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CS4110
Homework 4
Due September 28

P01. Regular Language

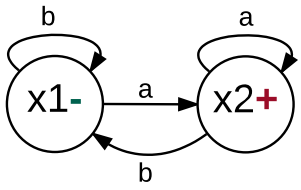
For the following pair of regular expressions, find the Finite Automaton that defines L1∩L2 :

L1: (a+b)*a
L2: (a+b)*aa(a+b)*

Must find the compliment of both languages

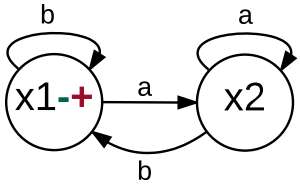
Note: L1 accepts all strings that end in **a**

L1:



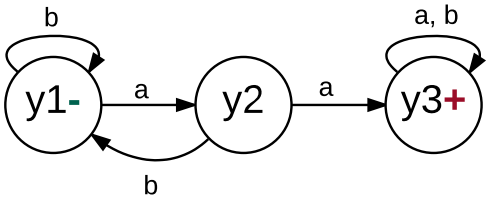
Find Compliment

L1':

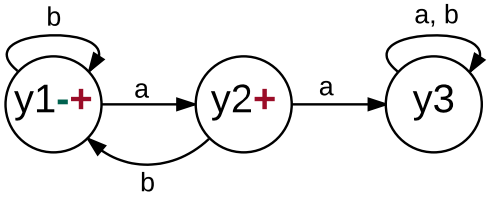


Note: L2 accepts all strings that contain 2 **a**s

L2:



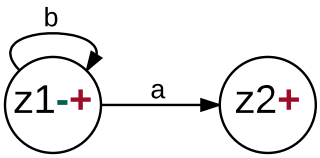
Find Compliment **L2'**:



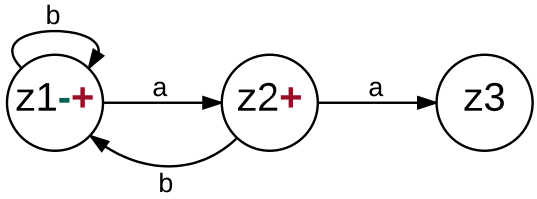
Must find L1' + L2'

(1) Start State: (**z1**) = (x1) or (y1) (-)(+)

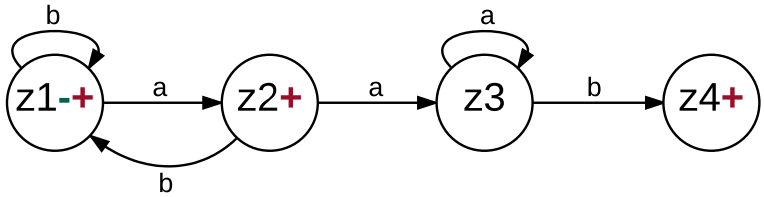
(2) At state (**z1**) which is (x1) or (y1)
if reading a, L1'->(x2) and L2'->(y2), so (**z2**) = (x2) or (y2) (+)
if reading b, L1'->(x1) and L2'->(y1), so (**z1**) = (x1) or (y1) (not new) (+)



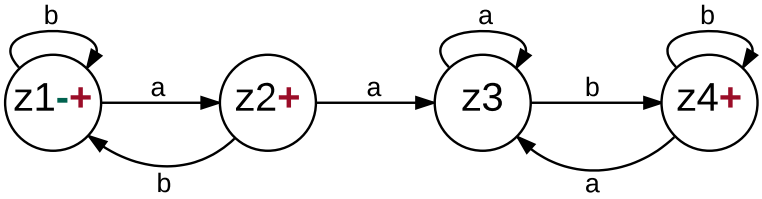
(3) At state (**z2**) which is (x2) or (y2)
if reading a, L1'->(x2) and L2'->(y3), so (**z3**) = (x2) or (y3)
if reading b, L1'->(x1) and L2'->(y1), so (**z1**) = (x1) or (y1) (not new) (+)



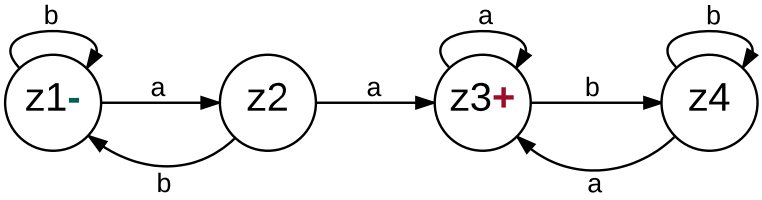
(4) At state (**z3**) which is (x2) or (y3)
if reading a, L1'->(x2) and L2'->(y3), so (**z3**) = (x2) or (y3) (not new)
if reading b, L1'->(x1) and L2'->(y3), so (**z4**) = (x1) or (y3) (+)



(4) At state (**z4**) which is (x1) or (y3)
if reading a, L1'->(x2) and L2'->(y3), so (**z3**) = (x2) or (y3) (not new)
if reading b, L1'->(x1) and L2'->(y3), so (**z4**) = (x1) or (y3) (not new)



Must find the compliment of this union of L1' + L2'



P02. Non-regular Language

Use the pumping lemma to show that the following language is non-regular:
a^(n) **b**^(2n), n>1

1. Need to find the substrings x y and z such that y can be pumped
2. This language will have some **a**s then twice that number of **b**s

Lets try a few out:

x y z
a **aa** **bbbbbb**
If y is pumped there will be too many **a**s

x y z
aaa **bbbb** **bb**
If y is pumped there will be too many **b**s

x y z
aa **abb** **bbbb**
If y is pumped the string will be out of order, we will get **abbabb**

Cannot find a substring to be pumped that satisfies the properties of the language, so this language is non regular