CSE331	Automata and Computability

Lecture 5.3: Deterministic Finite Automata

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Extended Transition Function

The extended transition function takes a state q and an input string w and yields the resulting state in which the processing of the string ends. The definition proceeds by induction over the length of w. The definition precedes by induction over length of w. It is sometimes represented as $\hat{\delta}$ (delta hat) to distinguish it from the transition function.

Induction basis: When w is of length 0 or an empty string (ε), it is defined as δ (q, ε) = q

Inductive Step: In this step, we determine the transition of a string (w) of length ***l+1*** from a string of length ***l***. Let's say, w is of the form "va" where v is a string of length *l* and "*a*" is a symbol. Therefore, δ (q, va) = δ (δ (q, v), a)

Example

Let's consider the DFA that accepts strings with two consecutive 1s and we have to determine δ (q_0, 110).

Transition table:

	0	**1**
→q_0	q_0	q_1
q_1	q_0	q_2
***q_2**	q_2	q_2

δ (q_0, 110)

= δ (δ (q0, 11), 0)

= δ (δ (δ (q0, 1),1), 0)

= δ (δ (δ (δ (q0, ε), 1),1), 0)

= δ (δ (δ (q0, 1),1), 0) ***[The basis of the induction]***

= δ (δ (q1,1), 0)

= δ (q2, 0)

= q2

Language of a DFA in terms of the Extended Transition Function

The language of a DFA (Q, Σ , δ , q_0, F) is a set that contains strings w such that δ (q0, w) $\in$ F