RECAP Lecture 7

- FA of **EVEN EVEN,** FA corresponding to finite languages(using both methods), Transition graphs.

Recap Definition of TG continued …

Definition: A Transition graph (TG), is a collection of the followings

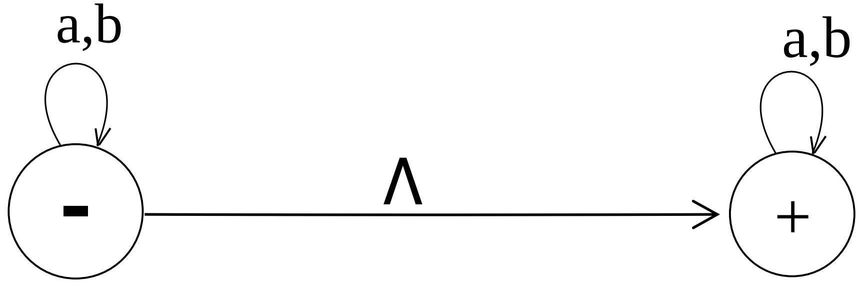
1) Finite number of states, at least one of which is start state and some (maybe none) final states.
2) Finite set of input letters (Σ) from which input strings are formed.
3) Finite set of transitions that show how to go from one state to another based on reading specified substrings of input letters, possibly even the null string (Λ).

Note

- It is to be noted that in TG there may exist more than one paths for certain string, while there may not exist any path for certain string as well. If there exists at least one path for a certain string, starting from initial state and ending in a final state, the string is supposed to be accepted by the TG, otherwise the string is supposed to be rejected. Obviously collection of accepted strings is the language accepted by the TG.

Example

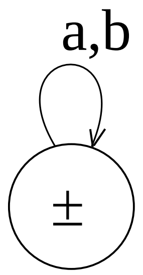
- Consider the Language L , defined over Σ = {a, b} of **all strings including Λ.** The language L may be accepted by the following TG



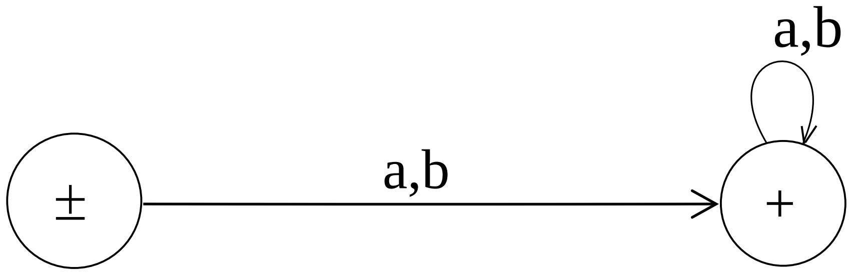
The language L may also be accepted by the following TG

Example Continued …

TG_1



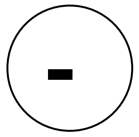
TG_2



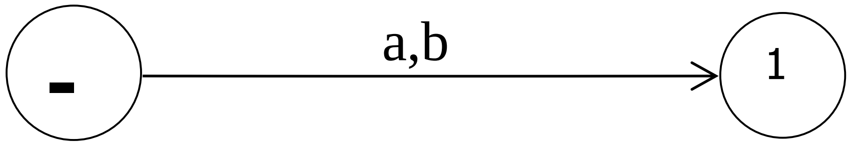
Example

- Consider the following TGs

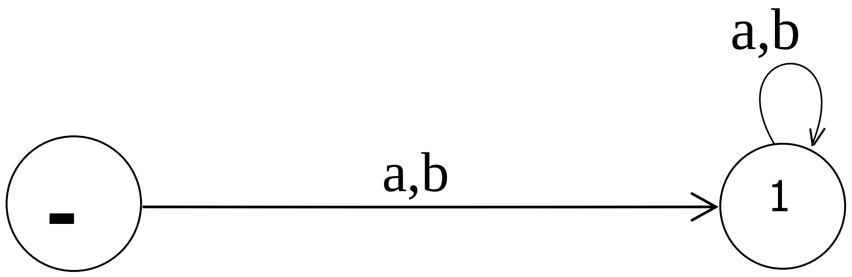
TG_1



TG_2



TG_3



Example Continued …

- It may be observed that in the first TG, no transition has been shown. Hence this TG does not accept any string, defined over any alphabet. In TG_2 there are transitions for a and b at initial state but there is no transition at state 1. This TG still does not accept any string. In TG_3 there are transitions at both initial state and state 1, but it does not accept any string.

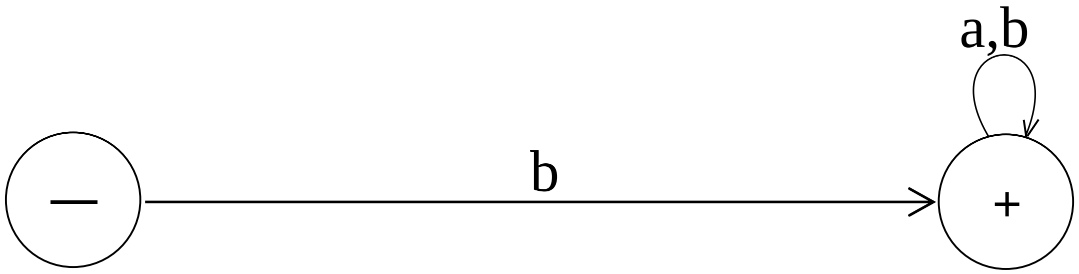
Example Continued …

Thus none of TG_1, TG_2 and TG_3 accepts any string, *i.e.* these TGs accept empty language. It may be noted that TG_1 and TG_2 are TGs but not FA, while TG_3 is both TG and FA as well.

It may be noted that every FA is a TG as well, but the converse may not be true, *i.e.* every TG may not be an FA.

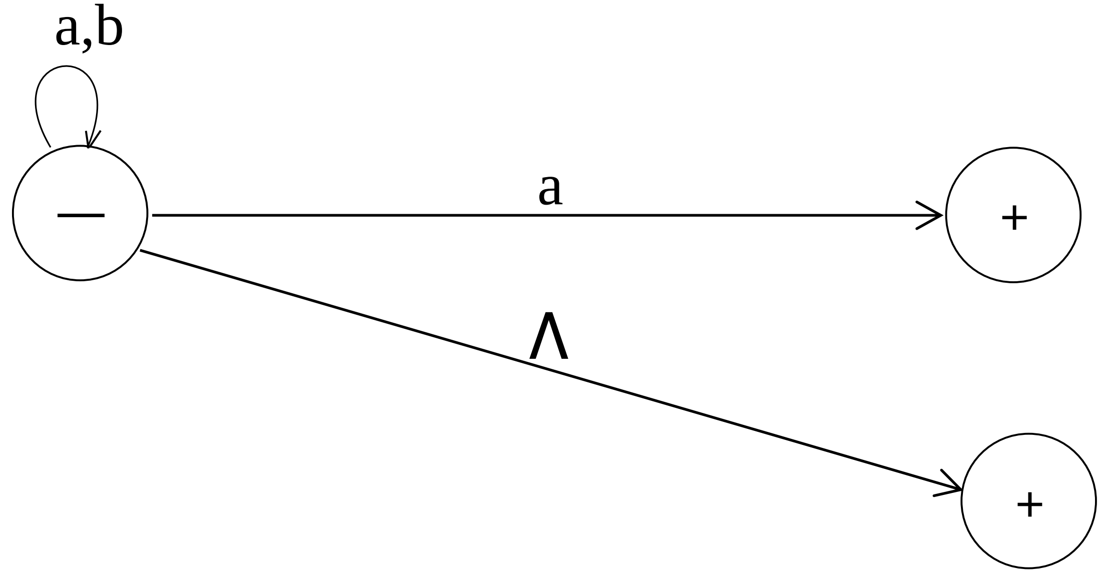
Example

Consider the language L of strings, defined over $\Sigma=\{a, b\}$, **starting with b.** The language L may be expressed by RE $b(a + b)^*$, may be accepted by the following TG



Example

⌘Consider the language L of strings, defined over Σ={a, b}, **not ending in b.** The language L may be expressed by RE Λ + (a + b)*a , may be accepted by the following TG



Task solution …

Using the technique discussed by Martin, build an FA accepting the following language

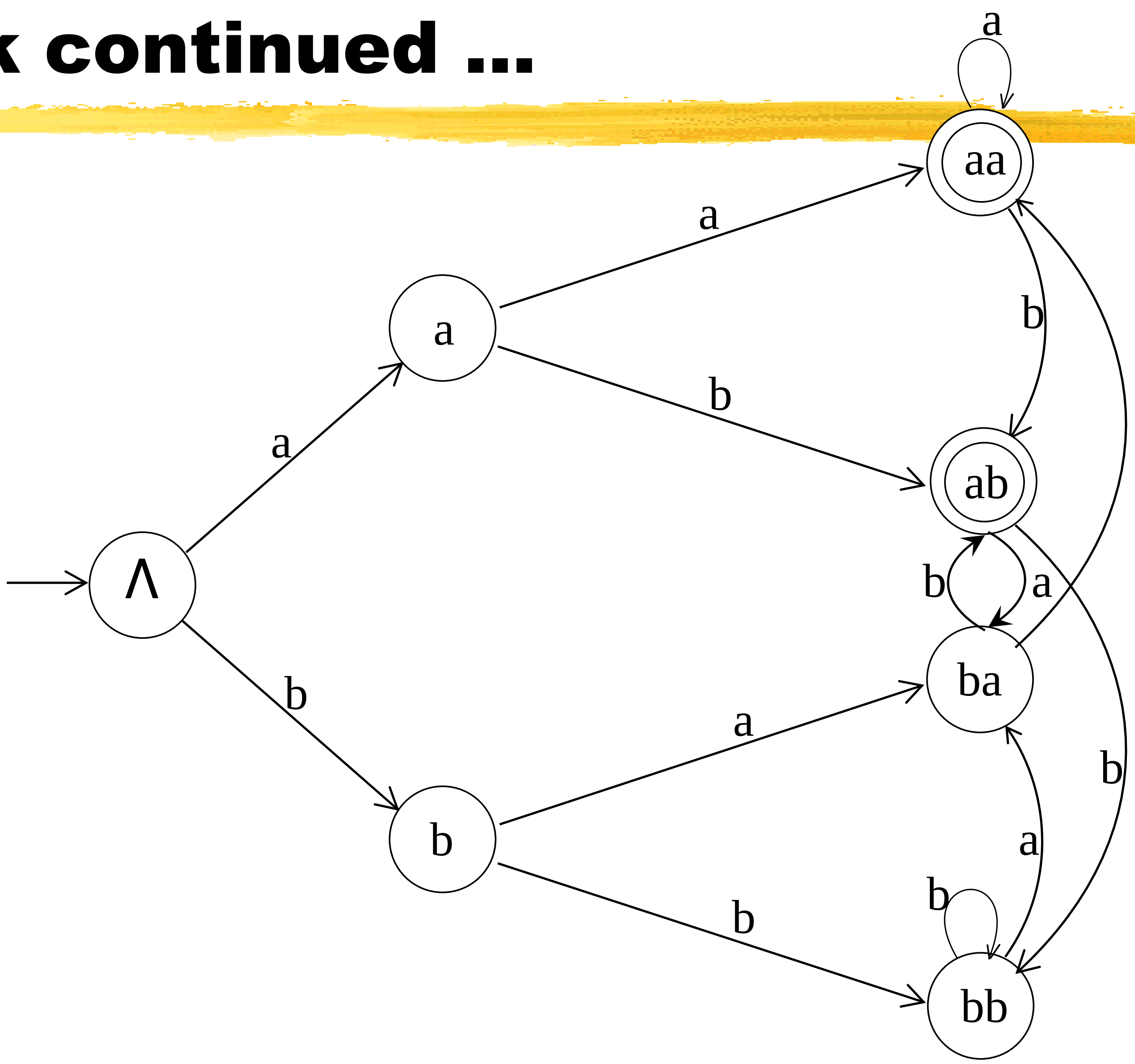
$L = \{w \in \{a,b\}^*$: length(w) $\geq$ 2 and second letter of w, from right is a}.

Solution: The language L may be expressed by the regular expression

$(a+b)^*(aa+ab)$

This language may be accepted by the following FA

Task continued ...



Task solution …

- Using the technique discussed by Martin, build an FA accepting the following language

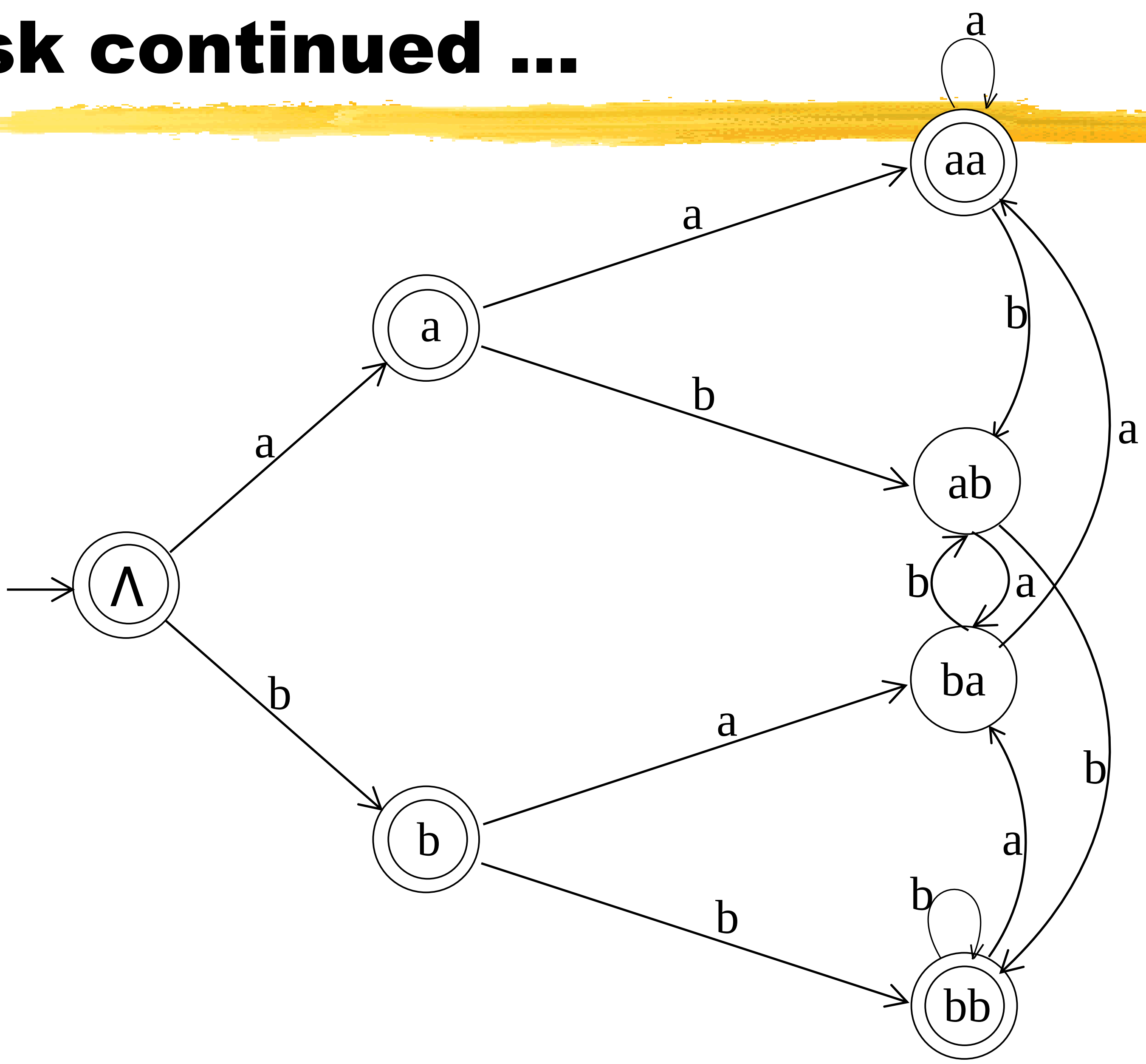
  L = {w ∈ {a,b}*: w neither ends in **ab** nor in **ba**}.

- **Solution:**The language L may be expressed by the regular expression

  $\Lambda + a + b + (a+b)^*(aa+bb)$

  This language may be accepted by the following FA

Task continued ...



TASK

- Build a TG accepting the language of strings, defined over Σ={a, b}, **ending in b.**

Example

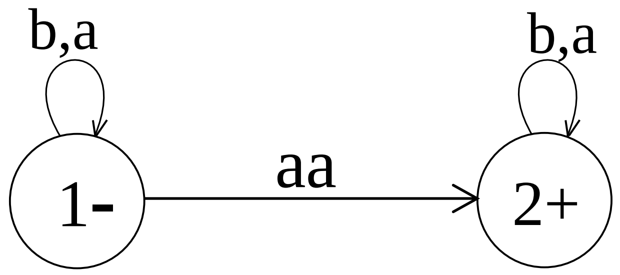
Consider the Language L of strings, defined over Σ = {a, b}, **containing double a.**

The language L may be expressed by the following regular expression

$$(a+b)^* (aa) (a+b)^*.$$

This language may be accepted by the following TG

Example Continued …



Example

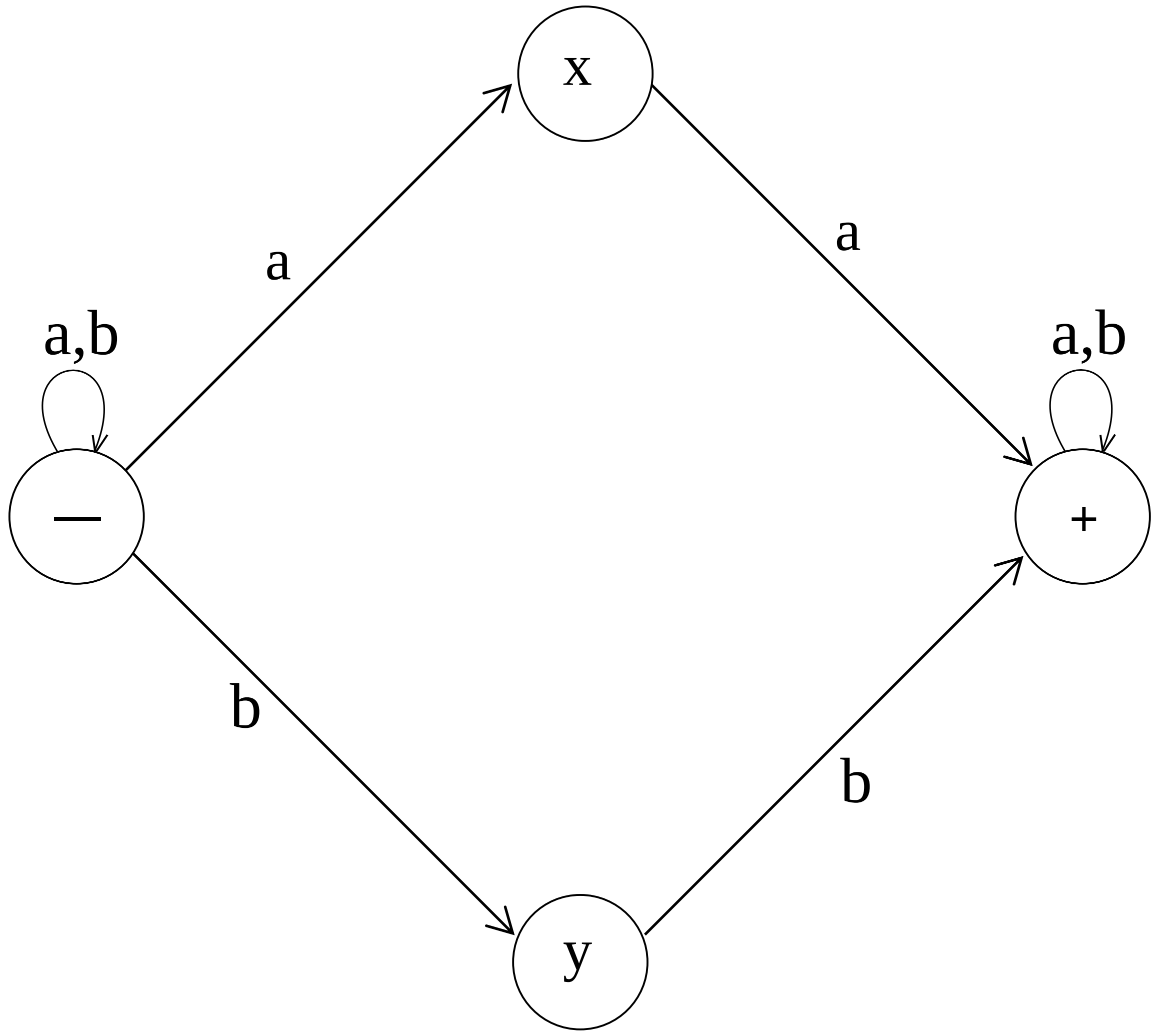
Consider the language L of strings, defined over $\Sigma=\{a, b\}$, **having double a or double b**.

The language L can be expressed by RE

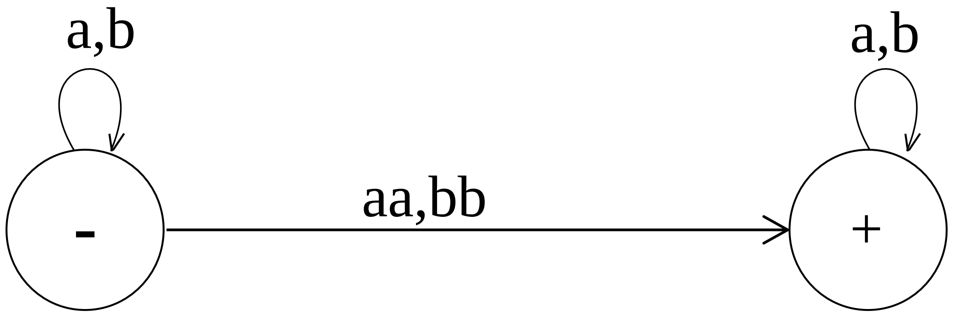
$(a+b)^* (aa + bb) (a+b)^*$.

The above language may also be expressed by the following TGs.

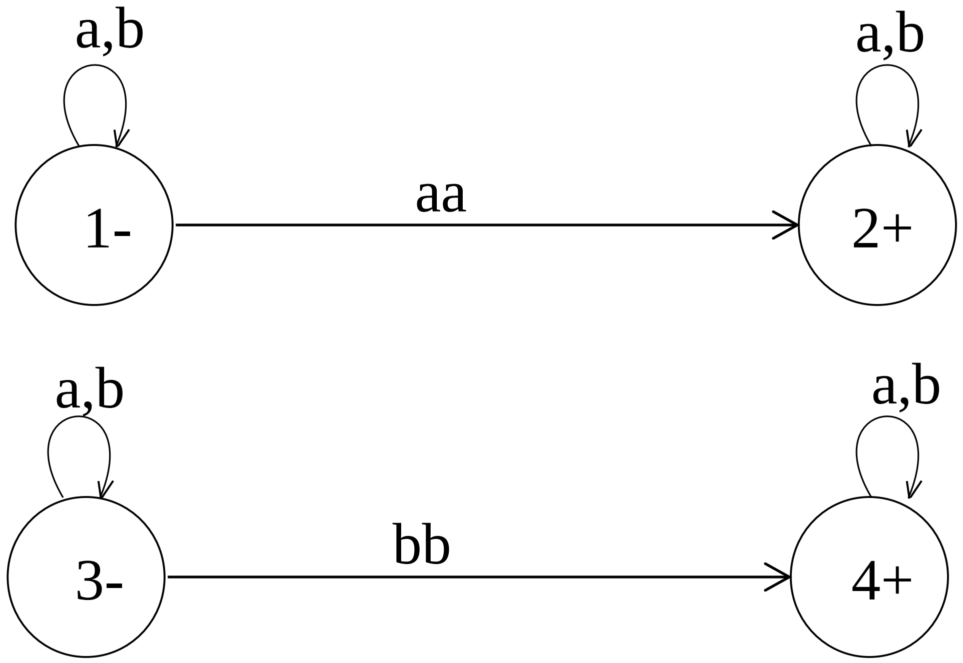
Example continued ...



OR



OR



Note

- In the above TG if the states are not labeled then it may not be considered to be a single TG

Summing Up

- TG definition, Examples:accepting all strings, accepting none, starting with b, not ending in b, containing aa, containing aa or bb