Regular Languages and Deterministic Finite Automata (DFA)

Example: Find the regular expression for the language and design a DFA to accept the language:

L = {w | w consists of 0's and 1's which is of even length and begins with 01}

Exercise:

1. Construct DFAs for the regular languages represented by the regular expressions (0|1)*1, (0|1)*00(0|1)*, 1*10, 1(0|1)*0 over the alphabet {0, 1}.
2. Design a DFA that accepts strings of odd length over alphabet {a, b}.
3. Propose regular expressions and DFAs for the keyword *int* and any valid *C identifier*.

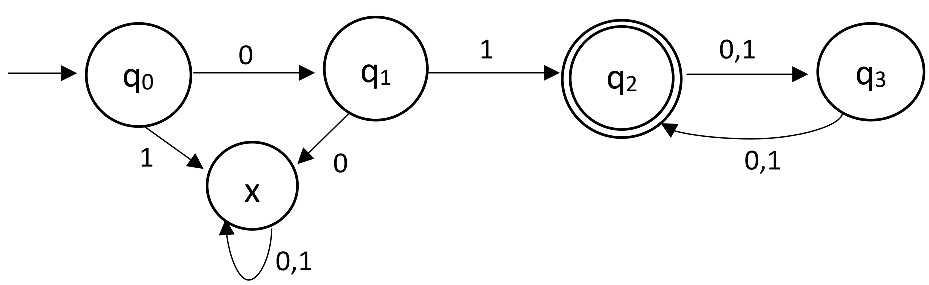
Extended Transition Function:

- It describes what happens when we start in any state and follow any sequence of inputs.
- If δ is the transition function, then the extended transition function constructed from δ will be $\hat{\delta}$.
- The extended transition function is a function that takes a state *q* and a string *w* and returns a state *p* – the state the automaton reaches when starting in state q and processing the sequence of inputs *w*.
- Basis: $\hat{\delta}(q, \varepsilon) = q$.
- Suppose w is a string of the form xa; that is, a is the last symbol of w, and x is the string consisting of all but the last symbol. Example: if w=1101 then x=110 and a=1. Then,

$$\hat{\delta}(q, w) = \delta(\hat{\delta}(q, x), a)$$ relation between Transition Function & Extended TF

Example:

Language, L = {w | w consists of 0's and 1's which is of even length and begins with 01}



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Input String: 011101, since it starts with 01 and is of even length, we expect the string is in the language L. Thus, $\hat{\delta}(q_0, 011101) = q_2$

Verification:

$\hat{\delta}(q_0, \varepsilon) =$
$\hat{\delta}(q_0, 0) =$
.
.
$\hat{\delta}(q_0, 011101)$

The Language of a DFA:

The language of a DFA, $A = (Q, \Sigma, \delta, q_0, F)$ is denoted by L(A) and is defined by,

$$L(A) = \{x \in \Sigma^* \mid \hat{\delta}(q_0, x) \in F\}$$

That is, the language of A is the set of stings each of which takes the initial state q_0 to one of the final/accepting states.

**If *L* is *L(A)* of some DFA a, then it is said that L is a *regular language*.