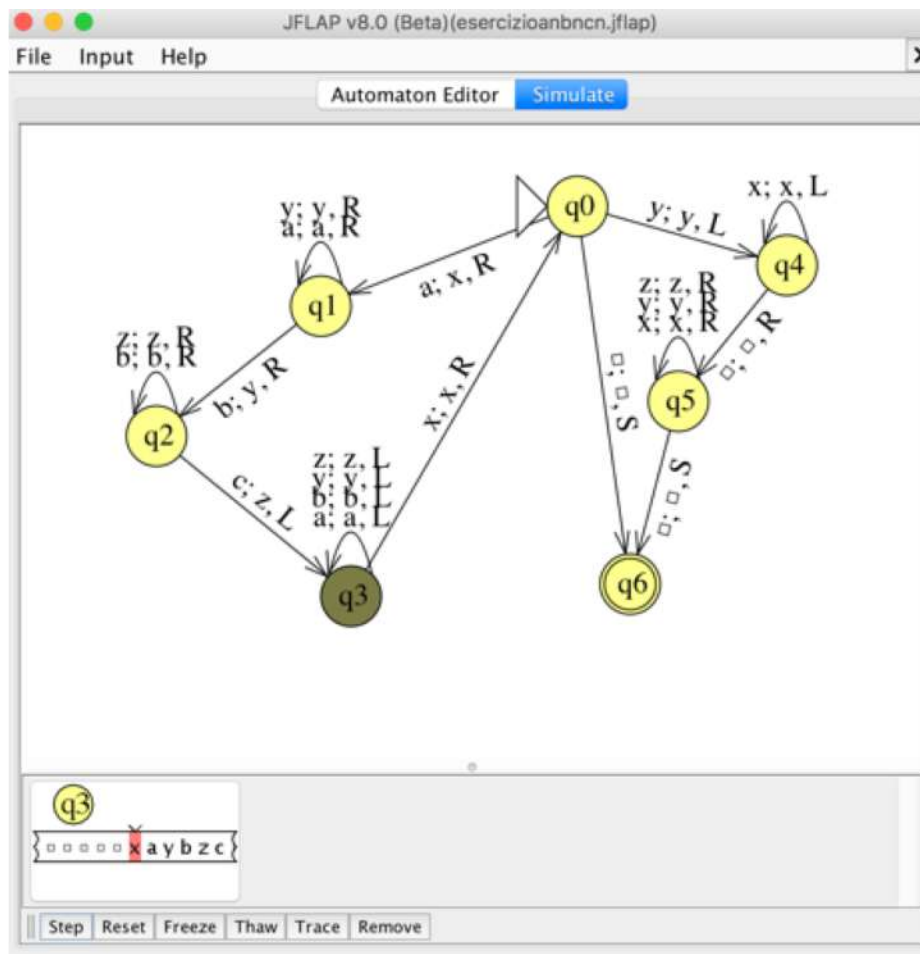
Esercizio 3



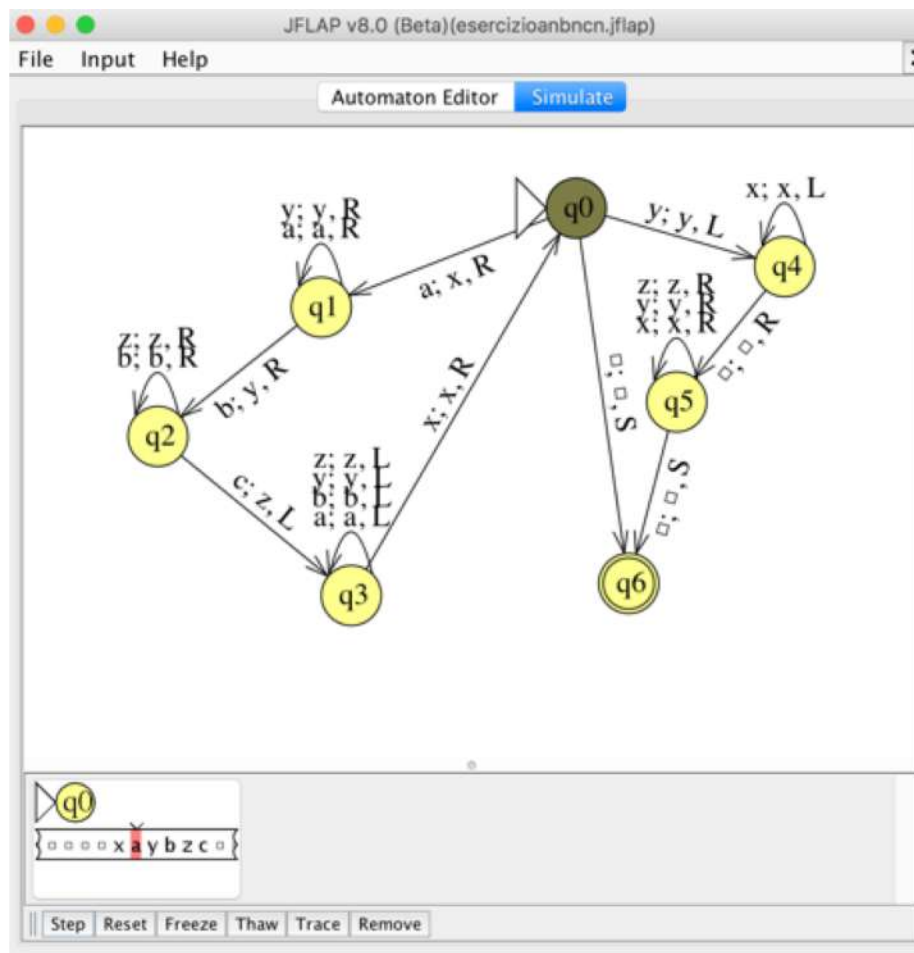
Esercizio 3



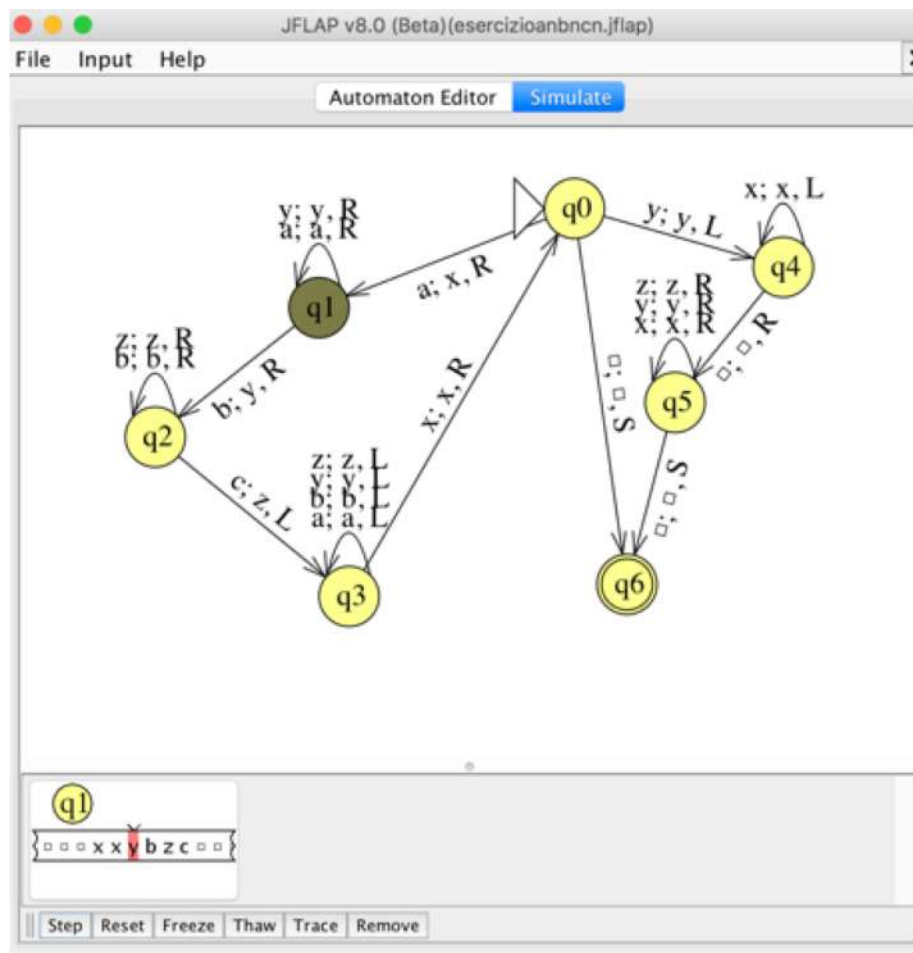
Esercizio 3



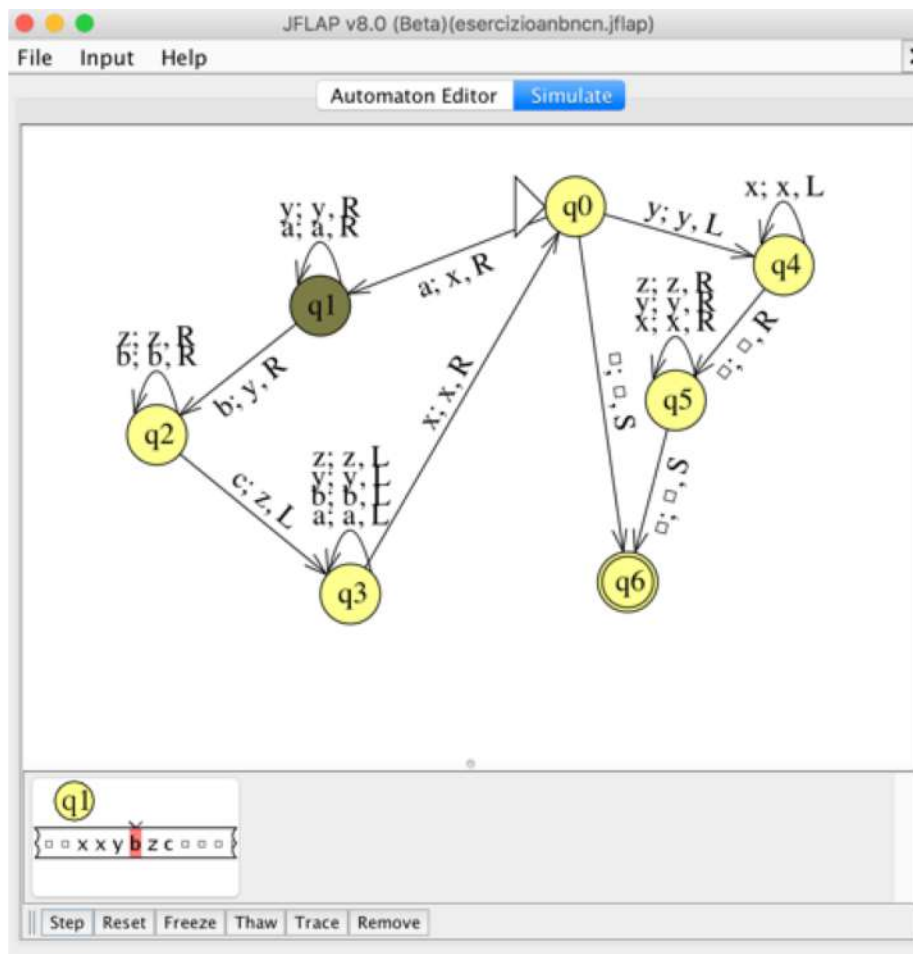
Esercizio 3



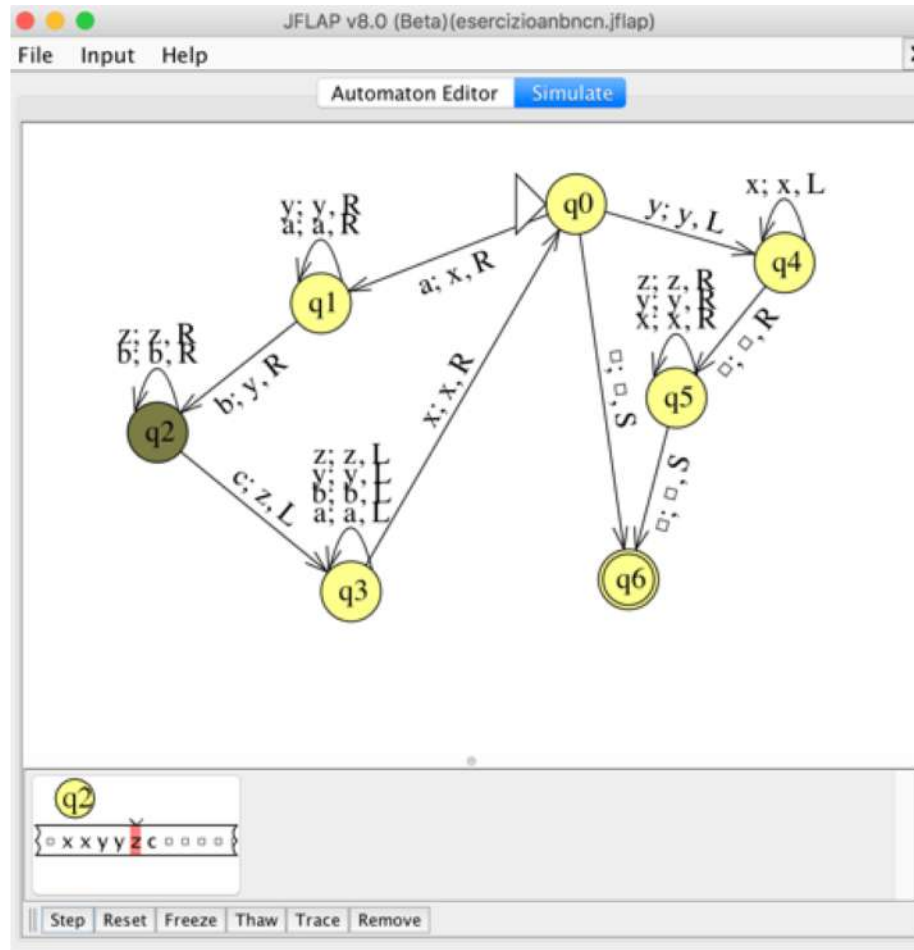
Esercizio 3



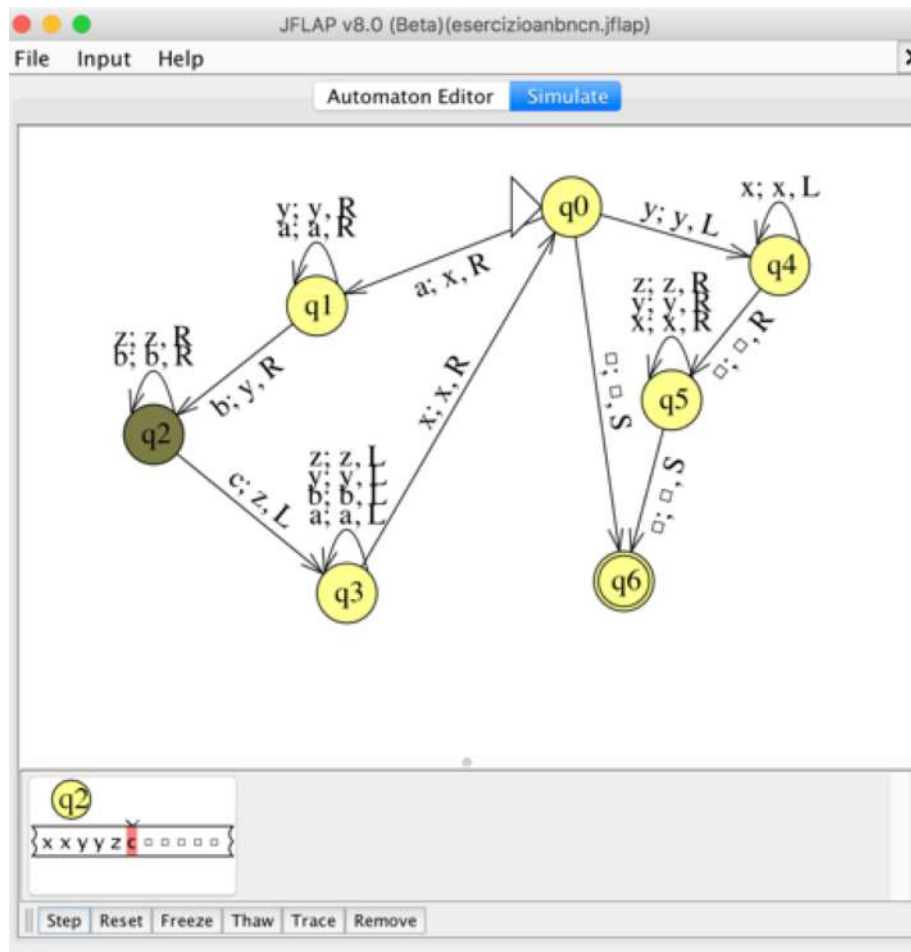
Esercizio 3



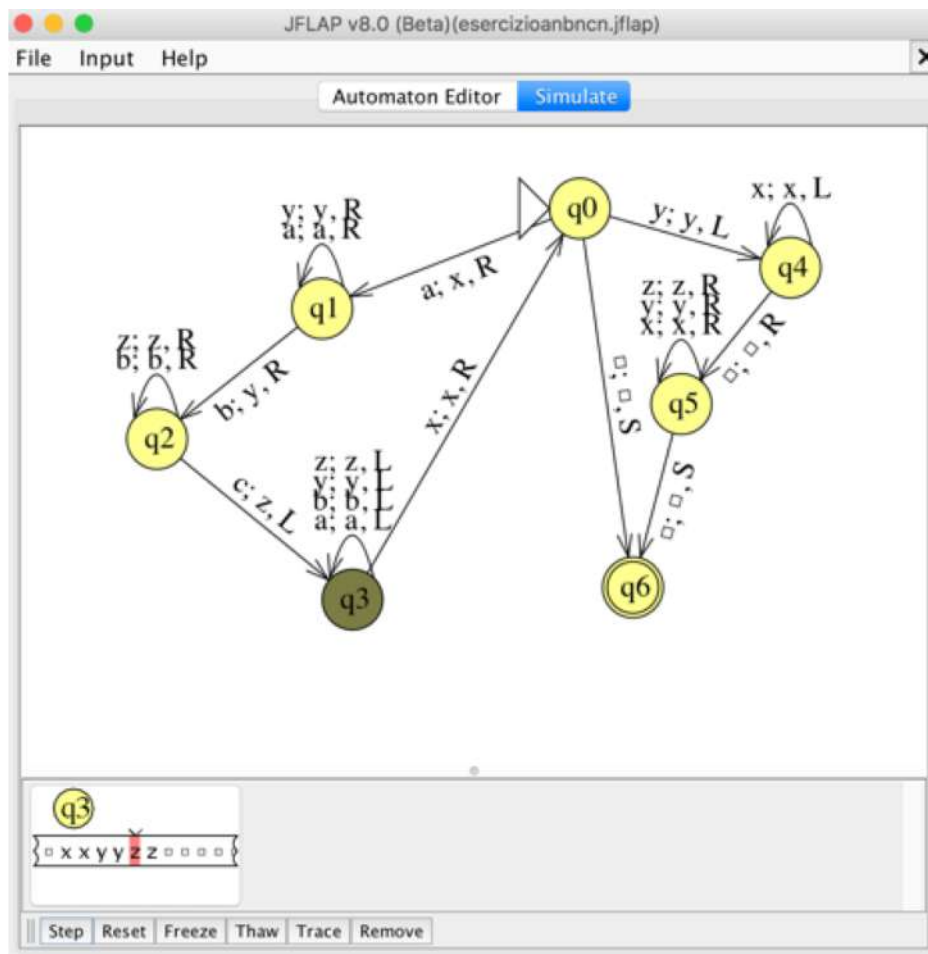
Esercizio 3



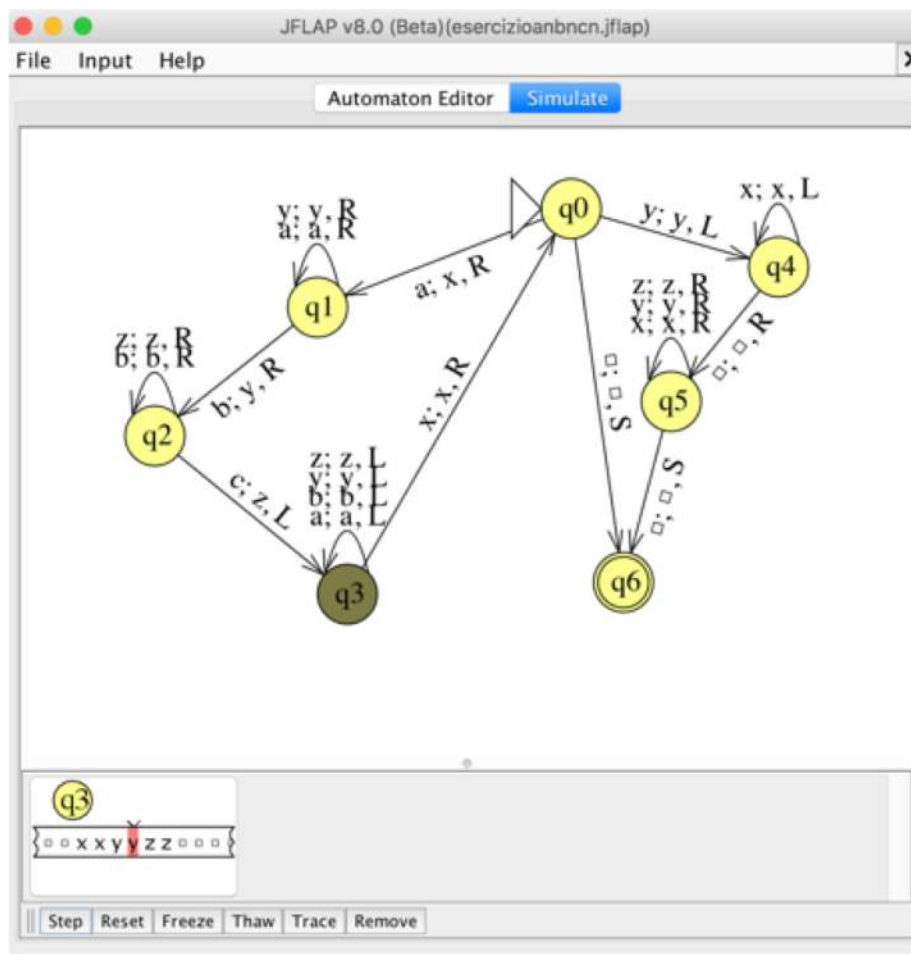
Esercizio 3



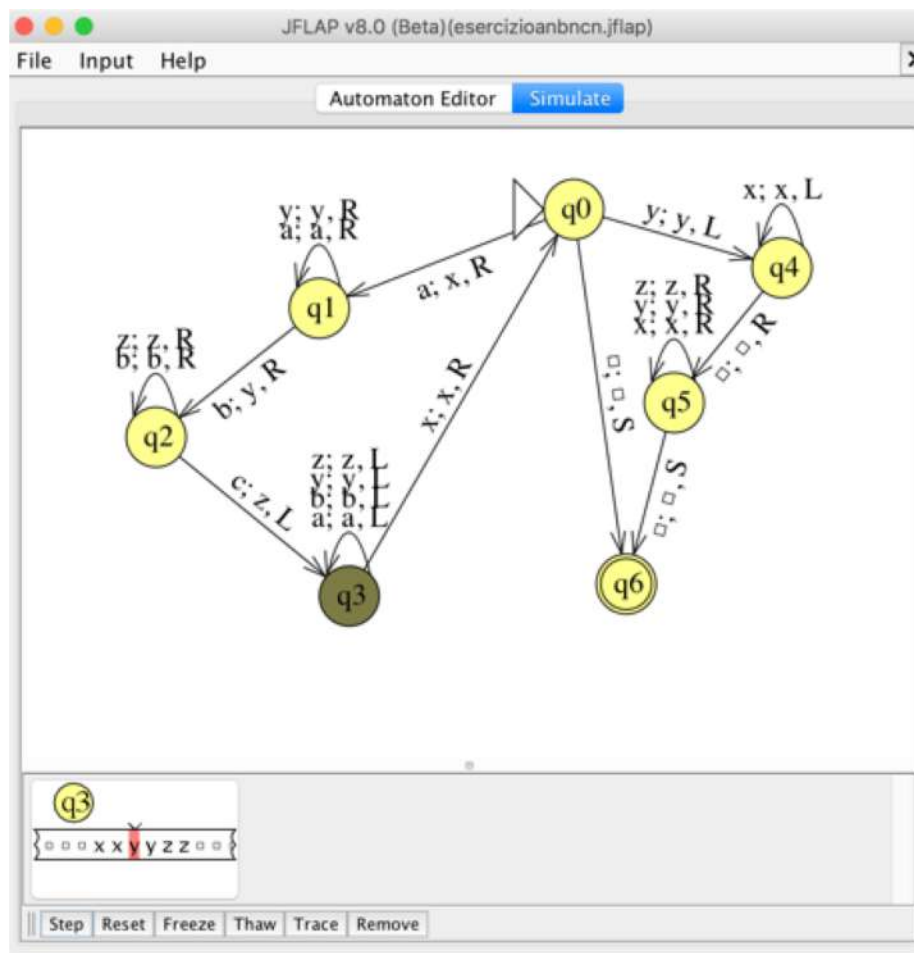
Esercizio 3



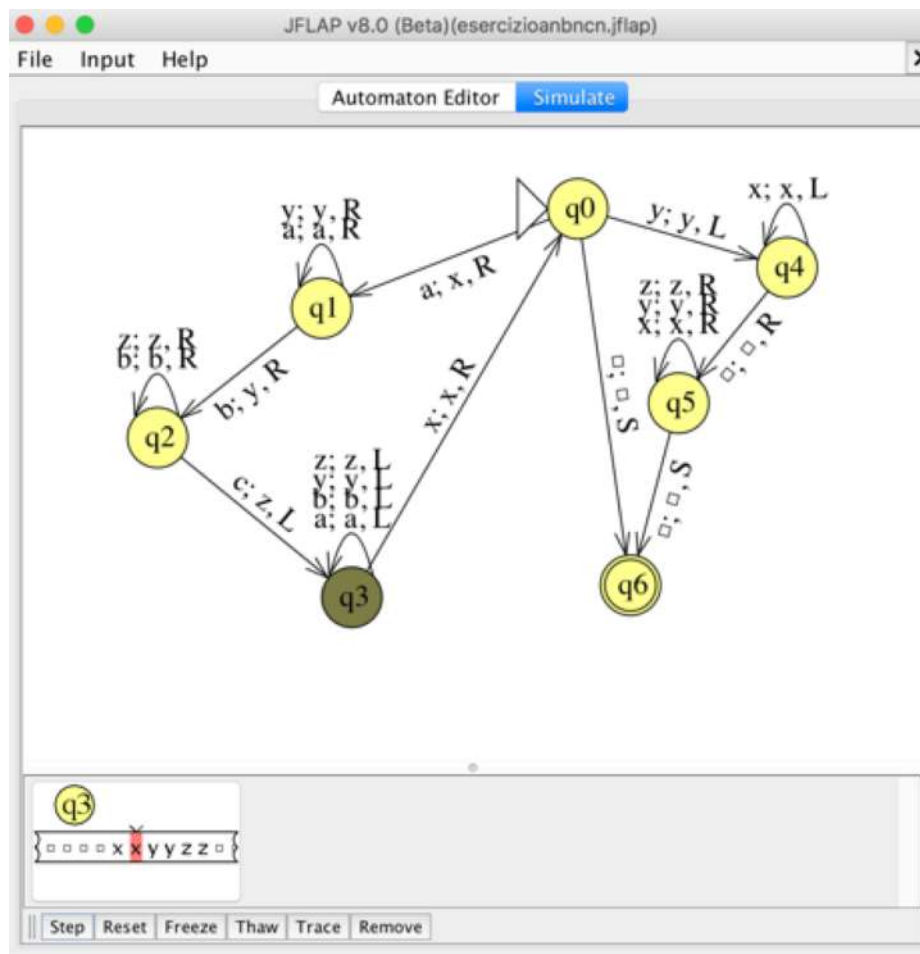
Esercizio 3



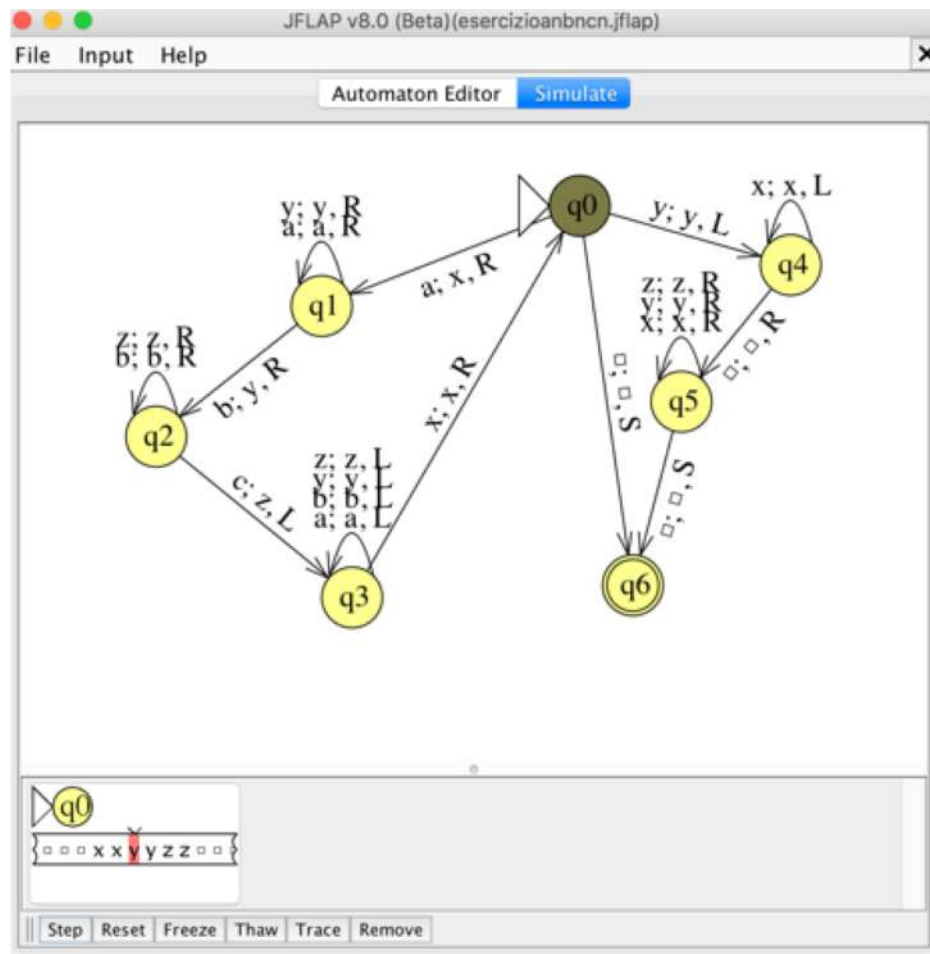
Esercizio 3



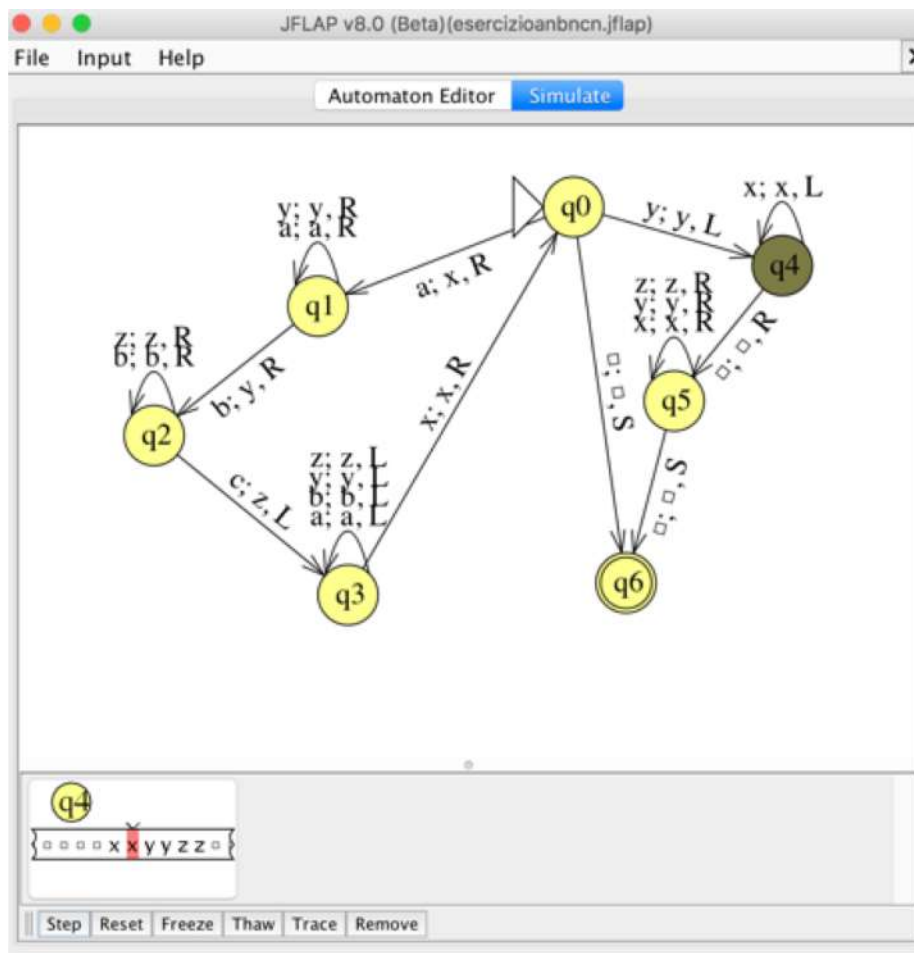
Esercizio 3



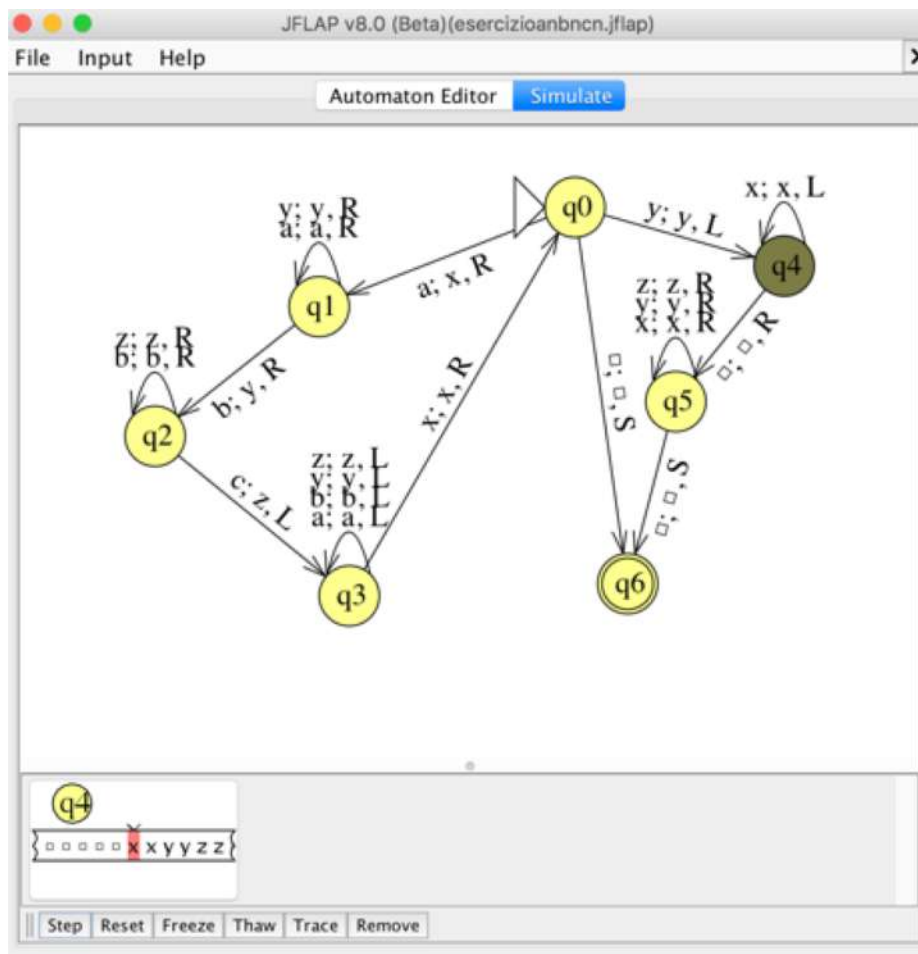
Esercizio 3



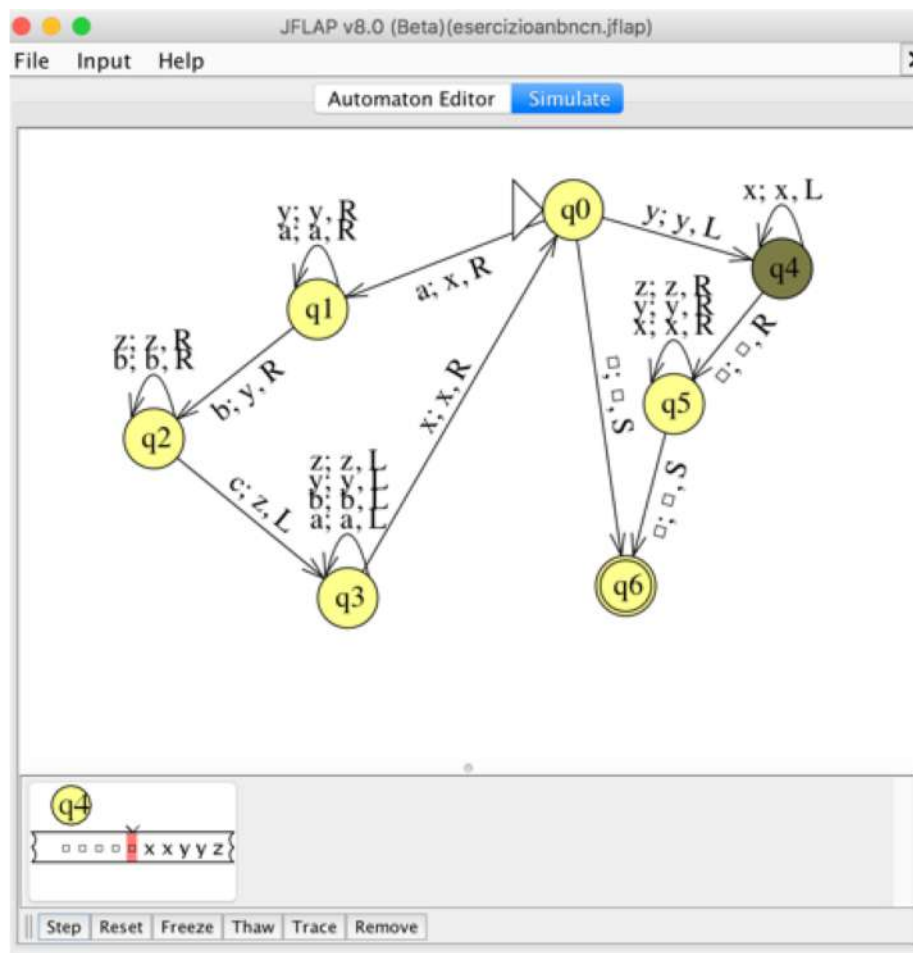
Esercizio 3



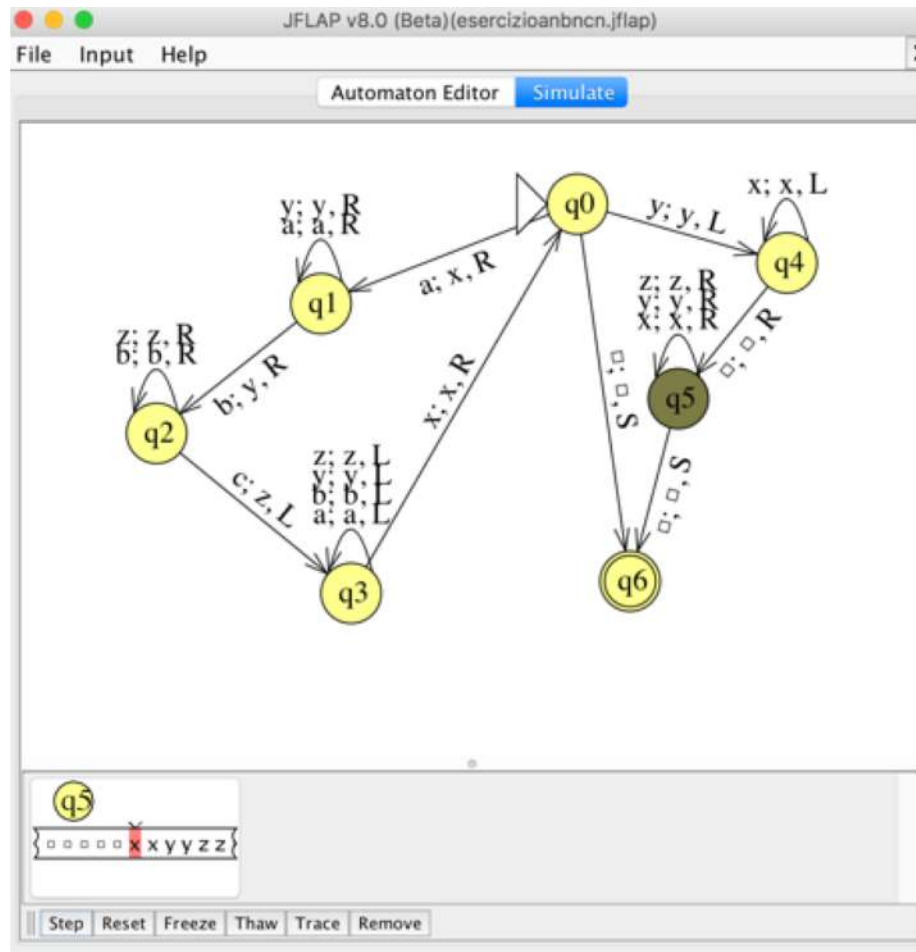
Esercizio 3



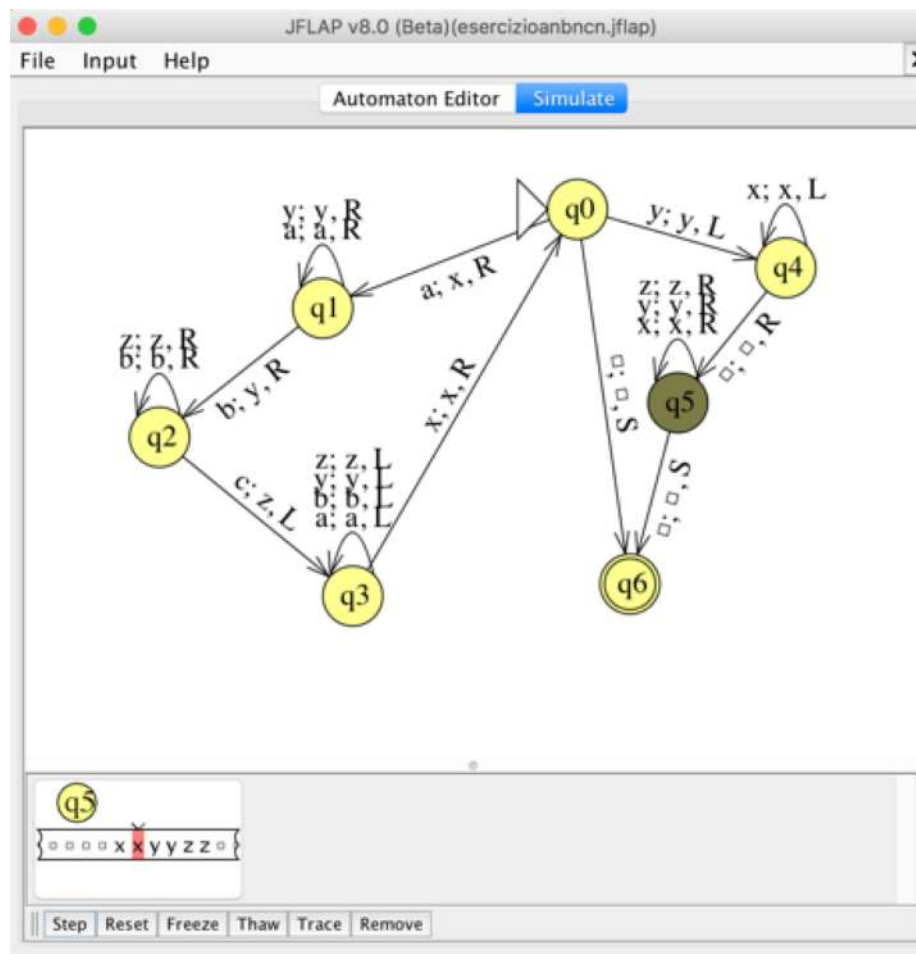
Esercizio 3



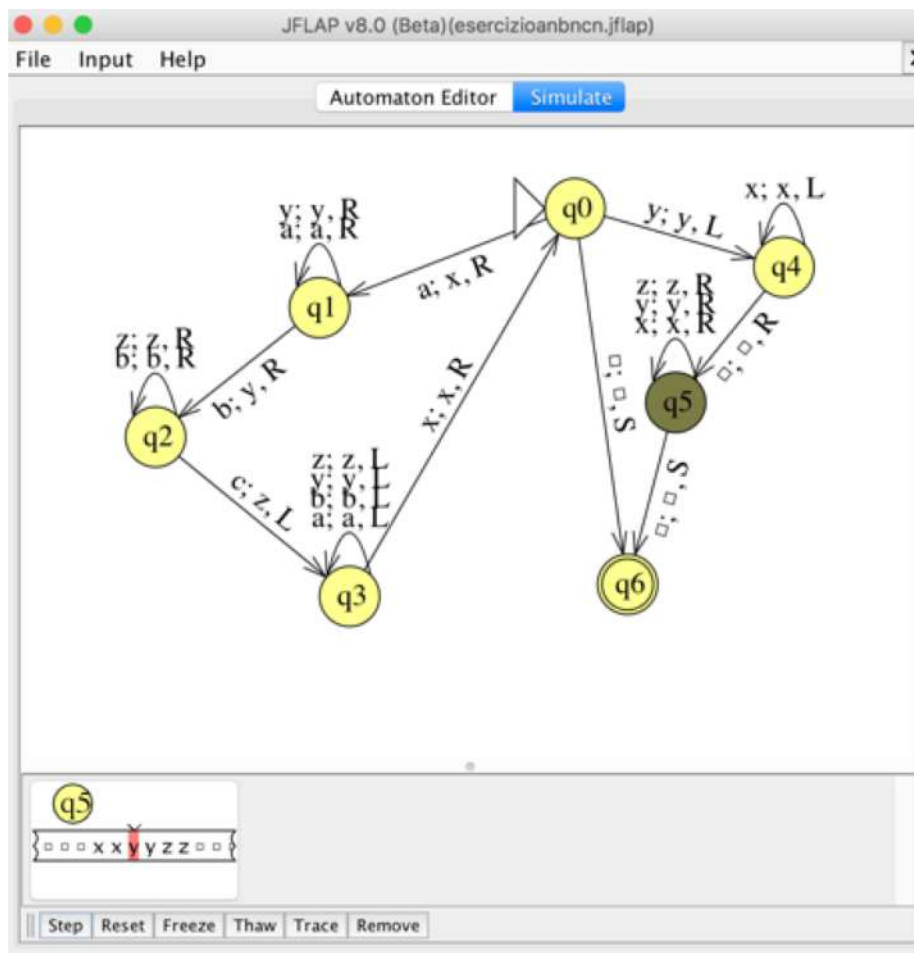
Esercizio 3



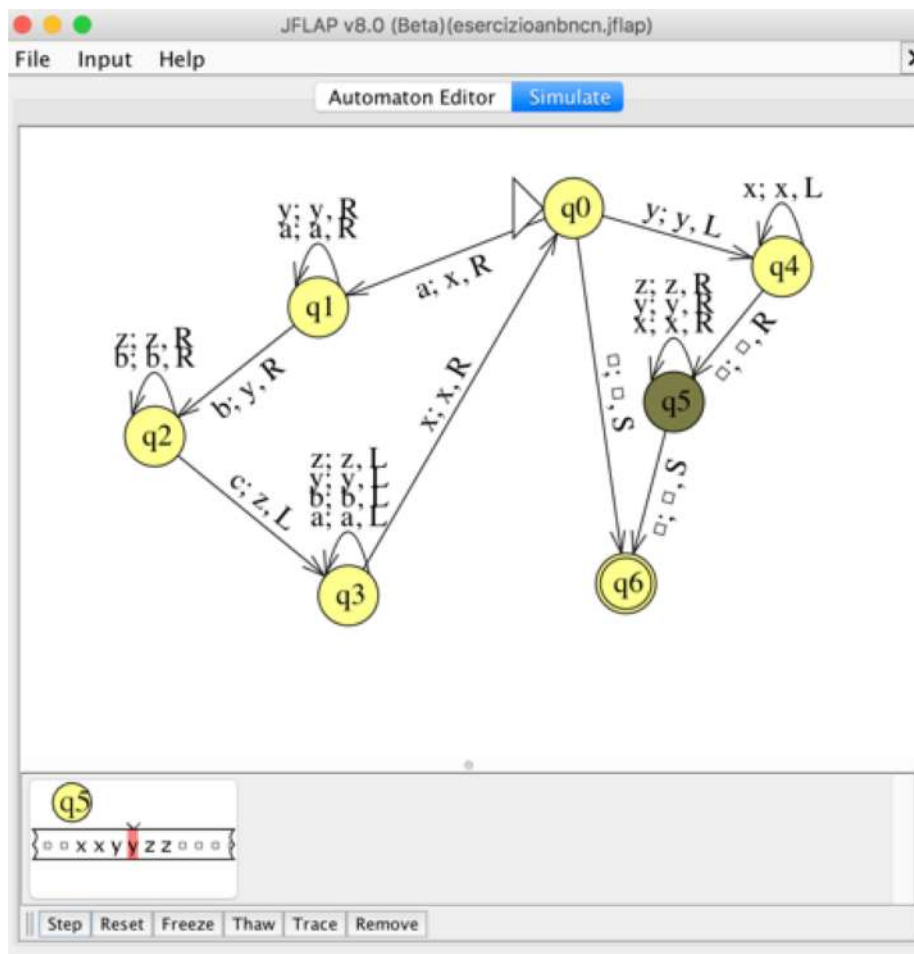
Esercizio 3



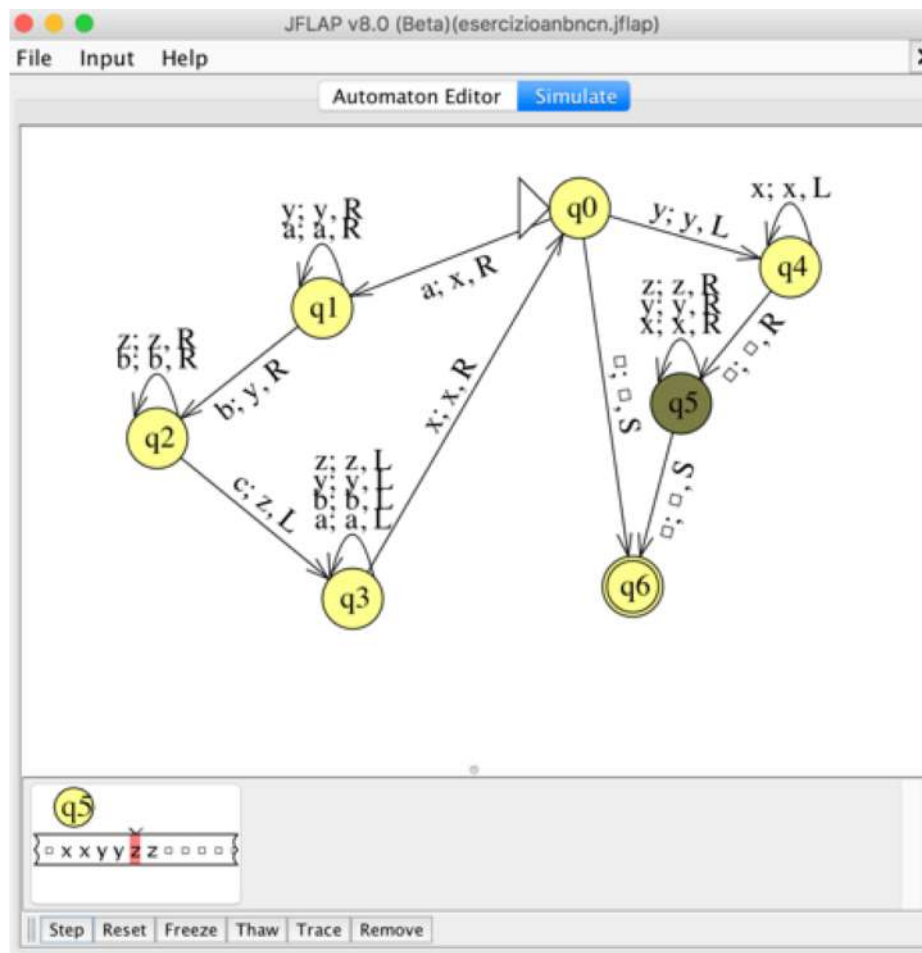
Esercizio 3



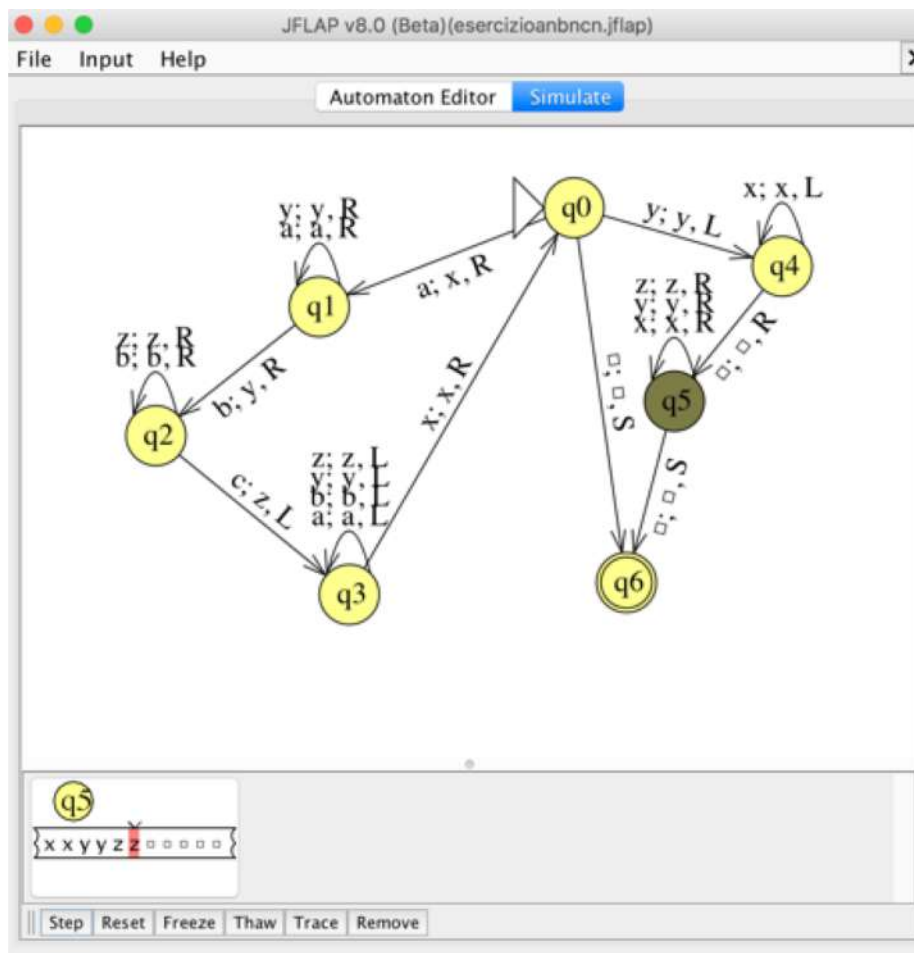
Esercizio 3



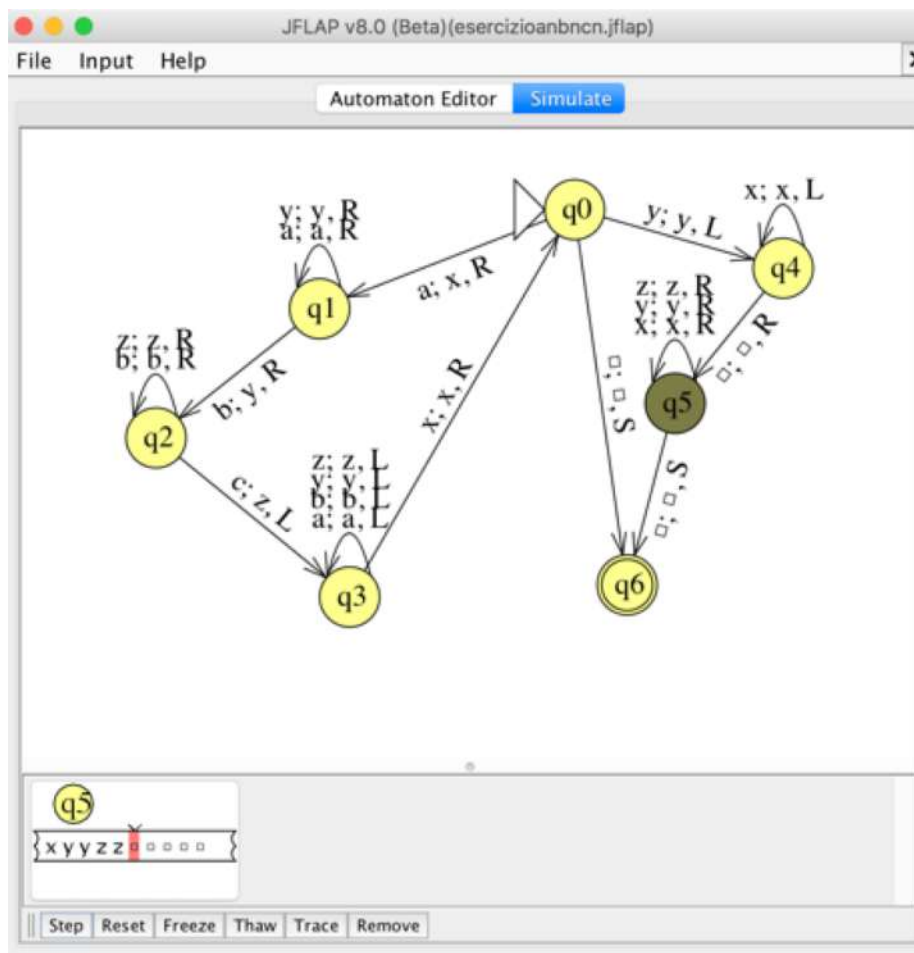
Esercizio 3



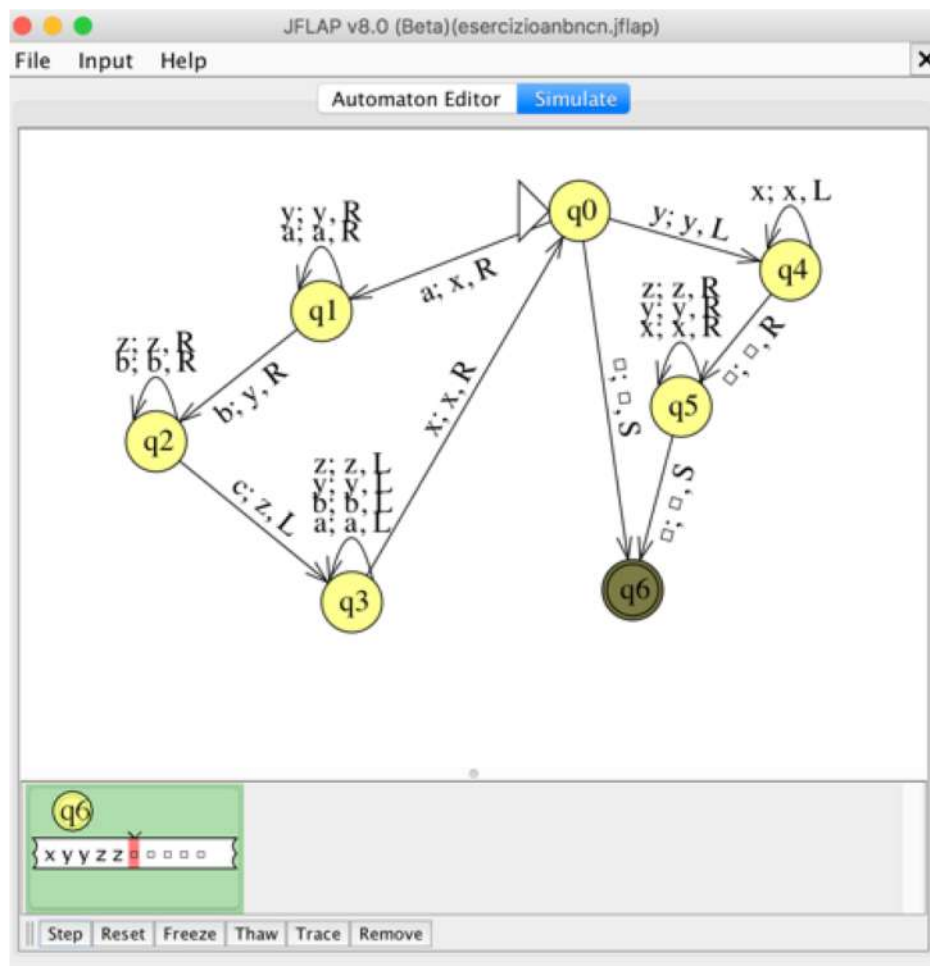
Esercizio 3



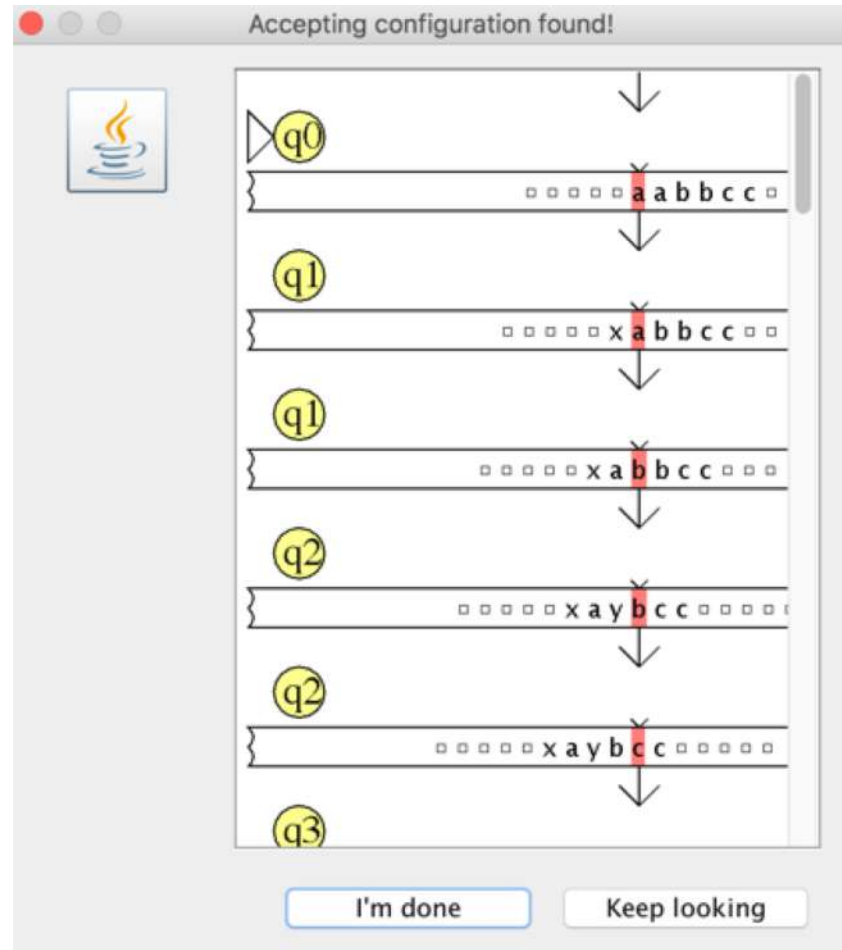
Esercizio 3



Esercizio 3



Esercizio 3



Esercizio 4

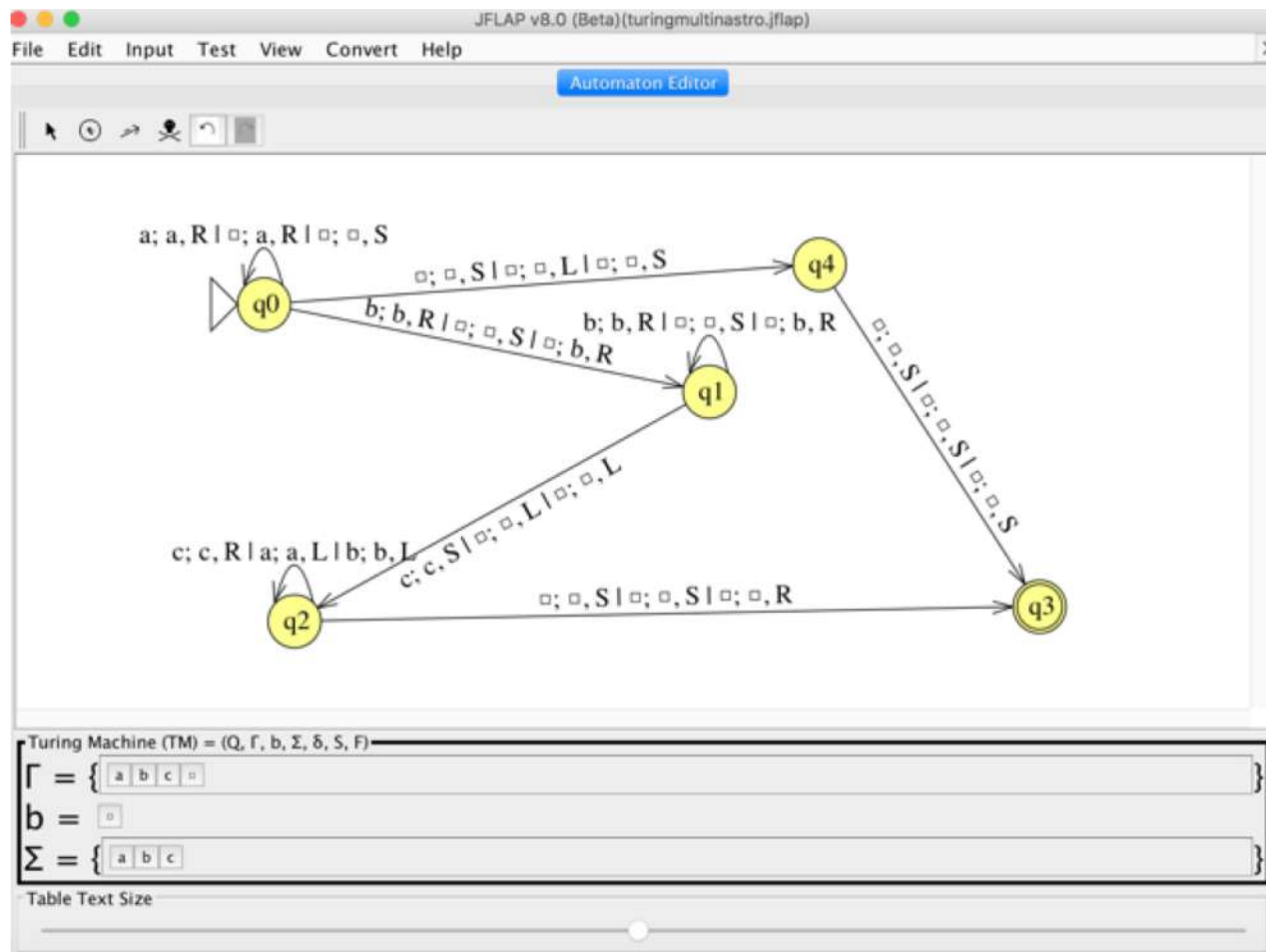
- $L = \{a^n b^n c^n\}$

Costruire una Macchina di Turing multinastro (3 nastri)

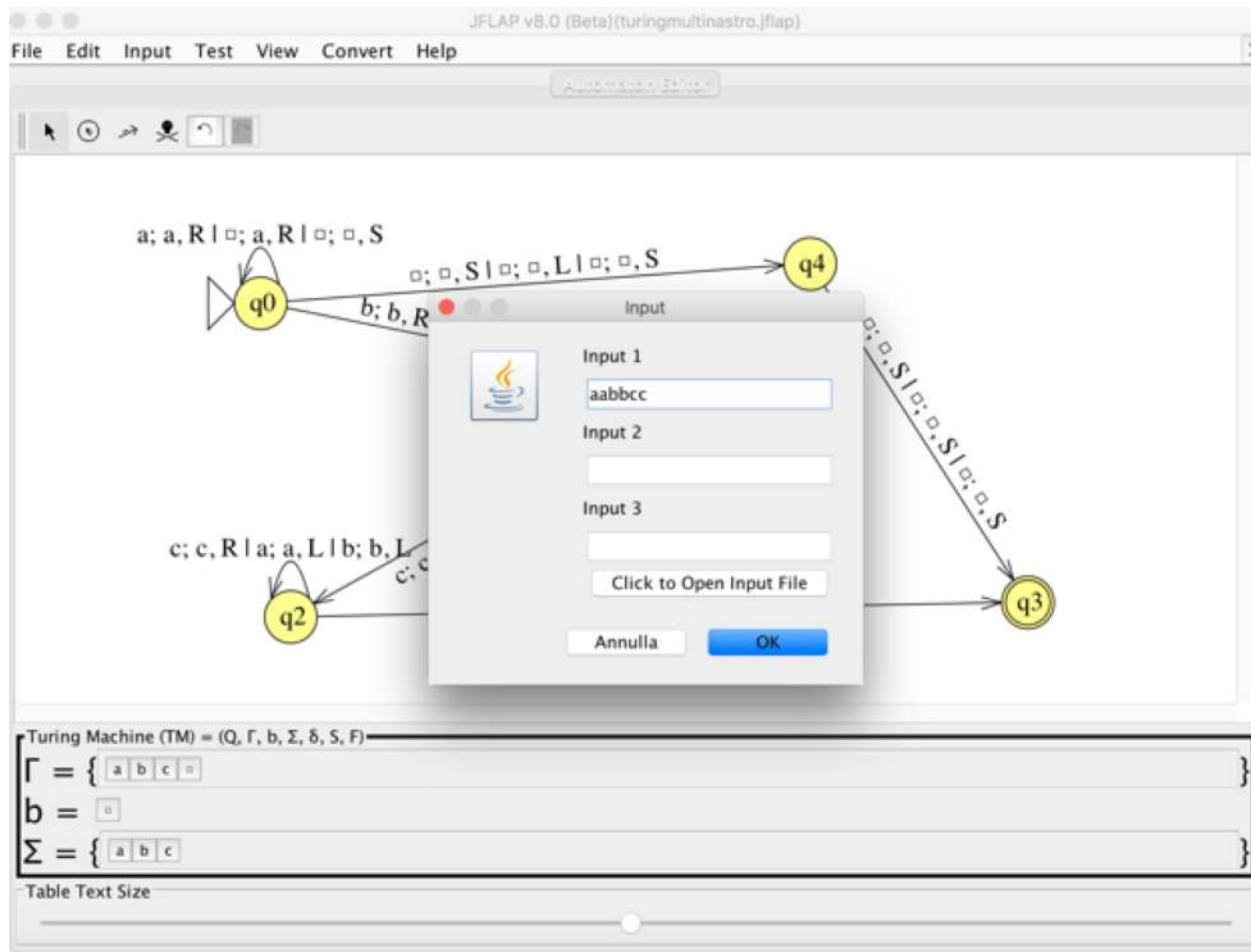
Esercizio 4

- Il primo nastro legge tutte le 'a' e le copia sul secondo nastro
- Poi legge le 'b' e le copia sul terzo nastro
- Infine, i 3 nastri devono controllare il numero di 'a', 'b', 'c'

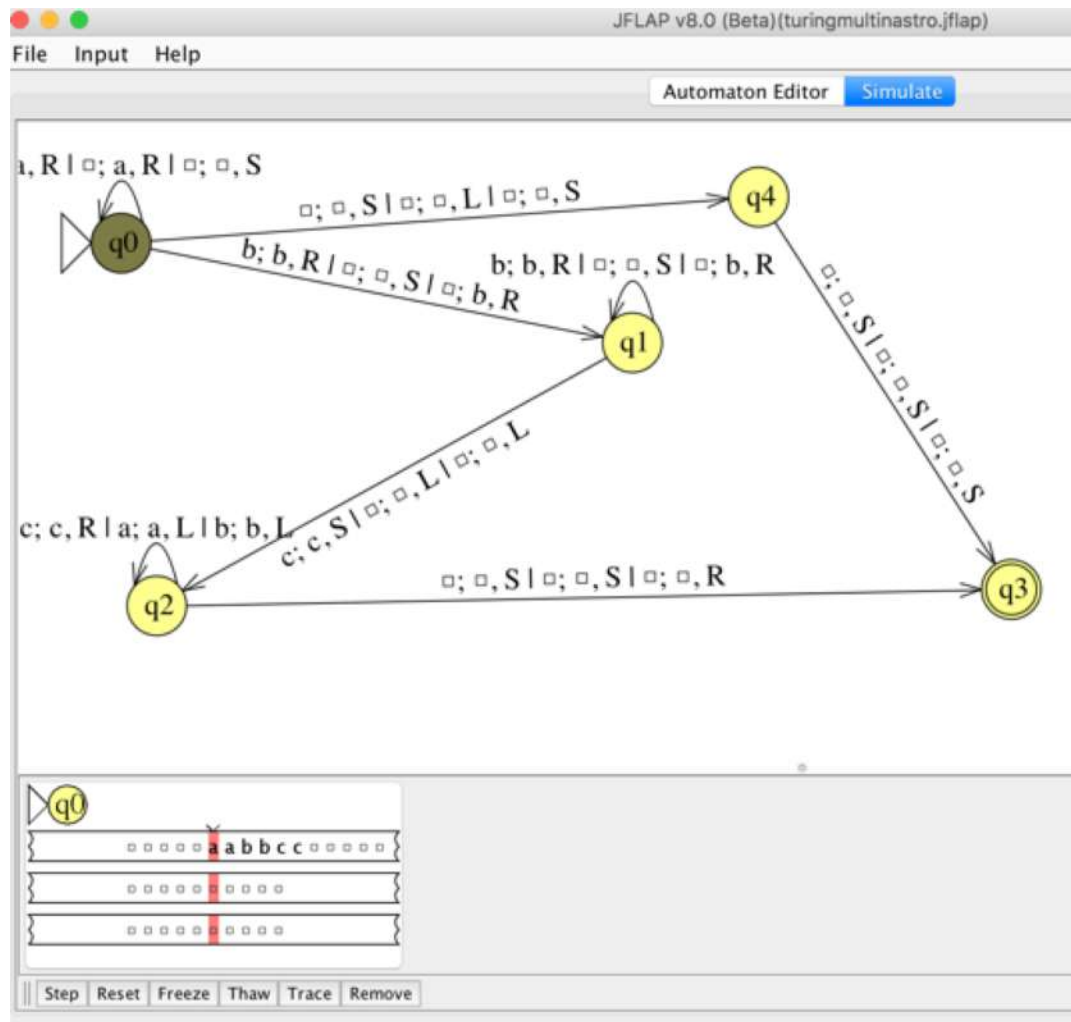
Esercizio 4



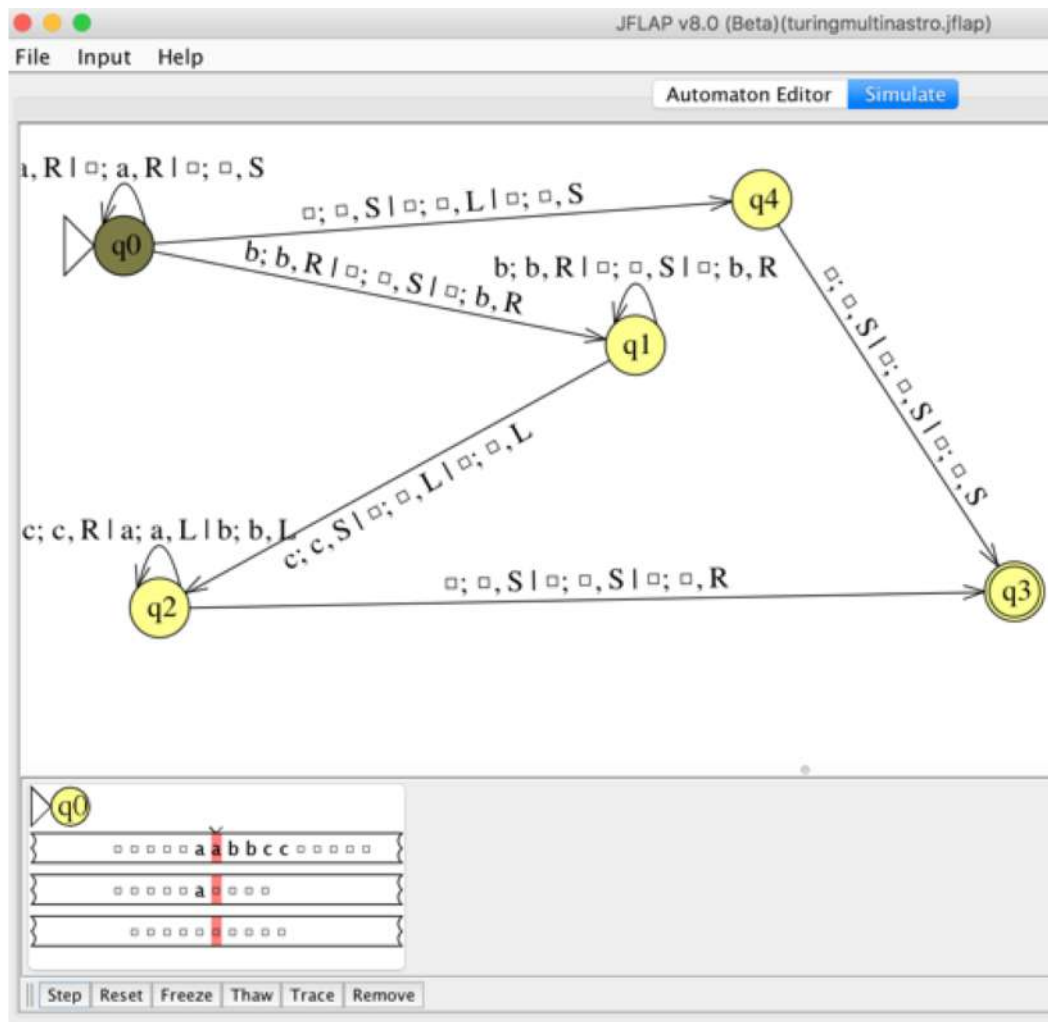
Esercizio 4



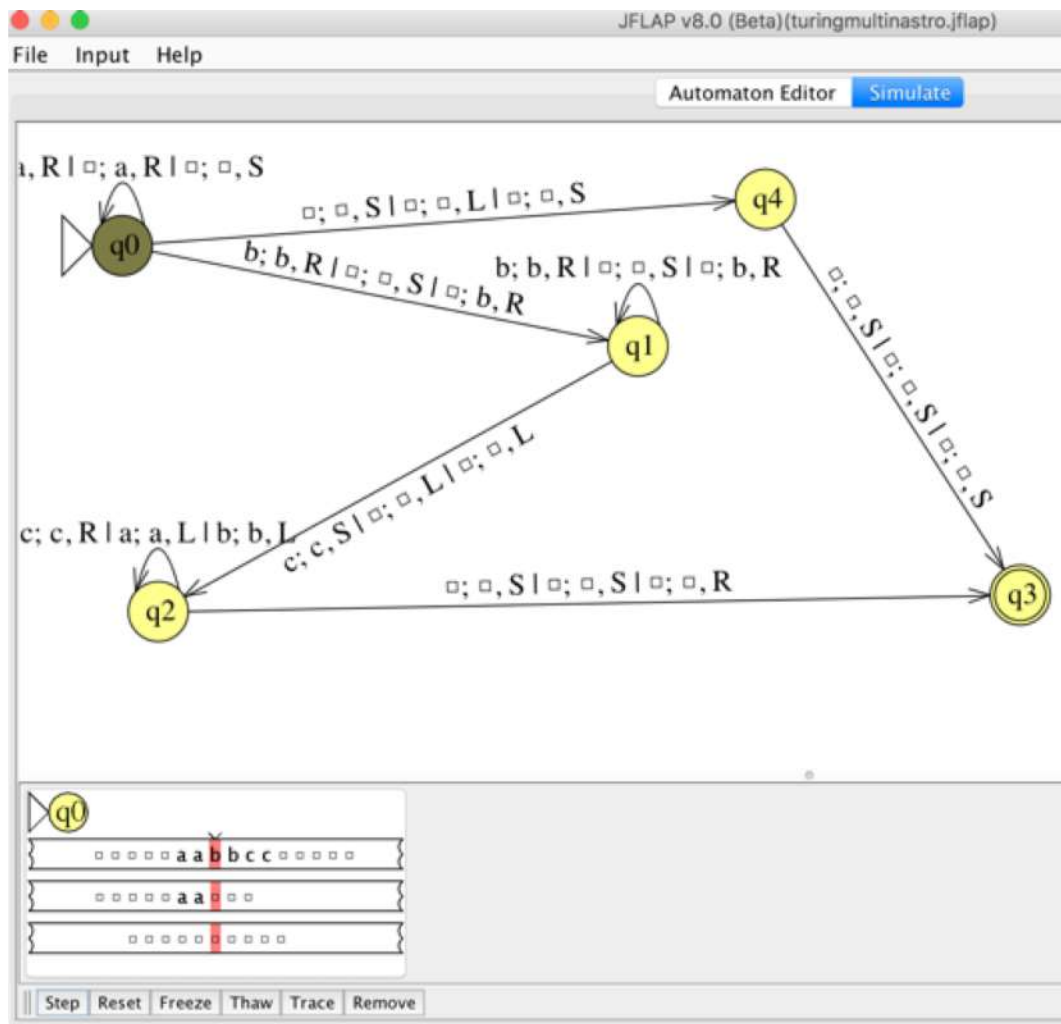
Step 1



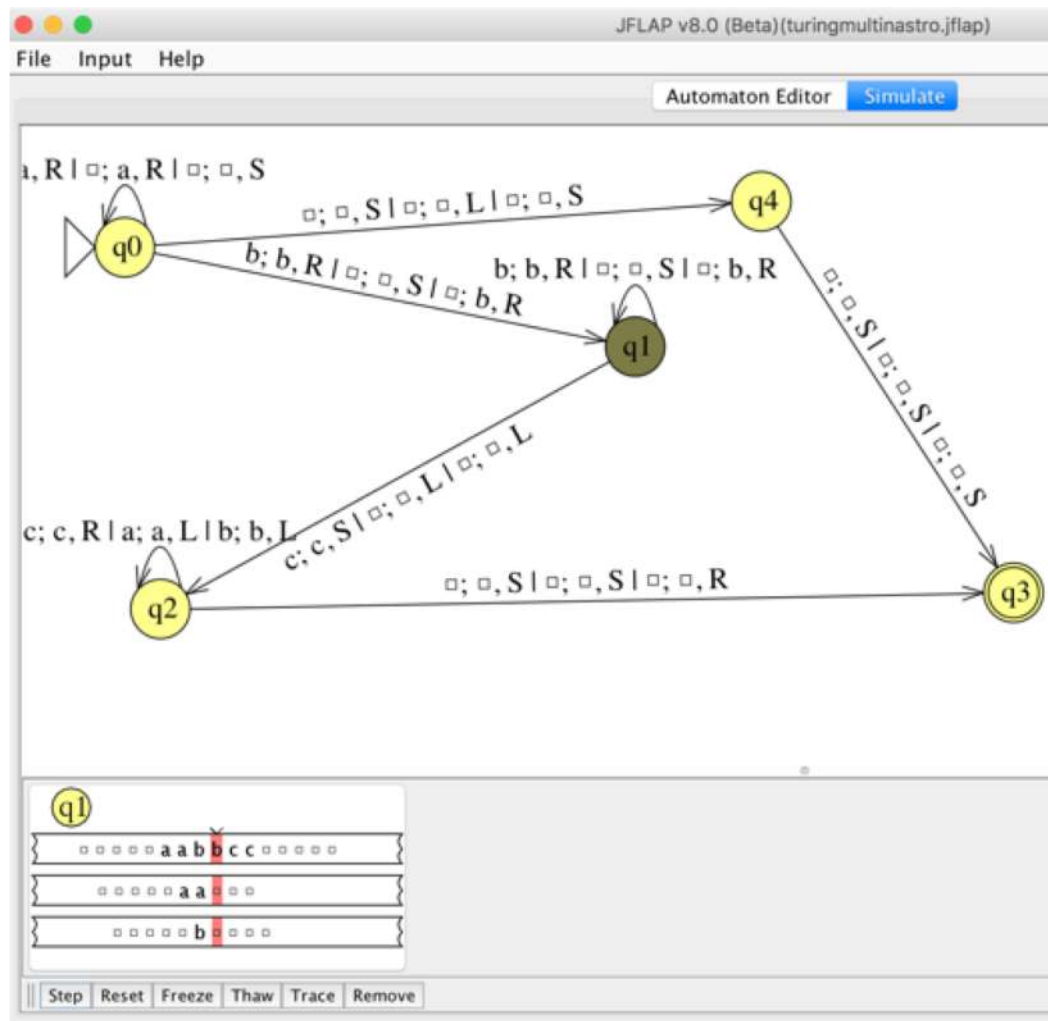
Step 2



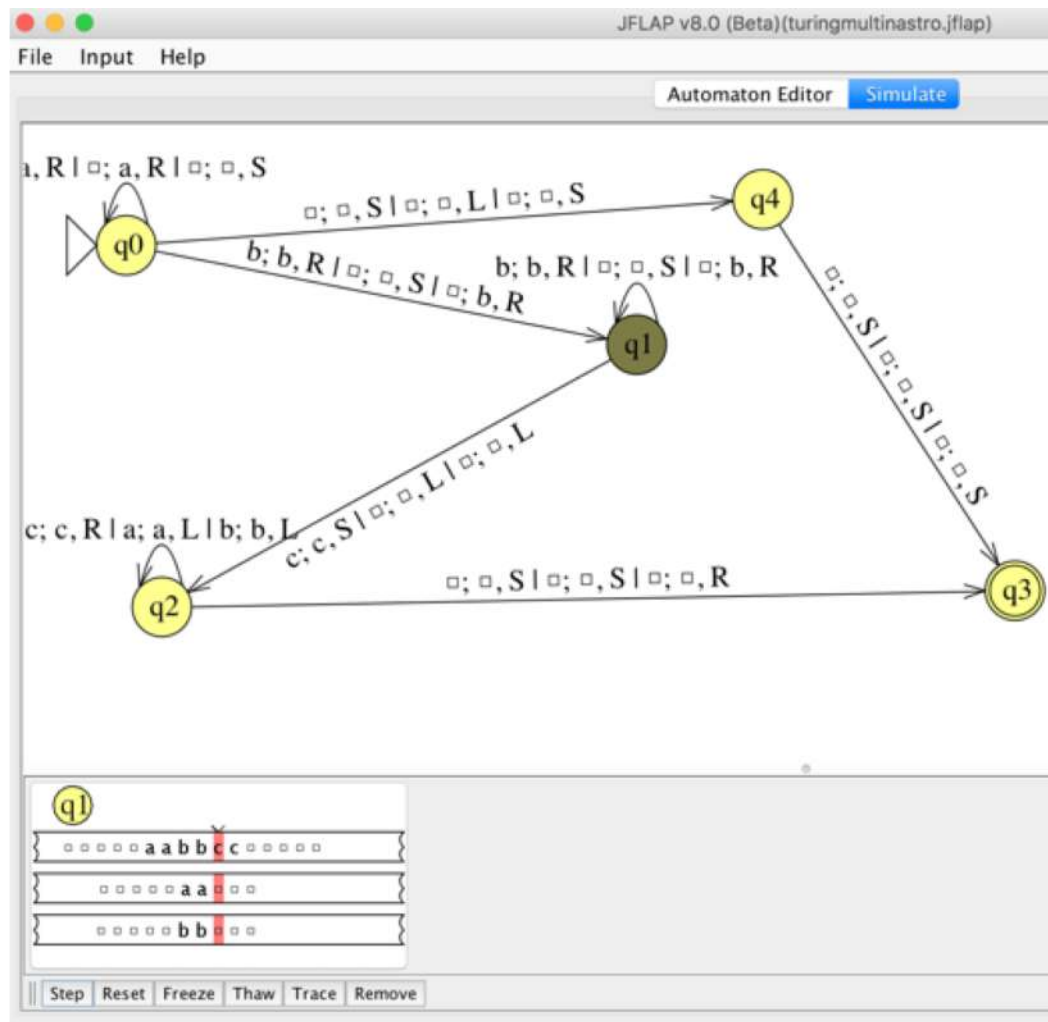
Step 3



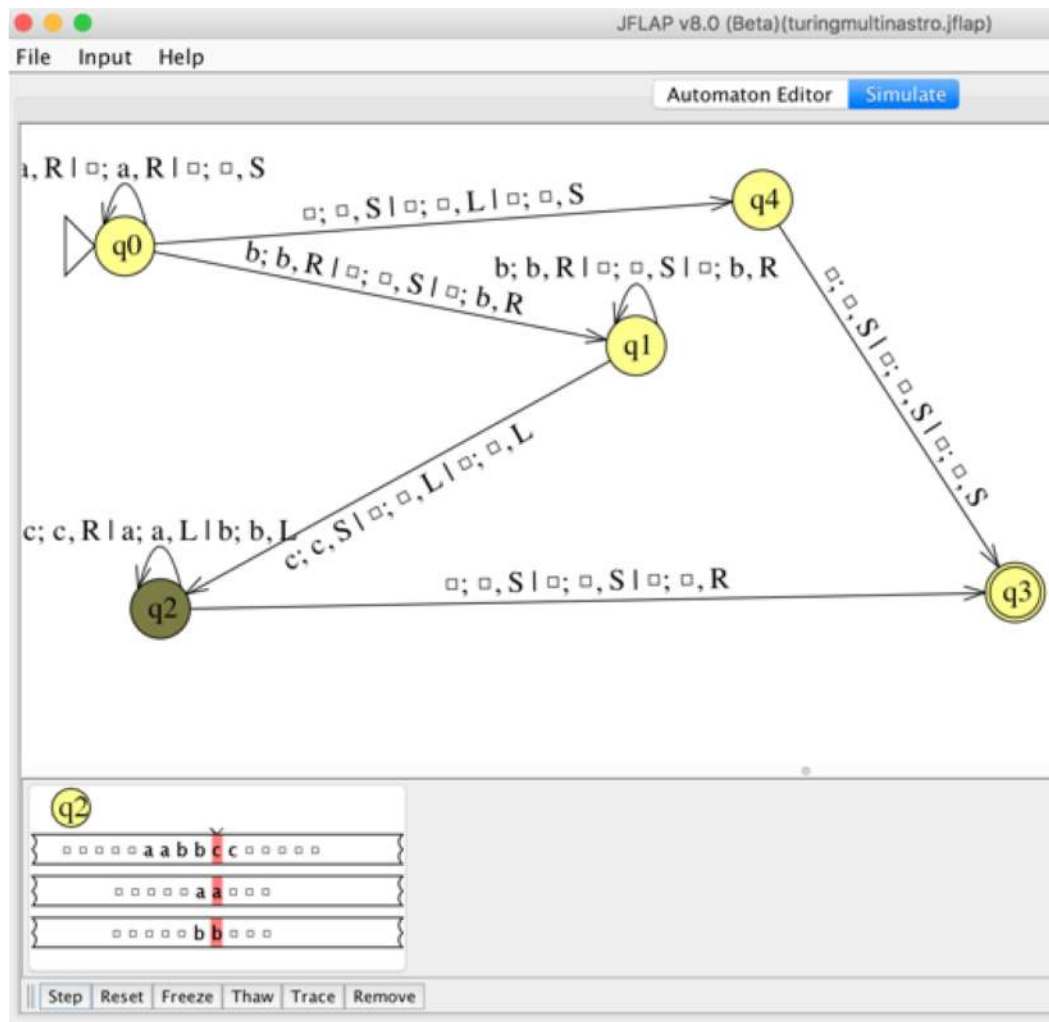
Step 4



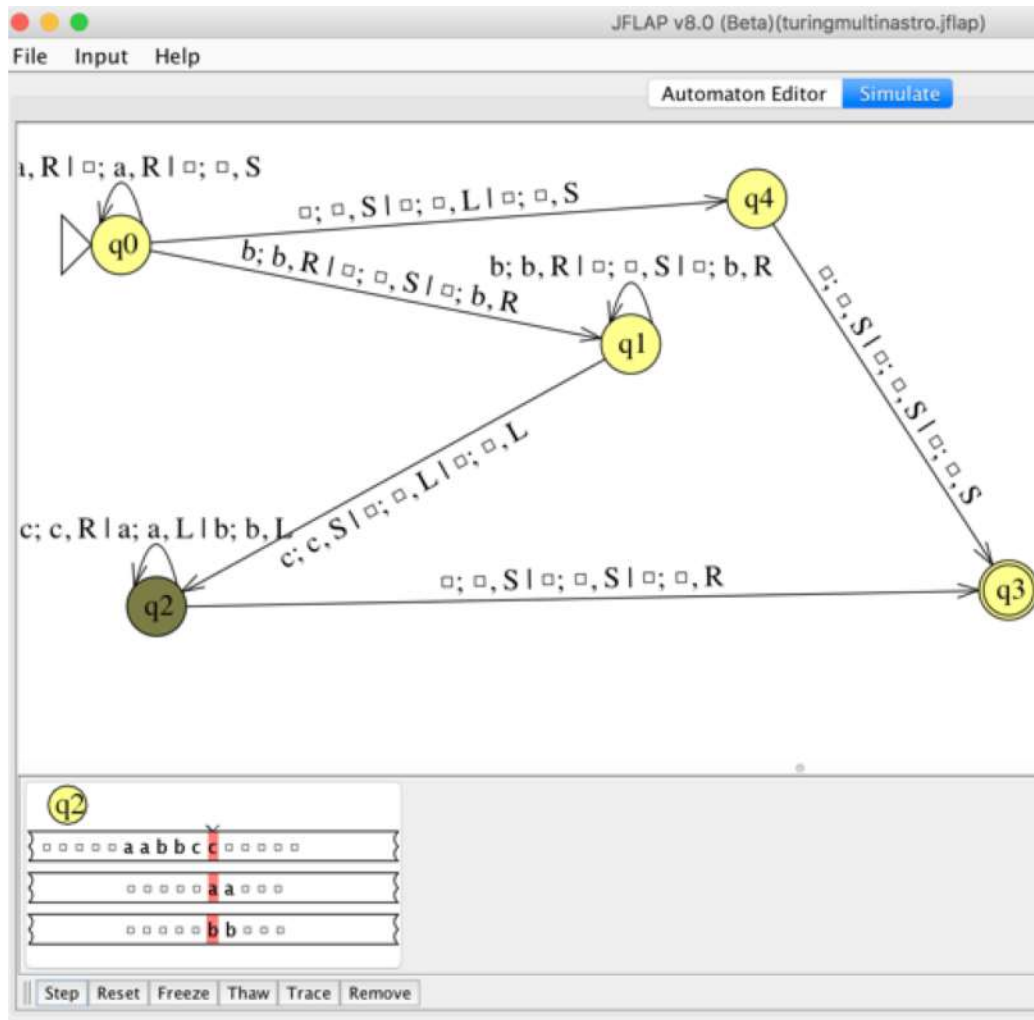
Step 5



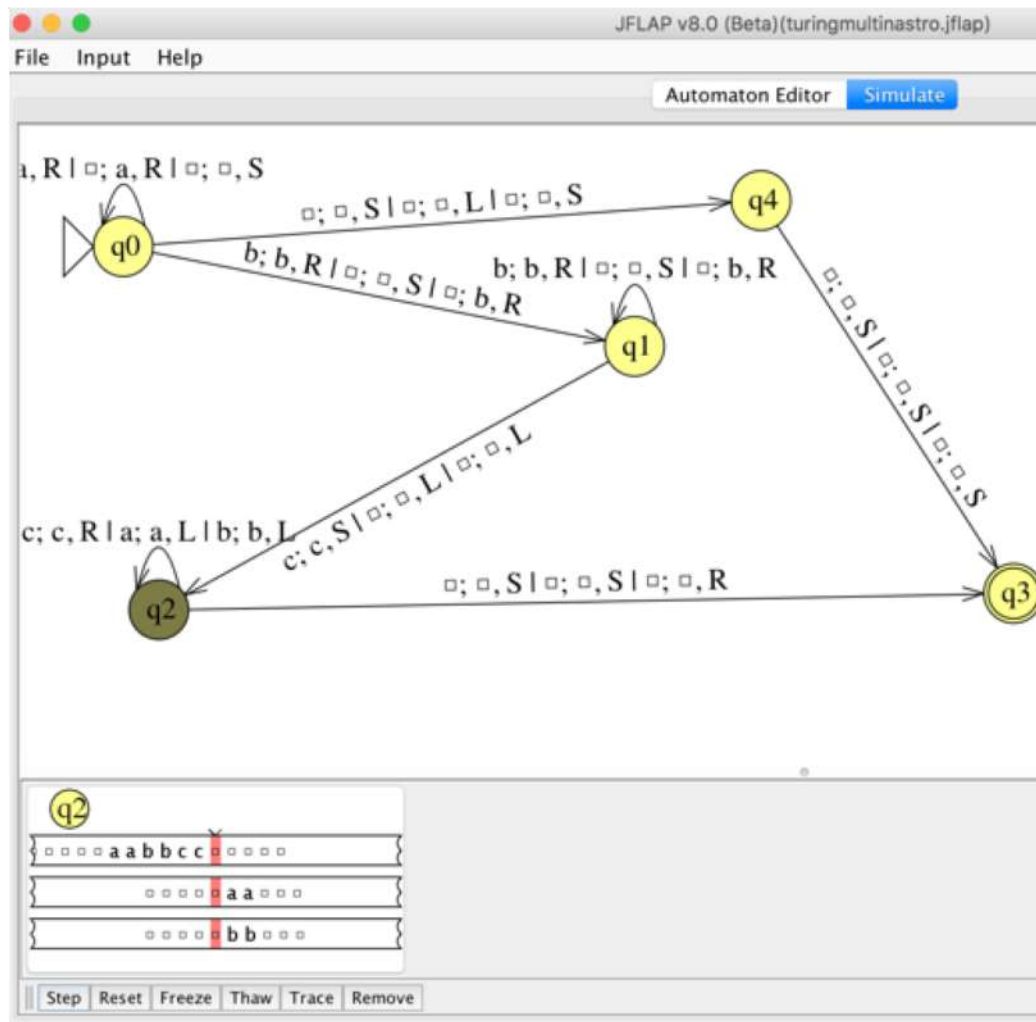
Step 6



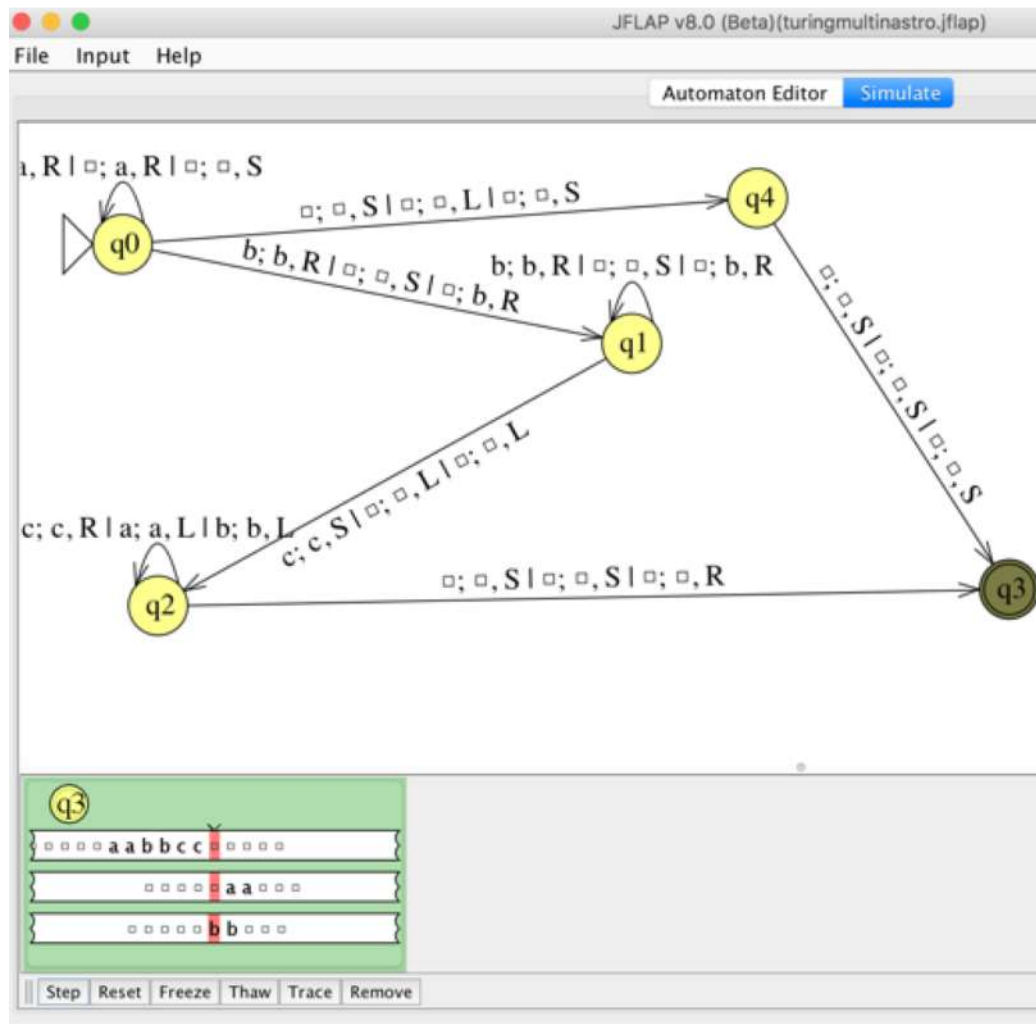
Step 7



Step 8



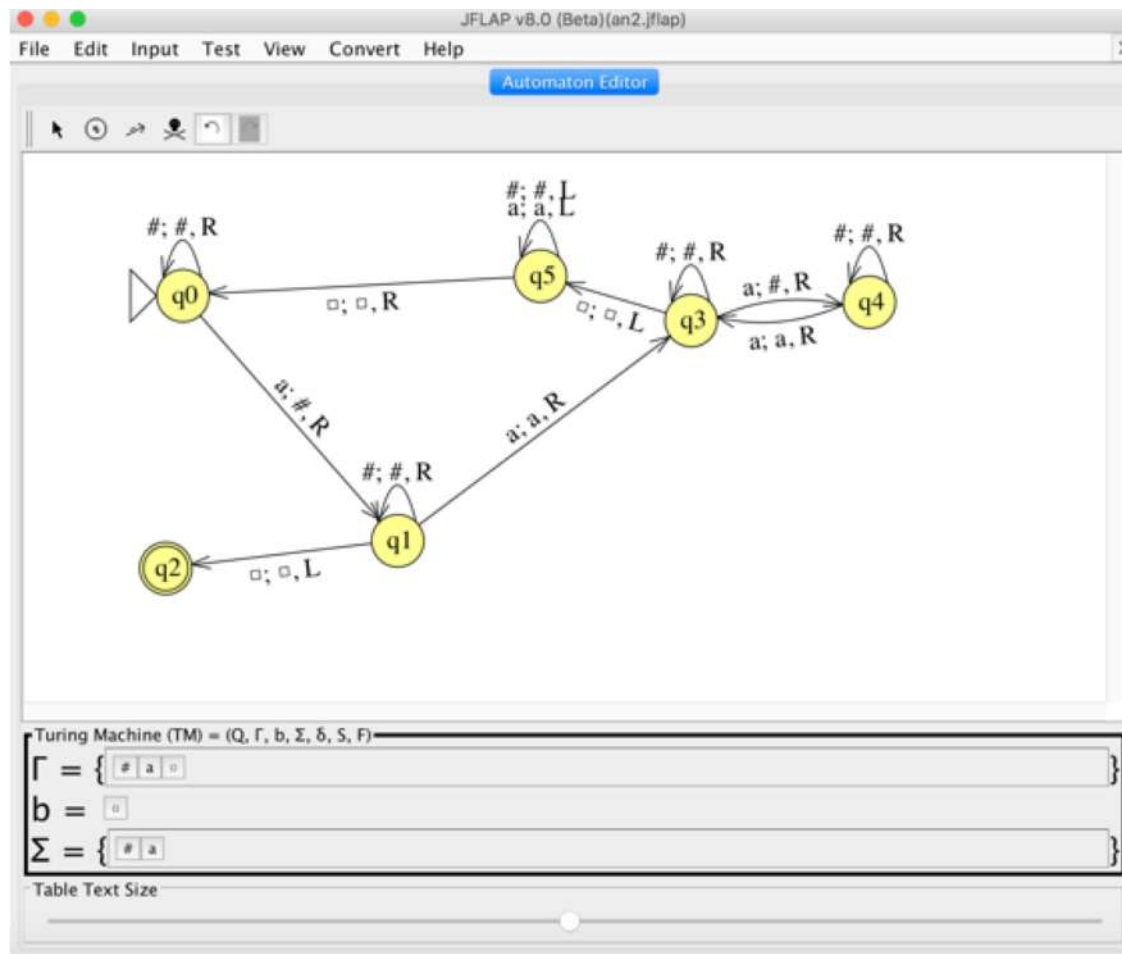
Step 9



Esercizio 5

- $L = \{a^{2^n}\}$
- Costruire una MdT

Esercizio 5



Esercizio 5

