Formal Languages & Automata Theory
Complement - Plip Final states to won-final
Module 1 - Intro. to formal language
Theory and Regular Languages
REGINION TONGUAGEN CONE CLOSED UNGEN COM
DFA - Deterministic Finite Automata
l = c = c = c
1=(P, E, S, 90) F) 3 staining stable 401 - ANN
O=set of all states = inputs
$\Sigma = inputs$ $S = transition function = P \times \Sigma \rightarrow P$
20 = Start state
F = Set of final states
Starts starts
* Trap state necessary.
94010092
Operations on Regular Languages.
GIVEN CONDITION
Union - AUB = {x x ∈ A or x ∈ B}
Concatenation - MOB = { Ly LCA and yCBS
Union - AUB = $\{x \mid x \in A \text{ or } x \in B\}$ Concatenation - $AoB = \{xy \mid x \in A \text{ and } y \in B\}$ Star - $A^* = \{x_1 x_2 x_3 \dots x_k \mid k \ge 0 each x_i \in A\}$ Sunday 02
* Regular Vahahages prof glosed finder Week 2 = 002-363
which & concatenation & 31th.
2
Intersection - AOR = {x x ∈ A and x ∈ B}
4-10 10 21936 NOUSI CC

Complement - Flip final states to non-final
and vice versa.
Thomas and PROUDRY LAWARED
Regulai languages are closed under all of these operations.
of these operations.
,
NFA - Non-deterministic Finite Antomata
and all alala
$M = (\emptyset, \Sigma, S, q_0, F)$ $\emptyset = set gstates$ $\Sigma = inputs$
$\Sigma = inputs$
S = transition function = $\varphi_x Z \rightarrow 2^{\varphi}$
Po = Start State F - Set Of final above.
F = set of final states. Separate
> Dedicate an edges for inputs for the
given condition.
2990 VAADO I VA - NOW
Conversion of NFA to DFA
Signal Service Signal And Servic
> All DFAS are NFAS. But vice verso be not be
true.

Steps: (Subset construction method)
De reached from a particular state only
Draw NFA JOHNUZ 9 st. MISSZ Jd
2) Transition table of NFA
3) Transition table of DFA from NFA. Start with start state same
-> Start with start state, same
transition. ARM 3 mora
-> If a new state formed, find the
transition of that new state.
-> Repeat until all States tacace formed
are reachable to every other state
4) Draw DFA. Sup design to begin to
- Depent for every states and every
* There should not be any & in DFA.
* There should not be any of in DFA. * Every state containing final State of NFA is final for DFA.
is final for Drift

JANUARY 2022

Su Mo Tu We Th Fr Sa

1 2 3 4
5 6 7 8 9 10 11
12 13 14 15 16 17 18
19 20 21 22 23 24 25
26 27 28 29 30 31

E - NFA

DECEMBER

2021

Su Mo Tu We Th Fr Sa

1 2 3 4
5 6 7 8 9 10 11
12 13 14 15 16 17 18
19 20 21 22 23 24 25
26 27 28 29 30 31

relie to a top state and menter $M = \{ \varphi, \Sigma, \delta, q_0, F \}$

O = set ofstates

Z = inputs / Ad Wiggers S= transition table = $\varphi \times \Sigma \cup E \longrightarrow 2^{\varphi}$ 90 = Start State F = Set of final States

* Every state on E goes to itself.

E-Closure (E*) - All the states that can be reached from a particular state only by seeing the Esymbol. 1911 word 2) Transition table airea

Convenion of E-NFA to NFA

Doraw E-NFA

2) Transition table of E-NFA:

-> First find the E* of a particular State, then transitions with a given Input, and Ex from transitions obtained through given input.

-> Repeat for every state, and every inpint.

3) paraentiansition table of NFA.

FFRRUARY 2022 Su Mo Tu We Th Fr Sa 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26

2022 JANUARY
Thursday
Week 2 T 006-359

Arom final E*

4) Draw NFA.

reaching only through E * Every state comprising final state of E-NFA are final states of NFA.

Extended transition function (5*/5")

DFA: QXE -> P) $0) \delta^* (q, \epsilon) \rightarrow q$ $0) \delta^* (q, \epsilon) \rightarrow \delta (\delta^* (q, x), q)$

Equivalence of DFA & NFA (Proof)

If D=(OD, E, SD; {90}, FD} is the DFA Constructed from NFA N=(ON, E, SN, 90, FN) by subset construction then L(D) = L(N) i.e., Sp ({203, w) = SN (90, \$3 cu)

ax last (looka) and the tal that

Base case: Iwl=0 = E

Sp ({203, €) = 2203

SN (20, E) = {20}

JANUARY 2022 Friday
Week 2 ■ 007-358 -> write down distinct states

Induction Hypothesis & Ind

let the same be true for Iw1 ≤ h

Sp* ({203, X) = SN (20, X)

Proof: Let w=Xa /w1=n+1

 $\delta_{D}^{*}(\{20\},X)=\delta_{N}^{*}(20,X)=\{P_{1},P_{2},...,P_{k}\}$

 $S_{b}^{*}(\{20\}, Xa) = S_{b}(S_{b}^{*}(\{20\}, X), a)$

= $S_p(\{P_1, P_2, ..., P_k\}, a)$

 $S_{p}(r;a) = 0$ $S_{p}(r;a) = [r_{o},r_{i},...,r_{k}]$

SN* (20, Xa) = 8006 SN (8N* (20,1X),a)

 $= \mathcal{S}_{N}\left(\left\{P_{1}, P_{2}, \dots, P_{K}\right\}, a\right)$

= U Sn (Pi, a) 3

 $= \{r_0, r_1, \dots, r_k\}$

: SN* (201Xa) = S,* (202, Xa)

Steps to identify equivalence

i) For pair of states $\{2i,2i\}$, \mathbb{Z} $a \in \Sigma$ where $S\{2i,a\} = 2a$ & $S\{2i,a\} = 2b$ then { qa, qb} should both be either intermediate or final state.

2) If initial is final in one automaton, same should be the case with other as well.

Grammai

G = (V, T, S, P) (S, A)

V= set of variables (non-terminals)
T= set of terminals

S = Staut Symbol State Land

P = Production rules for terminals & non-terminals.

Regular Grammar

Right linear Left linear Sunday 09

Week 3 @ 009-356

Suppose A, -32 A3

A→×B $A \rightarrow x$

 $A \longrightarrow Bx$ $A \rightarrow X$

A,BEV & XET.

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Equivalence of RG & DFA
Feb 108 1212 12 12 05 33
RG- COCCEDECE (V,T,S,P)
DFA - (O, E, S, 90, F)
That I have been been that to be
If initial is fact in our autopieties
ET-> Singer the the case with
$s \rightarrow q_0$
$P \rightarrow S$
C YAMMAN A
Suppose $A_1 \rightarrow \infty A_2$
$(A, x) = A_2$ $(9.2.7.1) = 0$
Ve set of variables (non-ternainals)
If A -> x then point A towards the
tinal state.
P = Production rules to terminals &