SNS COLLEGE OF TECHNOLOGY

Coimbatore-36.

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COURSE CODE& NAME : *19CSB301* &AUTOMATA THEORY AND COMPILER DESIGN

III YEAR/ V SEMESTER

UNIT – I FINITE AUTOMATA AND REGULAR LANGUAGES

Topic: FSA- Deterministic Finite State Automata

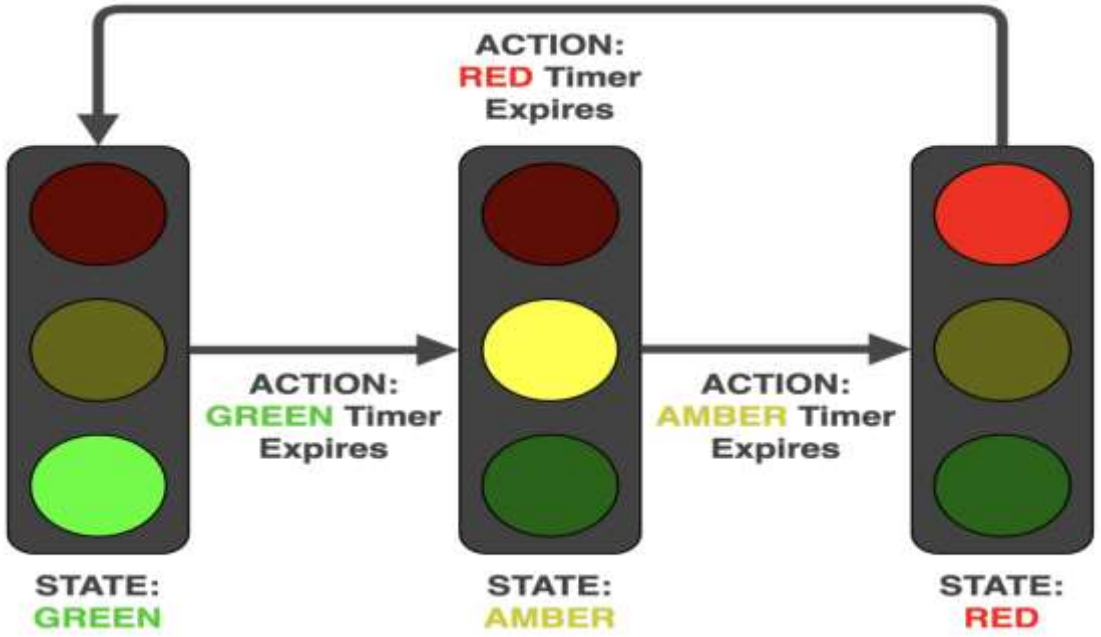
Dr.B.Vinodhini

Assistant Professor

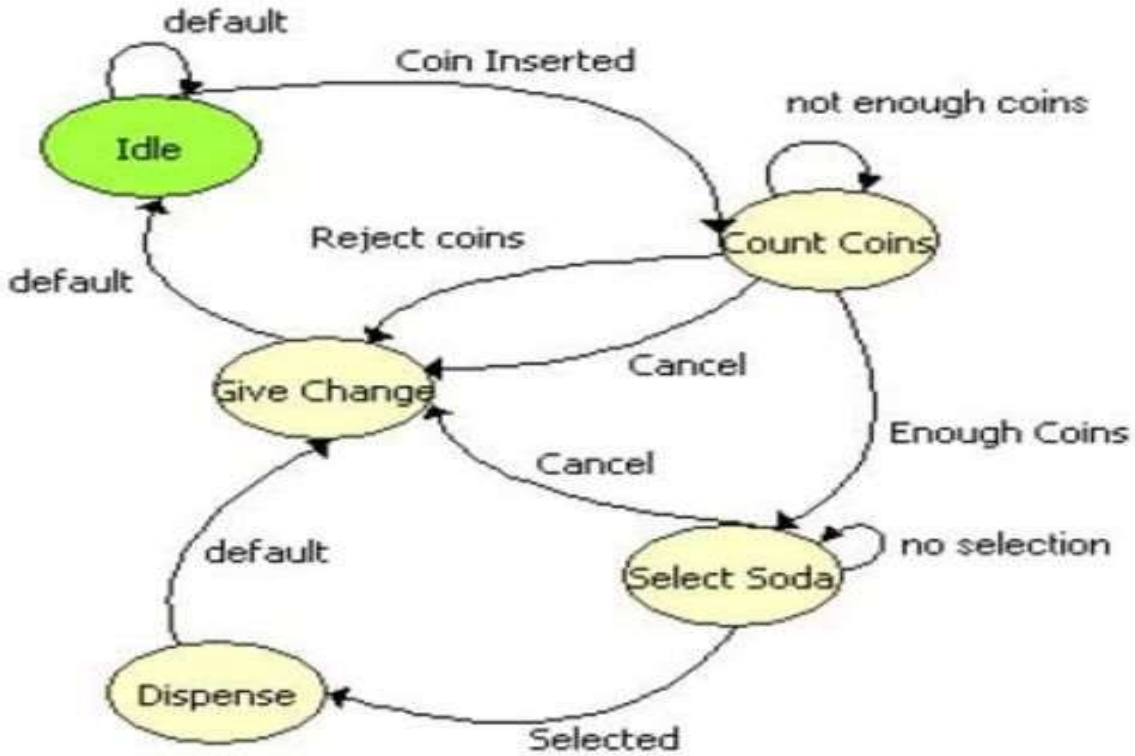
Department of Computer Science and Engineering

Finite State Automata

- Finite Automata – set of states and rules – transition – input
- 1State → 1 state
- Examples :Vending machine, Turnstile
  - Traffic Light



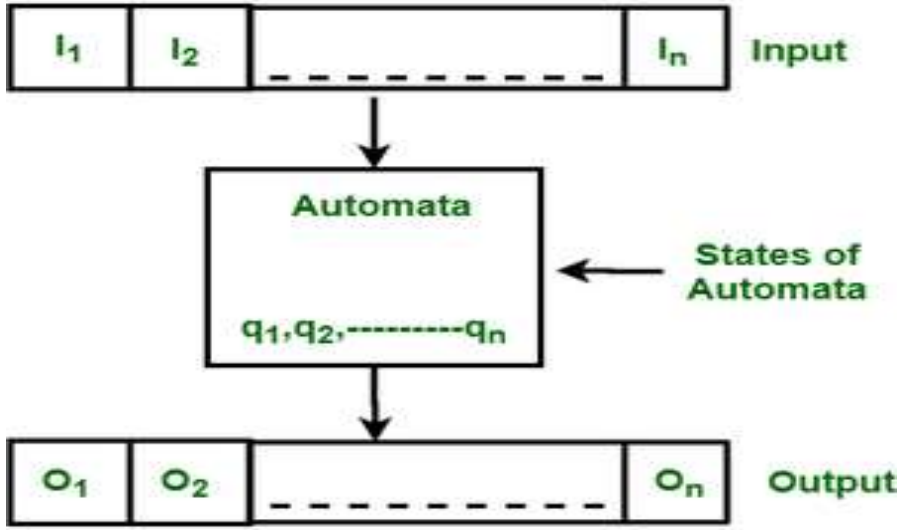
State Diagram of a Simple Soda Vending Machine



Finite State Automata

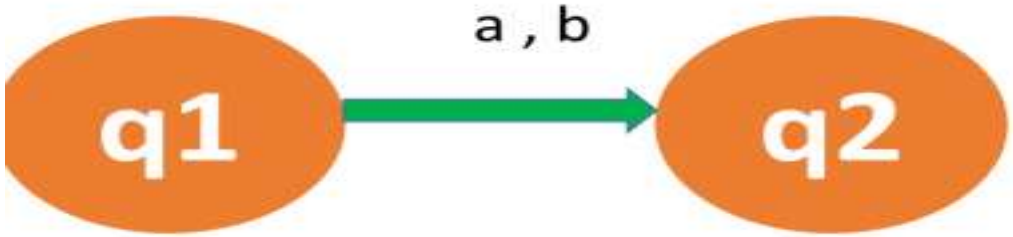
- ***FSA – Lexical Analysis of Compiler***

- FA – Tuple – {Q,∑, q, F, δ}
- Q – set of states
- ∑ - set of input symbols
- q – initial state
- F – set of final states
- δ - Transitions



Regular Expression to Finite Automata

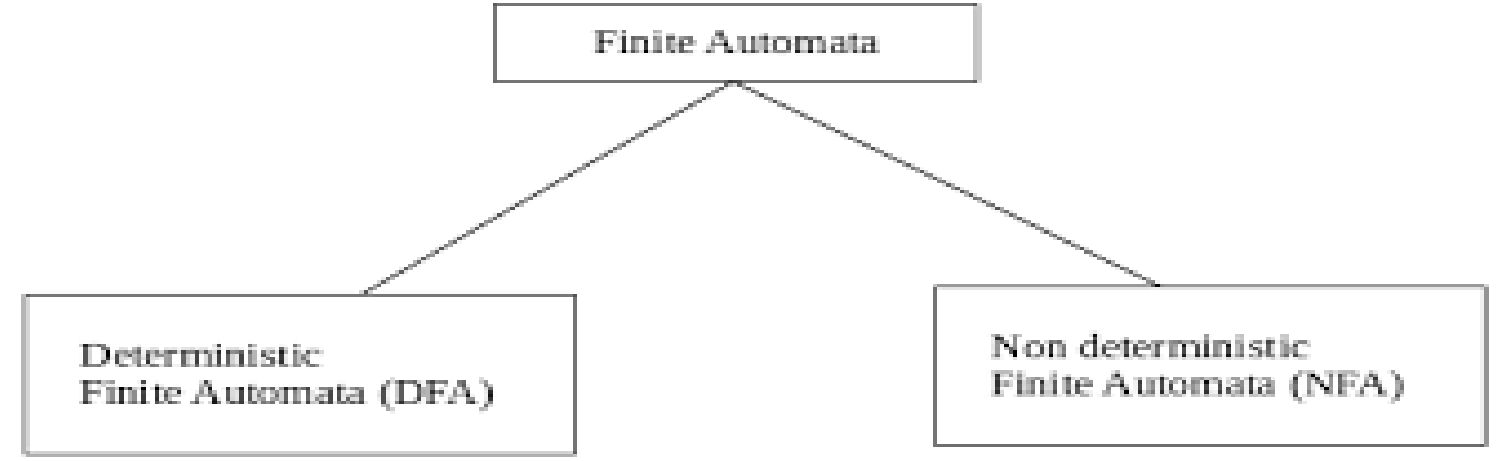
- a+b



- ab

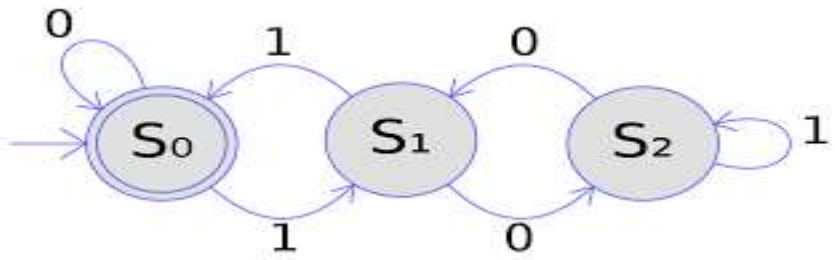
- a*

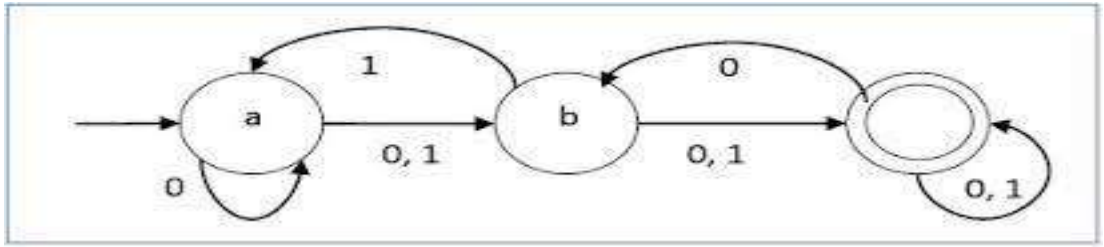
Types of Finite State Automata



Transition → 1 state to single next state for each input symbol

Transition → 1 state to multiple next state for each input symbol

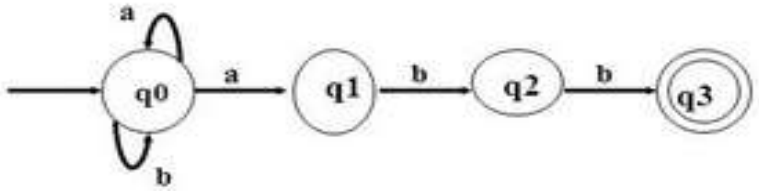




Transition Diagram

- FA can be represented using transition diagram.
- Corresponding to FA definition, a transition diagram has:
  - **States** represented by circles;
  - An **Alphabet** (Σ) represented by labels on edges;
  - **Transitions** represented by labeled directed edges between states. The label is the input symbol;
  - One **Start State** shown as having an arrow head;
  - One or more **Final State**(s) represented by double circles.

- Example transition diagram to recognize (a|b)*abb



Finite Automata

Finite Automata

A finite automata is a recognizer for a language that is used to check whether a string is accepted by a language or not. It takes input a string x and returns 'yes' if x is a sentence of the language and 'no' otherwise. It is capable of recognizing precisely the regular sets.

Two types of finite automata are:

a) Non – Deterministic Finite Automata.

b) Deterministic Finite Automata.

Non Deterministic Finite Automata

1 Non – Deterministic Finite Automata

A NFA is a mathematical model that consists of

a) Set of states 'S'

b) Set of input symbols 'Σ'

c) A transition function 'move' that maps state symbol pairs to set of states.

d) State 'S0' distinguished to be the start state.

e) Set of final states (or) accepting states 'F'

In computers, NFA is being represented by

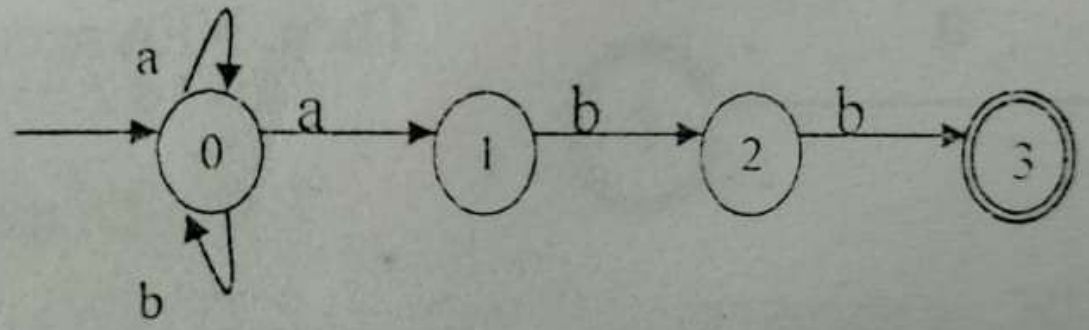
a) Transition Table

b) Adjacency list representation

NFA Example

ample:

Construct the NFA for the regular expression (a | b) * abb.



NFA Example

S = {0, 1, 2, 3}

Σ = {a, b}

Move functions:

move (0, a) = {0, 1} move (0, b) = {0}

move (1, a) = { } move (1, b) = {2}

move (2, a) = { } move (2, b) = {3}

S0 = 0

F = {3}

Transition Table:

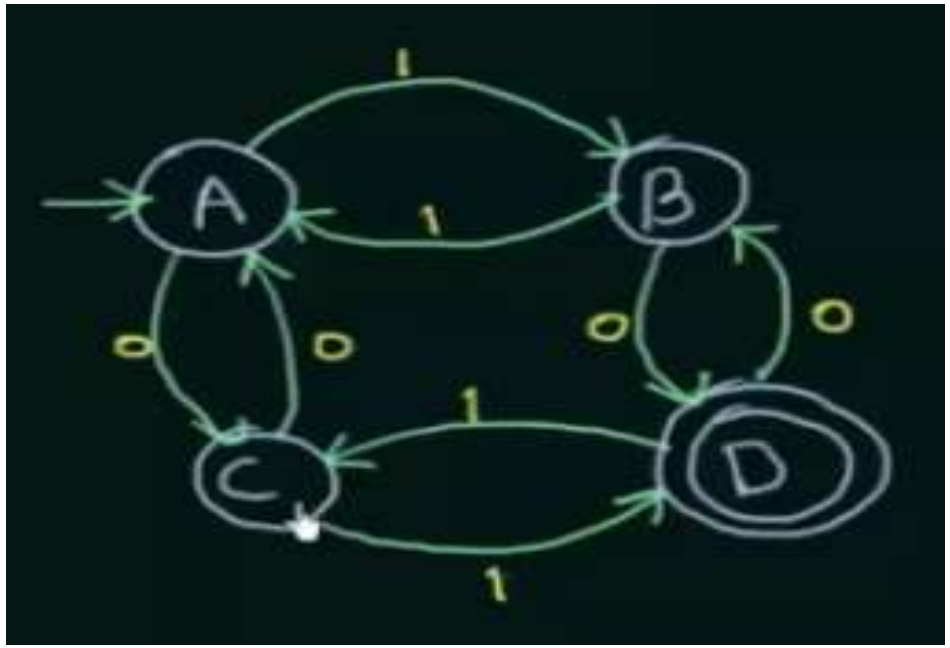
State	a	B
0	{0, 1}	{0}
1	{ }	{2}
2	{ }	{3}
3	{ }	{ }

Path for the string "aabb":

$0 \rightarrow 0 \rightarrow 1 \rightarrow 2 \rightarrow 3$

a a b b

Deterministic Finite Automata (DFA)

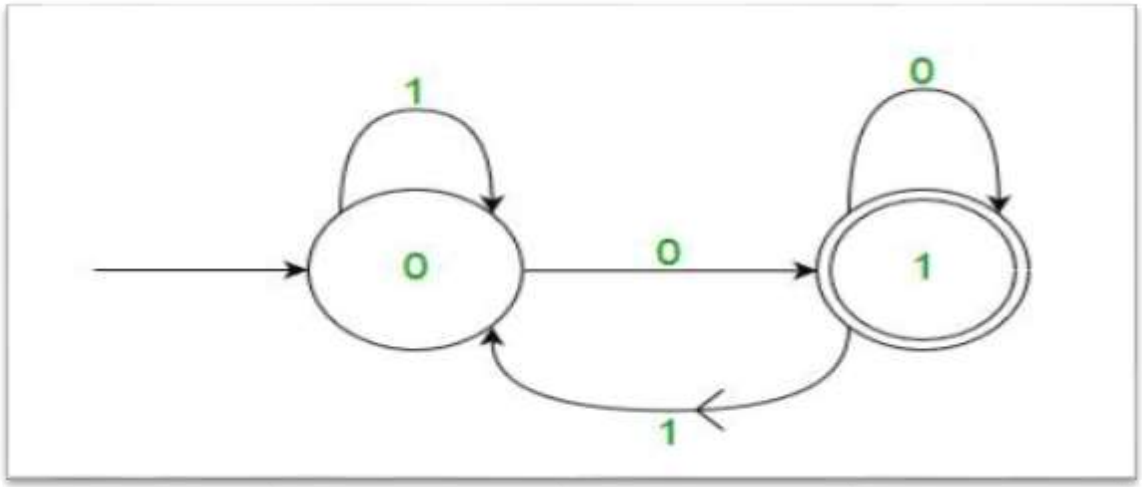


- {Q,∑, q, F, δ}
- Q = {A,B,C,D}
- ∑ = {0,1}
- Q_0 = A
- F = D
- δ → Tr

	0	1
A	C	B
B	D	A
C	A	D
D	B	C

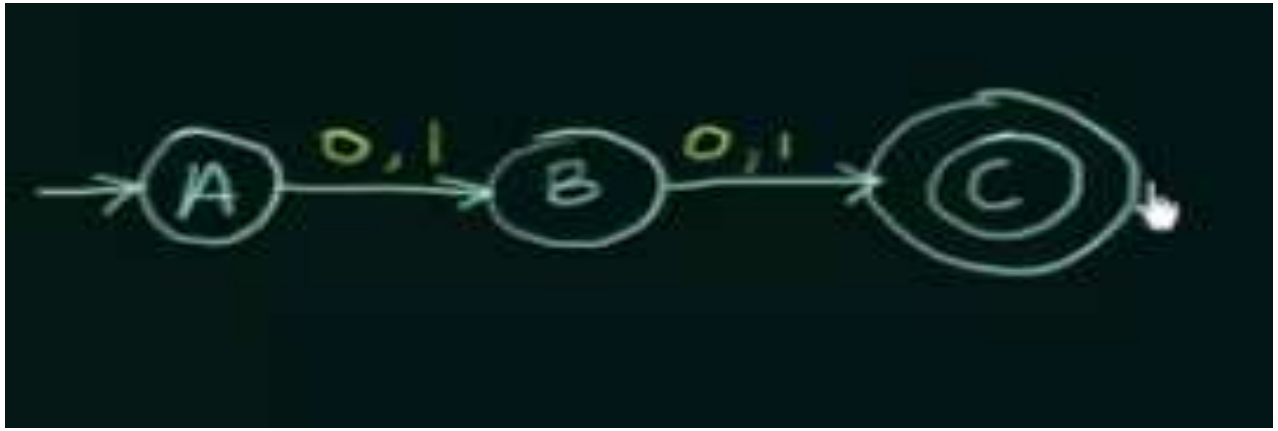
Deterministic Finite Automata (DFA)

- Example 1
- L1 = Set of all strings that end with '0'
- L1 = {000,000,010,0110,0100,01110,....}



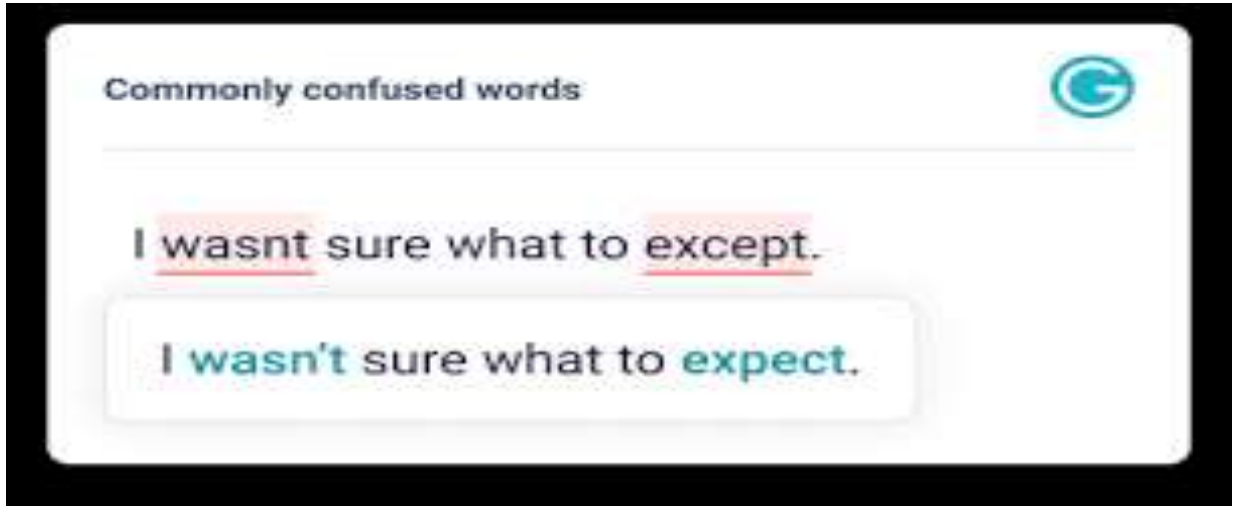
Deterministic Finite Automata (DFA)

- Example 2
- L1 = Set of strings over {0,1} of length 2
- L1 = {00,11,01,10}



DFA - Applications

- Lexical Analysis – compiler
- Spelling Checker
- Search Command



DFA -Examples

- Set of strings over {0,1} that start with 0 and end with 1
- Set of strings over {a,b} that ends with bb

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- Linz P. An introduction to formal languages and automata. Sixth edition, Jones and Bartlett Publishers; 2016.(UNIT-I)
- Ramaiah k. Dasaradh “Introduction to Automata and Compiler Design “ First Edition ,Prentice Hall India Learning Private Limited(2011)(UNIT-I to V)


Thank
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