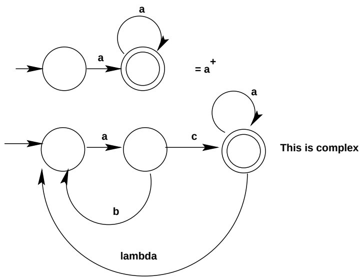
Read chapter 4

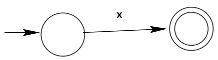
Today we will finish up dicsussion of finite automata.

Examination: Tentatively 17th March , 1998

DFA/ NFA ——> regular expression



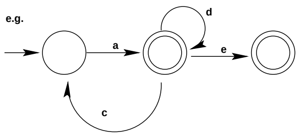
Simplify to



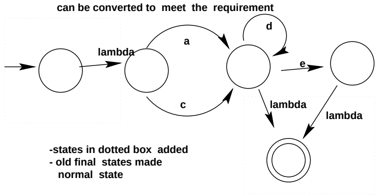
Given an NFA , or DFA, get a regular expression that describes the FA's behavior.

(1) Requirements
  (a) The start state have no in-transitions
  (b) There can be only one final state with no out-transitions.

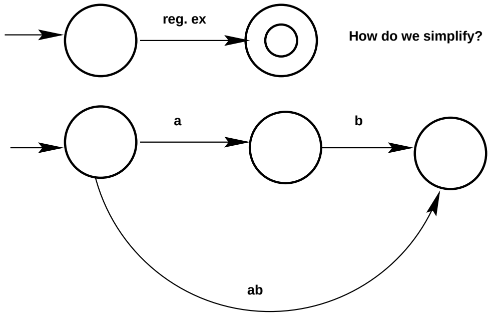
e.g.



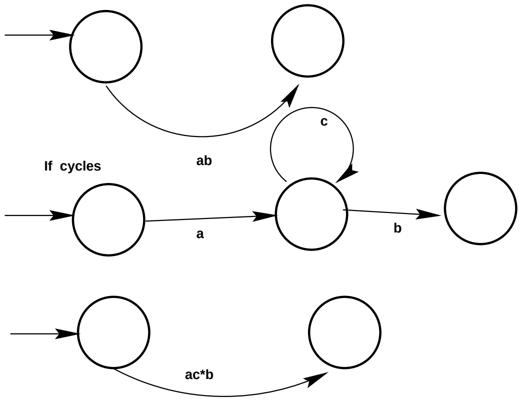
can be converted to meet the requirement

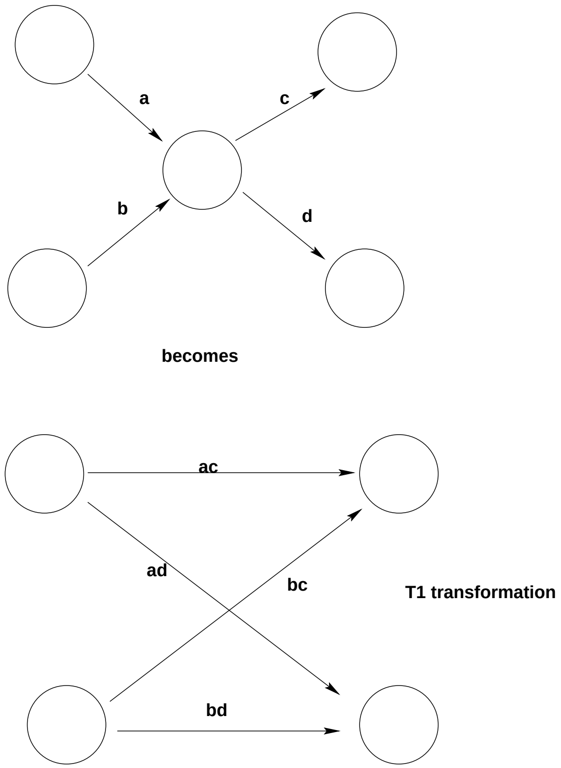


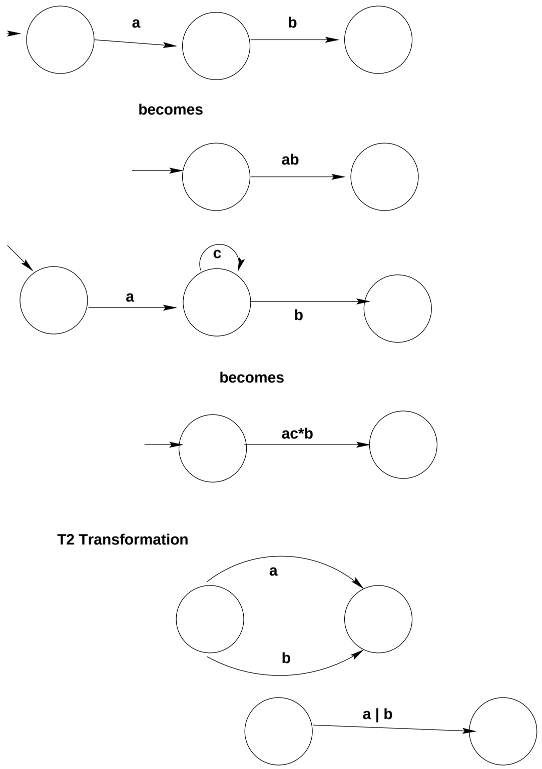
Idea of Algorithm: Simply by removing state and transitions until we have



Bypass, add a new transition



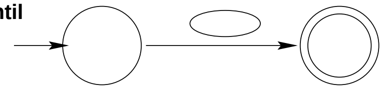

a
c
b
d
becomes
ac
ad
bc
T1 transformation
bd


a
b
becomes
ab
c
a
b
becomes
ac*b
T2 Transformation
a
b
a | b

Algorithm :

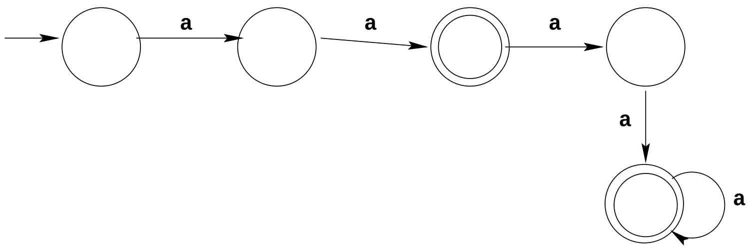
Repeat
  choose any state not equal to start or final state
  Apply T1 or T2

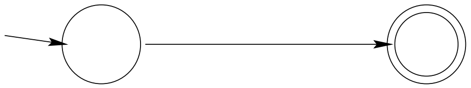
until



remains

e.g

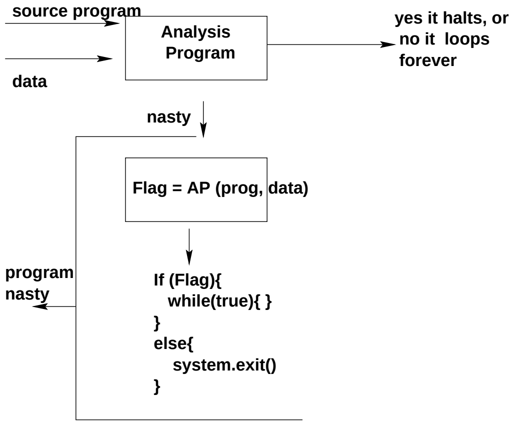




(aaaa(a+) | aa) same as (aa | aaaaa)+

Theory of Reg. Expr. And Finite Automata:

Halting problem:



Are there token defintions that cannot be written as regular expressions or FA ? (yes)

e.g [ ] , [[ ]] , [[[ ]]]

$\{ [^i \;]^i \mid i >= 1\}$

"The solution"
- **number the states from 1 to N**

Create Table

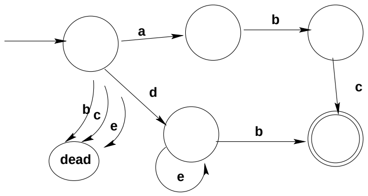
# of [	state reached	
1	S13	
2	S17	
3	S5	
.	.	
.	.	
.	.	
37	S17 ←	state repeated (doomed)

Complement of a regular expr:

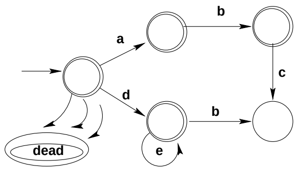
$\bar{R} = V^* - R$

if R is regular is $\bar{R}$

i) translate R into a FA



swap final state with non-final state



if R is regular is Rev(R) regular? (yes)

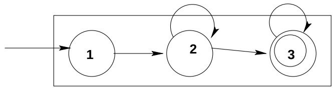
Rev = Reverse

Rev(S1S2...Sn) = SnSn-1...S2S1

Rev(abcd) = dcba
e.g

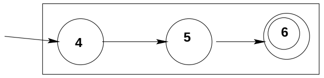
Algorithm:
Reverse arrows ,
make a new state, make lambda transition to
final state,
make start state the final state.

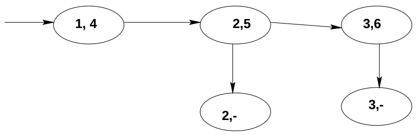
If R1 and R2 are regular , is(R1 intersection R2) regular? (yes)



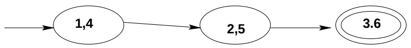
a+b+

ab





toss awy states with (-)(dash)



DeMorgan’s Law:

(R1 intersection R2) = $\overline{(\overline{R1} \text{ union } \overline{R2})}$

If R is regular, is any subset of R regular ? No

$\{ [^{+}\ ]^{+} \}$ not subset of $[^{+}\ ]^{+}$

Context Free Grammar:

Syntax of a programming language is its token structure

e.g.

;) A - B (= 0

productios (rules) important in parsing and involve tokens (teminals) symbols
and non-terminal (place holders)

non terminal ---> zero or more terminal or non terminals

Program ----> { statements}

statements ---> statements; statement

statements----> statement

statement ----> ID = Expr

Expr ---------> ID

Expr ---------> Expr + ID