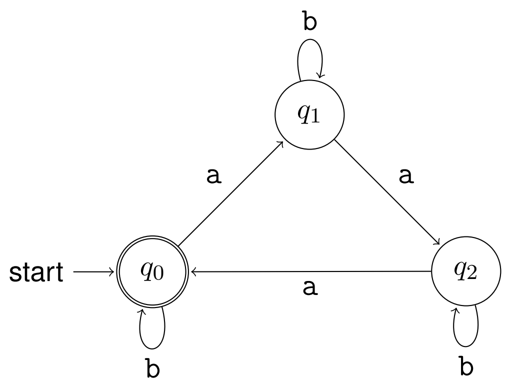
Lecture #2: Introduction to Deterministic Finite Automata
Lecture Presentation

Consideration of a Deterministic Finite Automaton

Consider a deterministic finite automaton M that has alphabet $\Sigma = \{\mathtt{a}, \mathtt{b}\}$ and that can be represented as follows.



How would you describe this deterministic finite automaton as a tuple $M = (Q, \Sigma, \delta, q_0, F)$?

- Q:
- Σ:
- δ:

- q_0:
- F:

What can be said about what happens when M is executed on each of the following strings $\omega \in \Sigma^\star$?

- $\omega = \lambda$:
- $\omega = \mathtt{a}$:
- $\omega = \mathtt{b}$:
- $\omega = \mathtt{aba}$:
- $\omega = \mathtt{ababab}$:
- $\omega = \mathtt{aaabba}$:

What are the states q_0, q_1 and q_2 being used to keep track of as the symbols in an input strong $\omega \in \Sigma^\star$ are being processed?

Making This More Formal: Recall that (in this course) $n \in \mathbb{N}$ if and only if n is an integer such that $n \geq 0$.

Theorem 1. *Let $n \in \mathbb{N}$.*

Then, for every string $\omega \in \Sigma^\star$ such that $|\omega| = n$, the following properties are satisfied.

(a) $\delta^\star(q_0, \omega) = q_0$ if and only if

(b) $\delta^\star(q_0, \omega) = q_1$ if and only if

(c) $\delta^\star(q_0, \omega) = q_2$ if and only if

Application: How could you *use* this result to prove that M has a given language?

How Could You Prove This Theorem?