

Generalized Transition Graphs

1

Course:	Theory Of Automata
Topic:	Generalized Transition Graphs
Instructor:	Dr. Ahmed Mateen

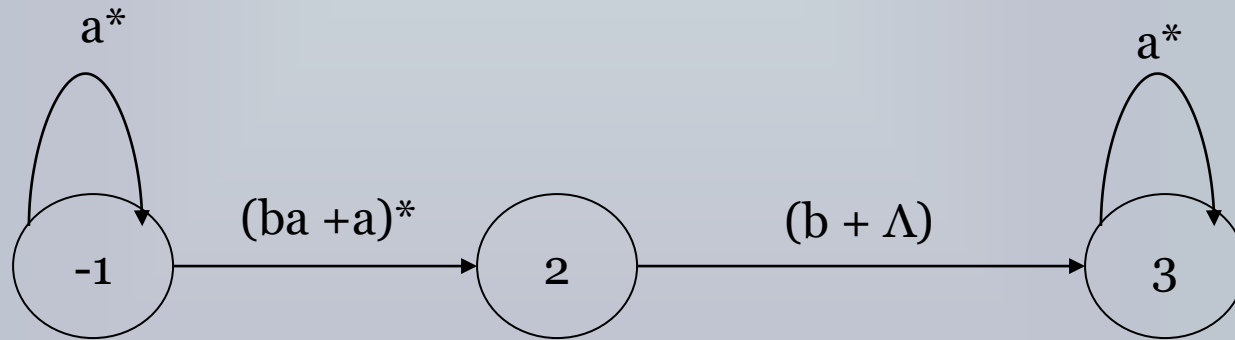
Generalized Transition Graphs (GTG)

2

- A variation of TG
- A generalized transition graph is a collection of three things
 - A finite set of states, of which at least one is a start state and some (may be none) are final states
 - An alphabet Σ of input letters
 - Directed edges connecting some pairs of states each labeled with a regular expression

Generalized Transition Graphs (GTG)

3



This machine accepts all strings without a double b

Generalized Transition Graphs (GTG)

4

- Examples
 - All words having even number of *a*s and *b*s
 - All words that start with *ab*
 - All words having *a*s in clumps of even numbers and end at one or more *b*s

Generalized Transition Graphs (GTG)

5

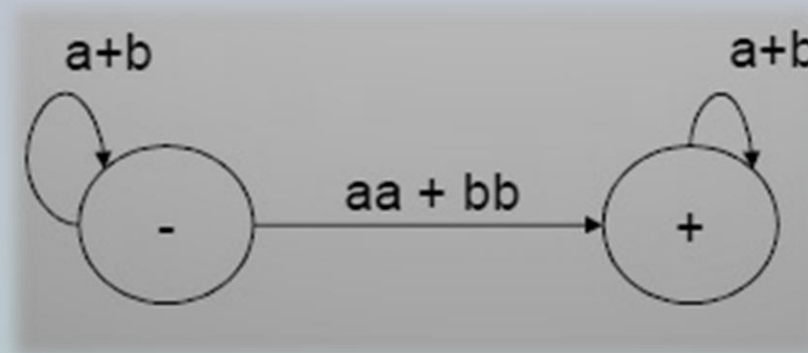
- A generalized transition graph is a collection of three things
 - A finite set of states, of which at least one is a start state and some (may be none) are final states
 - Finite set of input letters (Σ) from which input strings are formed.
 - Directed edges connecting some pairs of states each labeled with a regular expression.
- Note: it may be noted that in GTG, the labels of transition edges are corresponding RE.

Generalized Transition Graphs (GTG)

6

- **Example:**

- Consider the language L of strings, defined over $\Sigma = \{a, b\}$, containing double a or double b .
- The language may be expressed by the following regular expression $(a+b)^* (aa+bb) (a+b)^*$
- The language L may be accepted by the following GTG



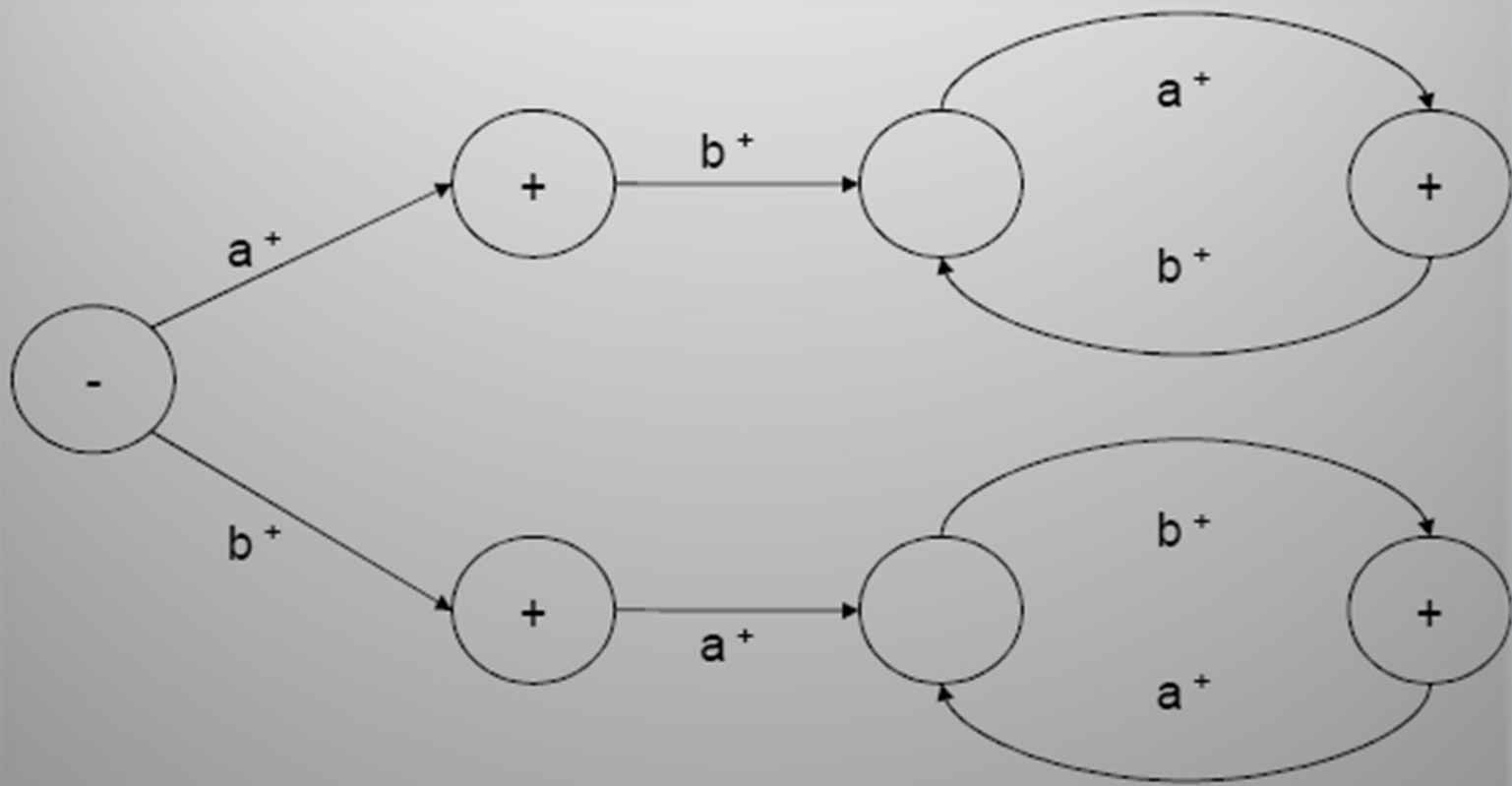
Generalized Transition Graphs (GTG)

7

- **Example:**
 - Consider the language L of strings, defined over $\Sigma = \{a, b\}$, beginning with and ending in same letters.
 - The language may be expressed by the following regular expression $(a+b) + a(a+b)^*a + b(a+b)^*b$
 - The language L may be accepted by the following GTG

Generalized Transition Graphs (GTG)

8



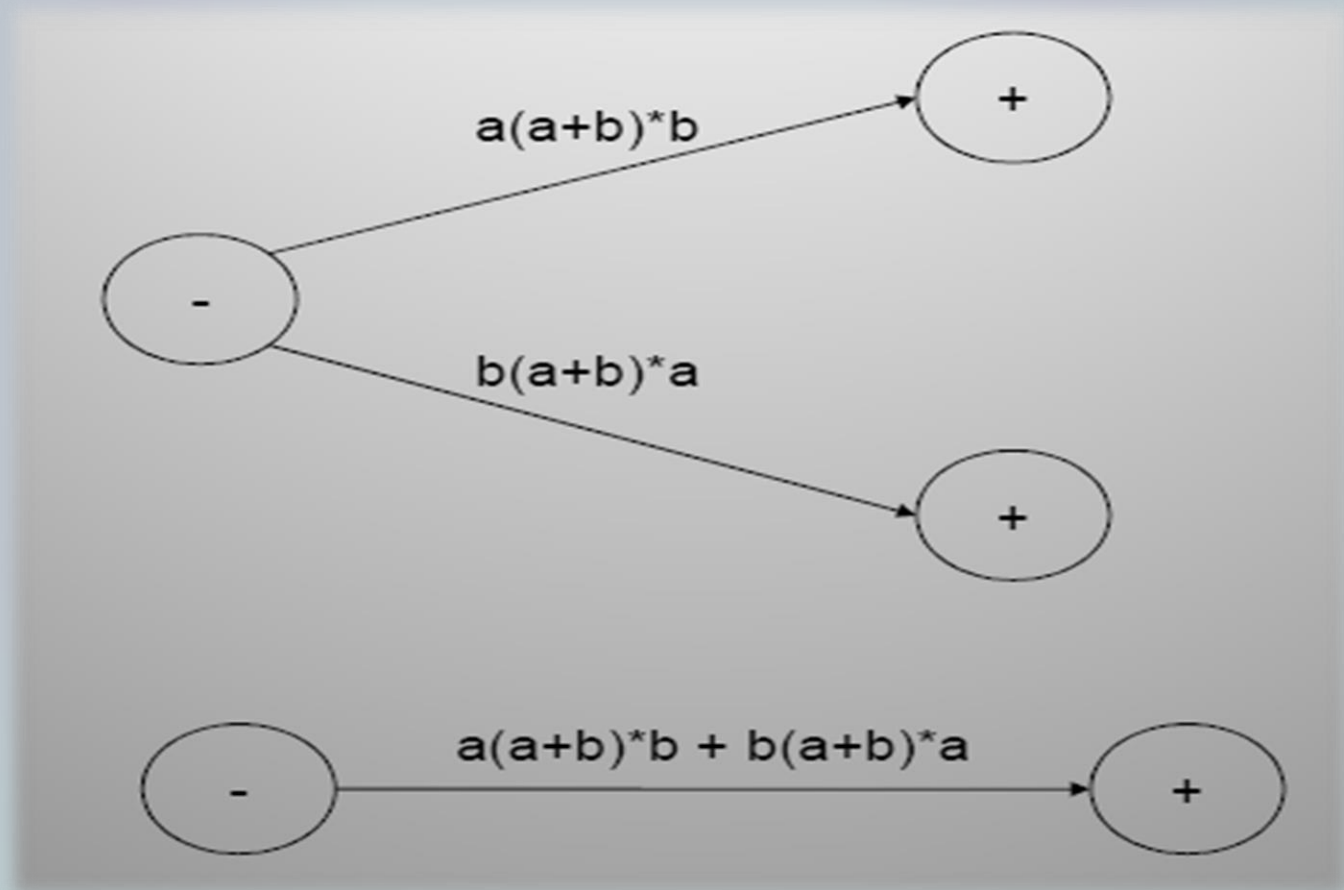
Generalized Transition Graphs (GTG)

9

- **Example:**
 - Consider the language L of strings, defined over $\Sigma = \{a, b\}$, beginning with and ending in different letters.
 - The language may be expressed by the following regular expression $a(a+b)^*b + b(a+b)^*a$
 - The language L may be accepted by the following GTG

Generalized Transition Graphs (GTG)

10



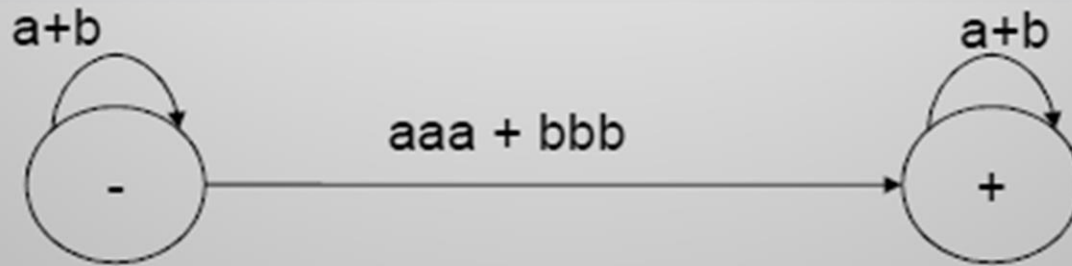
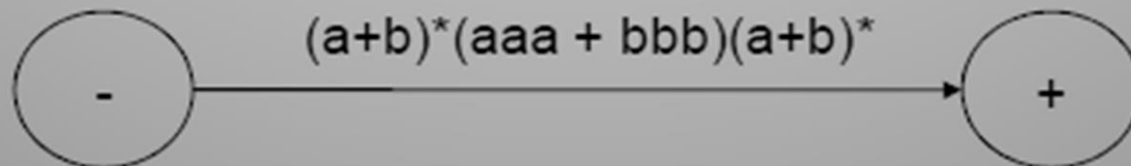
Generalized Transition Graphs (GTG)

11

- **Example:**
 - Consider the language L of strings, defined over $\Sigma = \{a, b\}$, having triple a 's or triple b 's.
 - The language may be expressed by the following regular expression $(a+b)^*(aaa + bbb)(a+b)^*$
 - The language L may be accepted by the following GTG

Generalized Transition Graphs (GTG)

12

**OR**

Generalized Transition Graphs (GTG)

13

- Note:
 - TGs and GTGs provide certain relaxations i.e. there may exist more than one path for a certain string or there may not be any path for a certain string. This property creates ***nondeterminism and it can also help*** in differentiating TGs and GTGs from FAs. Hence, an FA is also called a Deterministic Finite Automaton.
 - Not all TGs are nondeterministic

Generalized Transition Graphs (GTG)

14

- Nondeterminism:

