Lexical Analysis
Programming Languages

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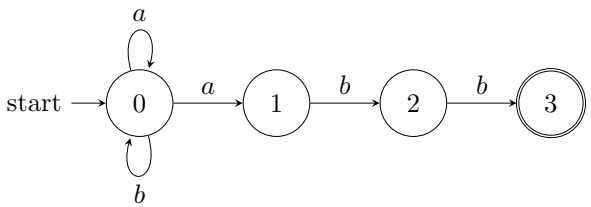
IIITB

Finite State Automata (FSA)

1. Non-deterministic FSA
2. Deterministic FSA

Non-Deterministic FSA (NFA)

Example 1



Language: $(a|b) \star abb$

Non-Deterministic FSA (NFA)

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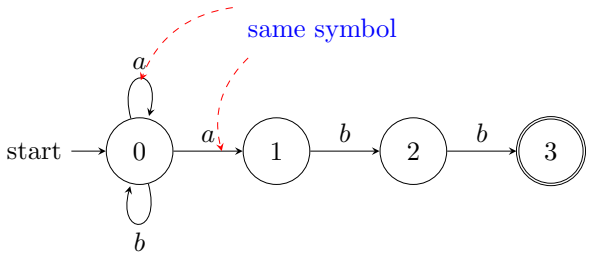

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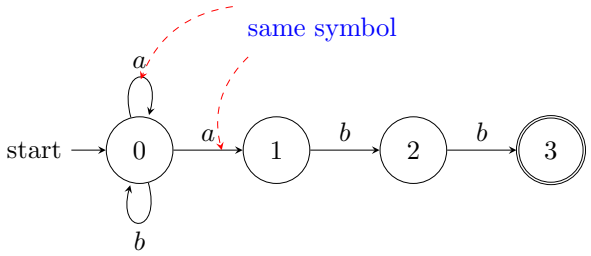

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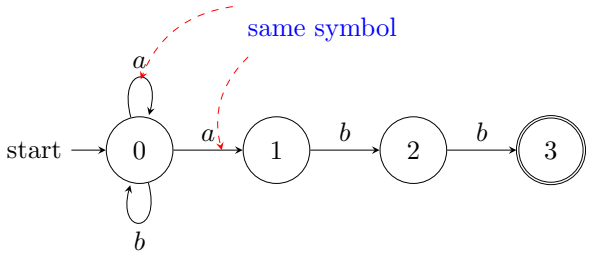

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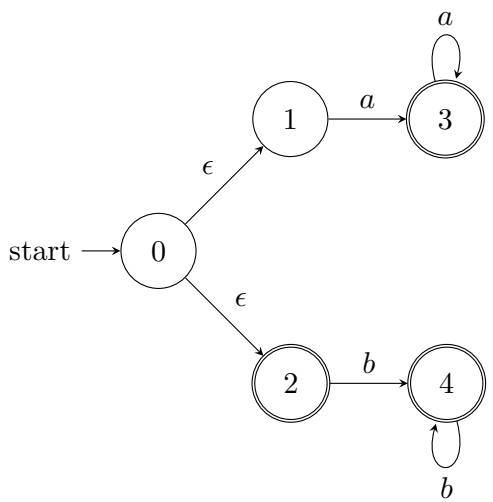
Non-Deterministic FSA (NFA)

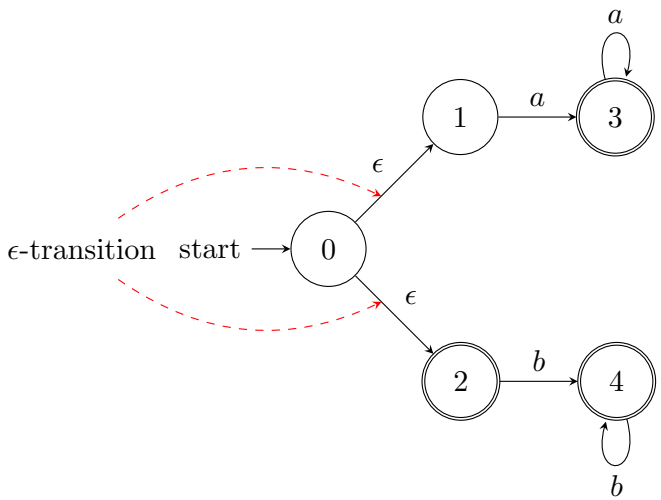
Example 2



Language: $aa\star|bb\star$

Non-Deterministic FSA (NFA)

Example 2



Language: $aa\star|bb\star$

Non-Deterministic FSA (NFA)

- Finite set of states – (S)
- Alphabet - $(\sum)$
- Transition function $(T : S \times \sum \rightarrow 2^S)$
- Initial state (S_0)
- Final/accepting states $(F \subseteq S)$

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Specific Properties

- The same state can transition to more than one states on the same symbol
- ϵ-transitions

Deterministic FSA (DFA)

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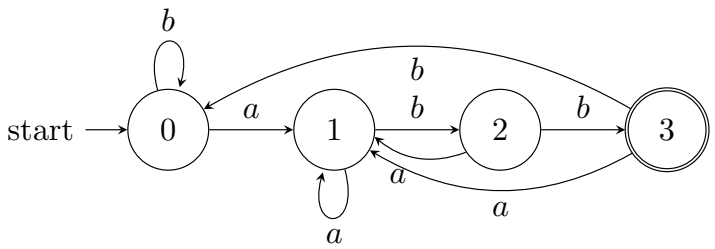
Specific Properties

- Only one next-state on the same symbol
- No ϵ-transitions

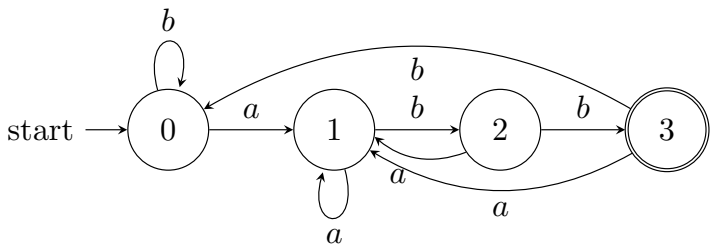
Deterministic FSA (DFA)

Example 1



Deterministic FSA (DFA)

Example 1



Language:

Deterministic FSA (DFA)

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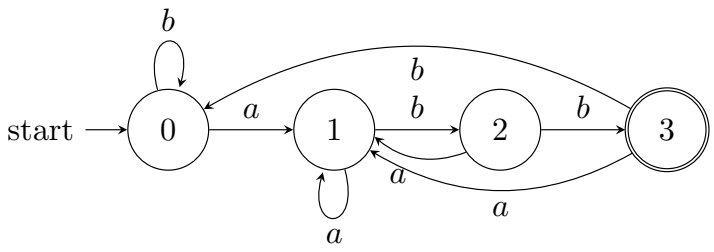

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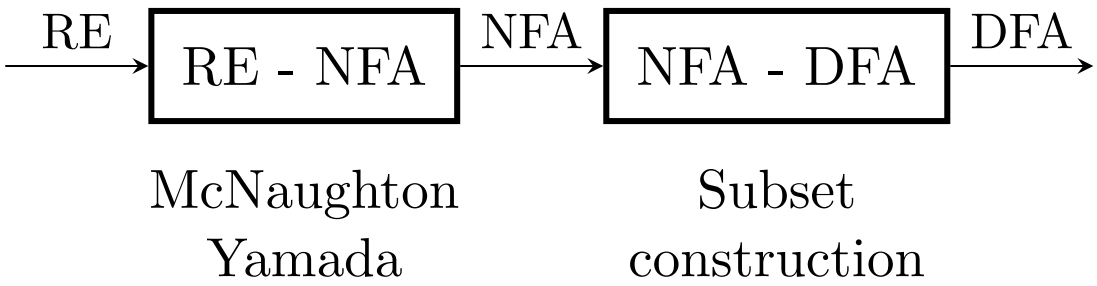
- DFAs: Faster to simulate
- Equally expressive $\equiv$ Regular expressions (Regular languages)

Lexical Analysis Process



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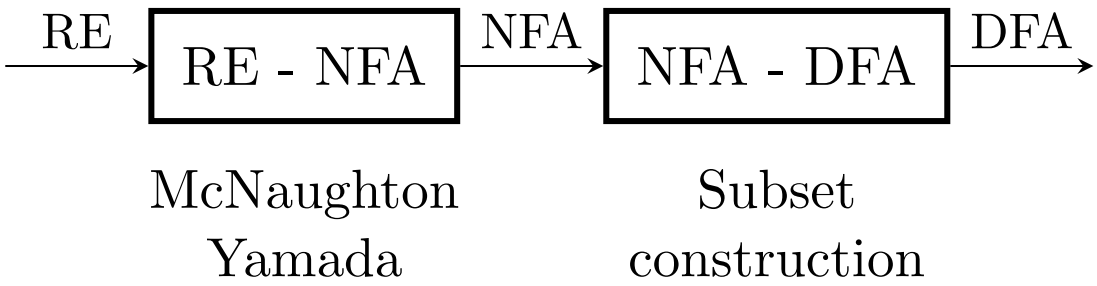

Next

Simulation of FSAs