Automata Formal Languages & Logic

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Unit 1

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NFA

Transition Function for a NFA

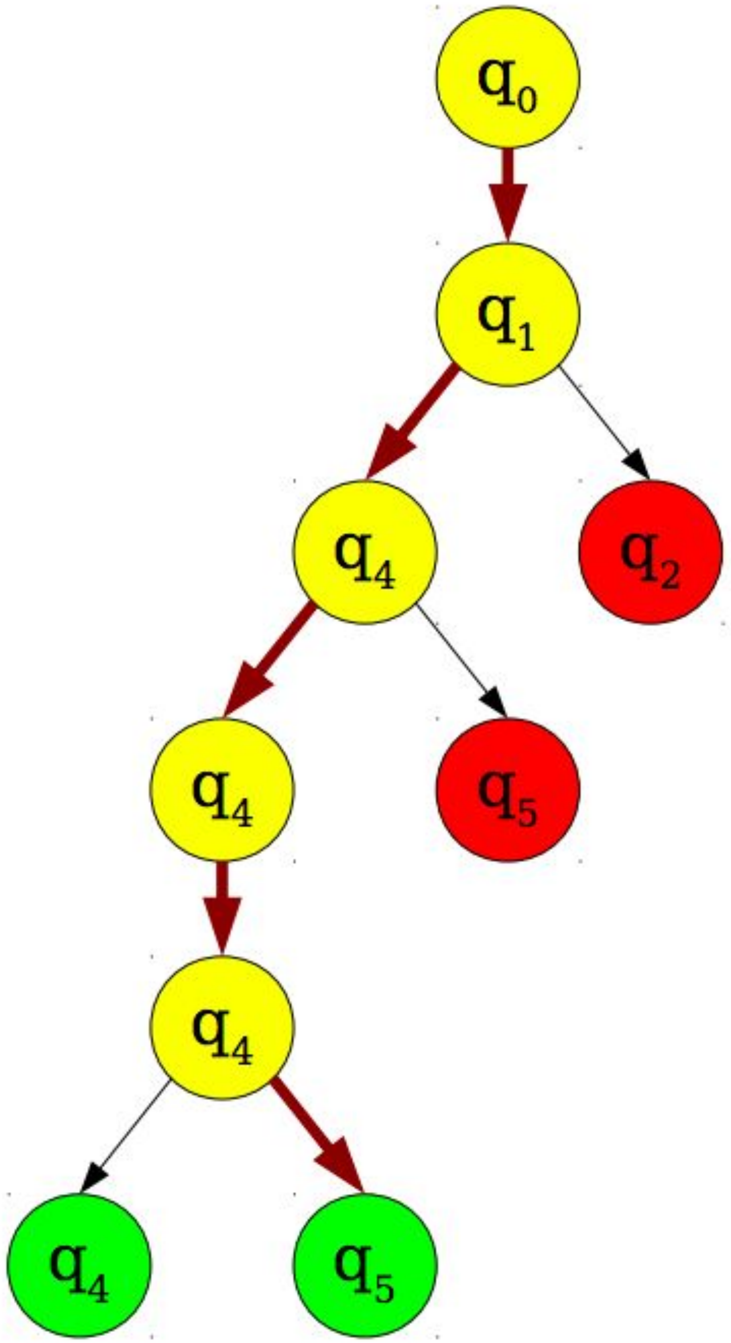
$$\delta : Q \times \Sigma \rightarrow 2^{Q}$$

- A model of computation is nondeterministic if the computing machine may have multiple decisions that it can make at one point.

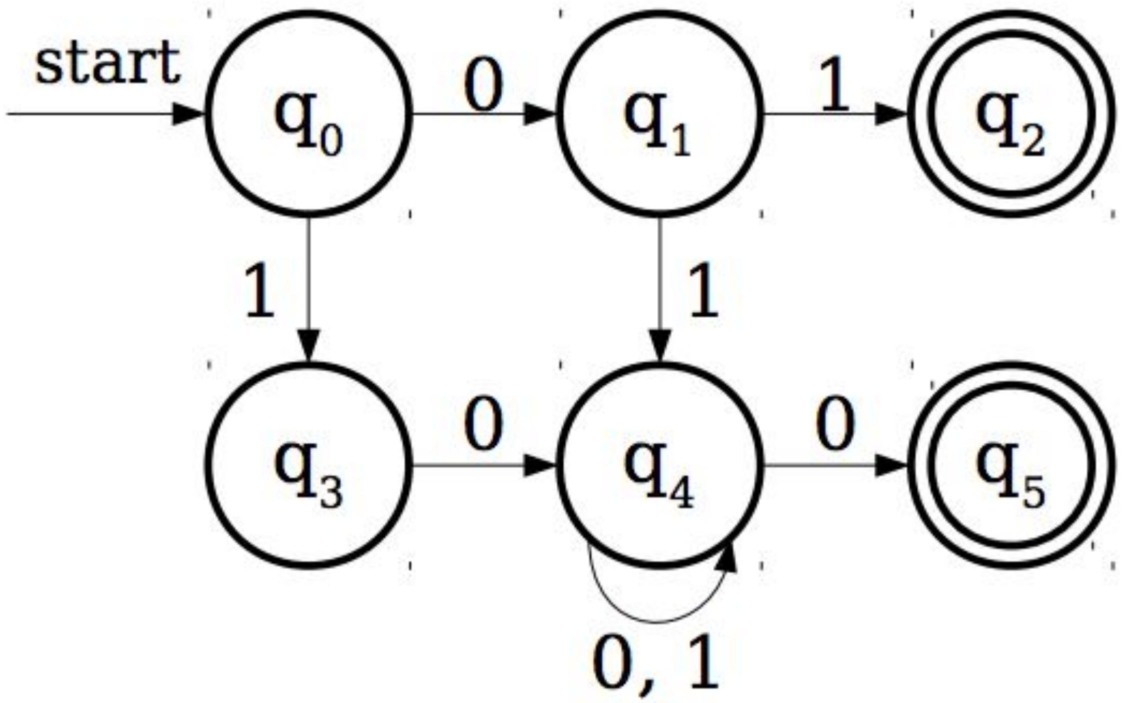
- If there is at least one choice that leads to an accepting state, the machine will accept the input string.

NFA

- Can have missing transitions or multiple transitions defined on the same input symbol.
- Structurally similar to a DFA, but represents a fundamental shift in how we'll think about computation.
- Computation in an NFA looks like a Tree

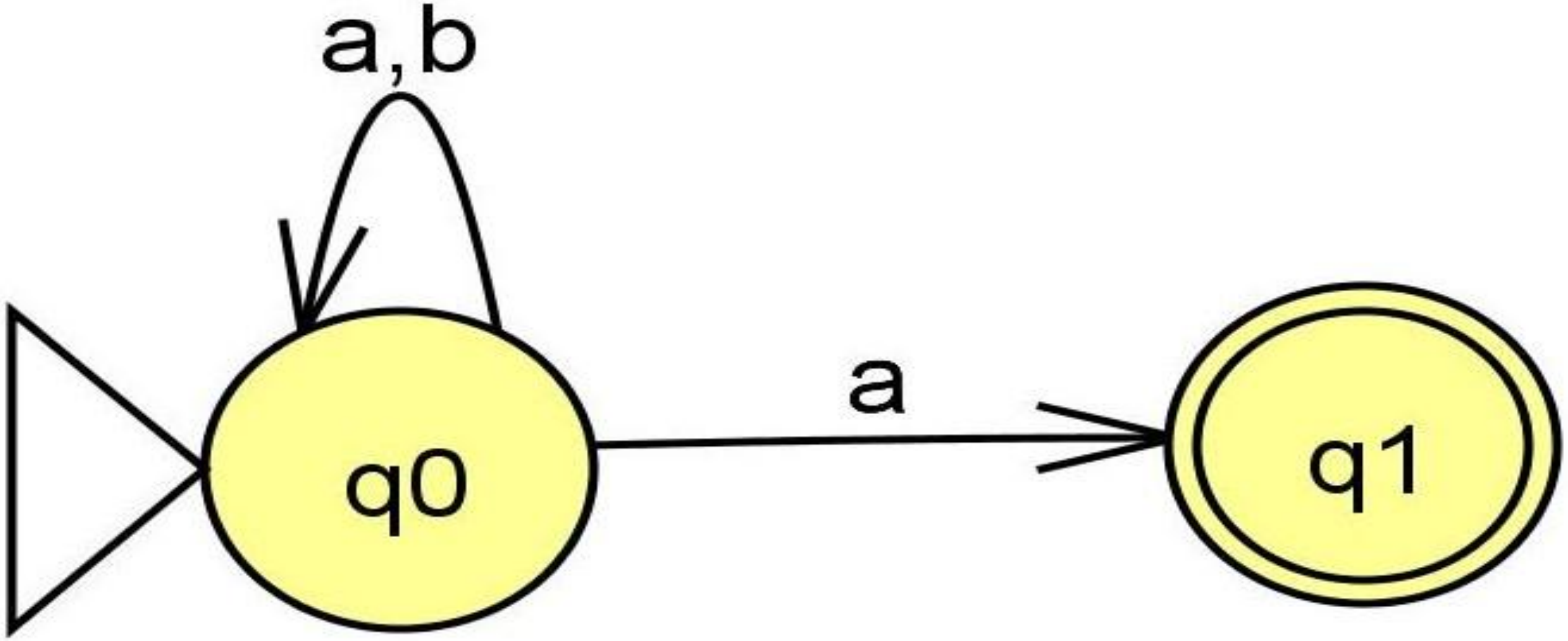


0 1 0 1 0



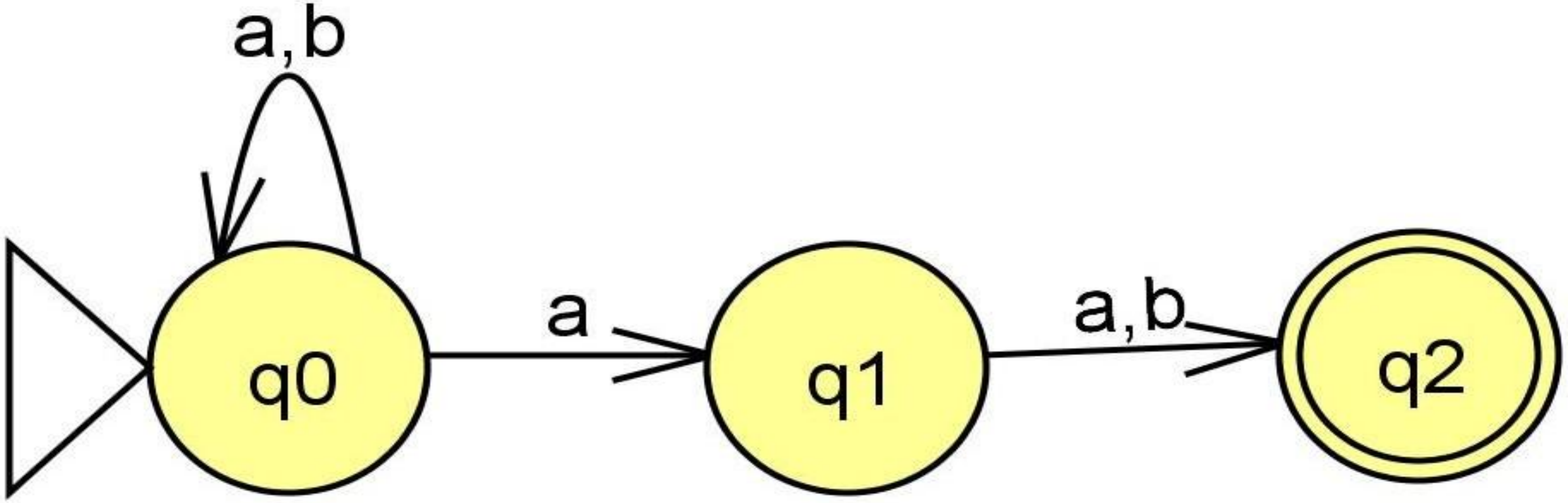
Example 1: Construct NFA for the language of string of a's and b's that end in a.

Solution:



Example 1: Construct NFA for the language of string of a's and b's ,where the second symbol from RHS is 'a'.

Solution:



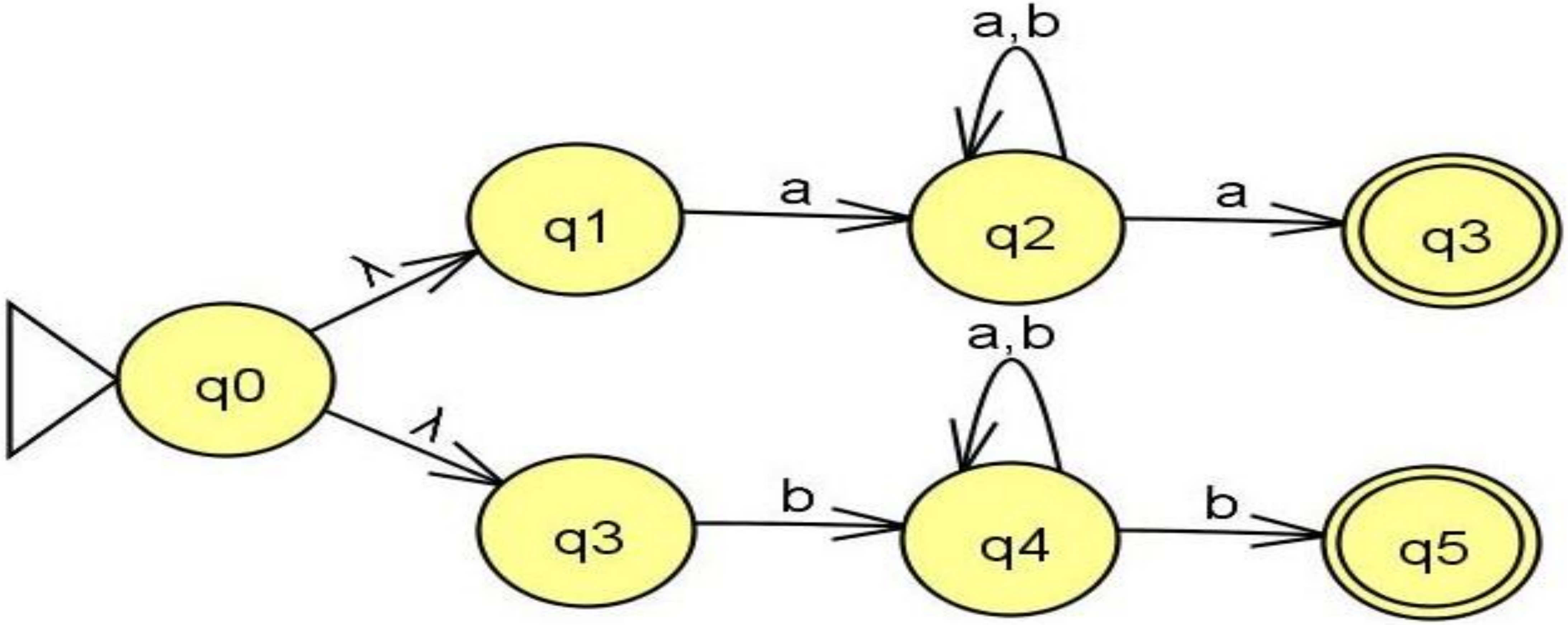
Transition Function for a λ-NFA

$\boldsymbol{\delta}$: Q X (Σ U λ) -> 2^Q

An NFA may follow any number of λ-transitions at any time without consuming any input.

Example 1:Construct λ-NFA for language of strings of a's and b's that start and end with the same symbol.

Solution:



A model of computation is deterministic if at every point in the computation, there is exactly one choice that can make.

- The machine accepts if that series of choices leads to an accepting state.

- A model of computation is nondeterministic if the computing machine may have multiple decisions that it can make at one point.

- The machine accepts if any series of choices leads to an accepting state.

Any language that can be accepted by a DFA can be accepted by an NFA.

- NFAs and DFAs are finite automata; there can only be finitely many states in an NFA or DFA.

- DFA's, NFA's, and ε–NFA's all accept exactly the same set of languages: the regular languages.

- The NFA types are easier to design and may have exponentially fewer states than a DFA.

- But only a DFA can be implemented!

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THANK YOU

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