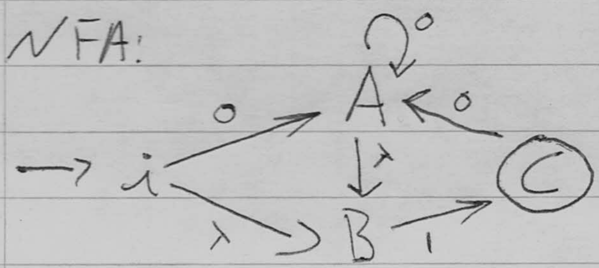
Phillip Goldfarb

312 HW

DATE	
TOPIC	

NFA:



Accepts: 1, 01, 0001, 101, 0101

Rejects: 0, 10, 00010, 011

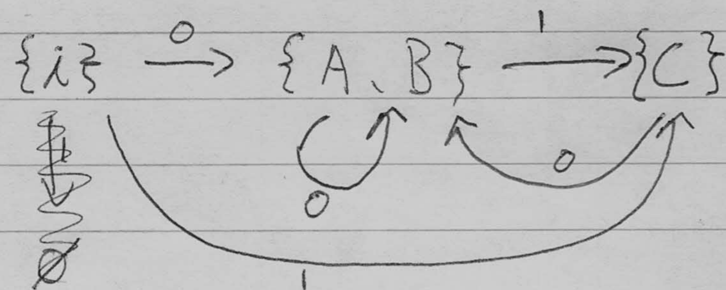
$\Sigma = \{0, 1\}$

Accepts non-empty binary string ~~ending in a single 1~~ with no more than one consecutive 1, that ends with 1

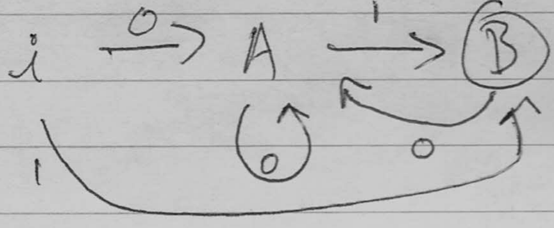
Transitions:

	0	1	λ
>i	A	-	B
A	A	-	B
B	-	C	-
(C)	A	-	-

DFA construction:



Equivalent DFA:



DFA to regular expression:

$R_i = 0R_a + 1R_b$
$R_a = 0R_a + 1R_b$
$R_b = 0R_a + \lambda$

$R_a = 0^*1R_b$
$R_b = 0\,0^*1R_b + \lambda$
$= (00^*1)^*\lambda$
$= \cancel{00^*} \quad (00^*1)^*$
$R_a = 0^*1(00^*1)^*$
$R_i = R_a$ //can I do that?
$= 0^*1(00^*1)^*$

leading zeros one 1

$(00^*1) \rightarrow$ a 1 led by at least one zero

$D_s R = \{t \mid st \in R\}$

RE to DFA:

$r = 0^*1(\cancel{00^*}0^*1)^*$
$D_0 r = (D_0\, 0^*1)(\cancel{00^*}1)^* + \delta(0^*1)D_0(00^*1)^*$
$D_0[0^*1] = [D_0\, 0^*]1 + \delta(0^*)D_0(1)$
$D_0[0^*] = 0^*$
$\cancel{D_0 r = r}$
$\cancel{D_1 r =}$

$D_0(1) = \emptyset$
$\delta(0^*) = \lambda$

not sure how to continue..

$\cancel{D}_0 r$

$$\delta(0^*1) = \delta(0^*)\delta(1) = \lambda\cancel{\emptyset}$$

$\cancel{D_0 r =}$

$$D_0(00^*1)^* = D_0 00^*1 \, (00^*1)^*$$

$$D_0(00^*1) = D_0(0)0^*1 + \delta(0^*1)$$
$$= \lambda 0^*1 + \lambda\cancel{\emptyset}$$
$$= 0^*1$$

$$D_0 r = 0^*1 + \lambda\emptyset(0^*1)$$
$$= 0^*1$$

$$D_1 r = (D_1 0^*1)(0^+1)^* + \delta(0^*1)(D_1 0^+1)$$

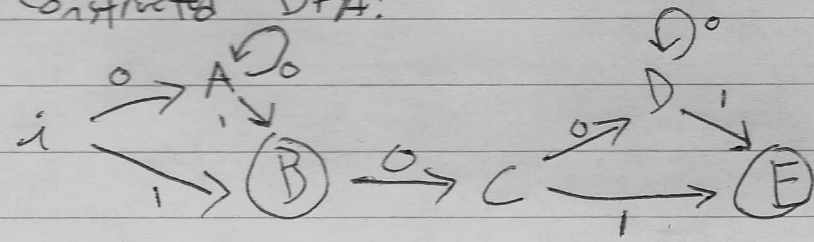
$$D_1 0^*1 = \underbrace{(D_1 0^*)1}_{= 0^*1} + \overset{\lambda}{\delta(0^*)}\,\overset{\lambda}{(D_1 1)}$$

$$D_1 0^+1 = D_1 00^*1 = \underbrace{(D_1 0)0^*1}_{= 0^*1} + \delta(0^*1)(D_1 0^*1)$$

$$D_1 r = 0^*1(0^+1)^* + \emptyset = r$$

I have no idea if this is going in the right direction

Constructed DFA:



Simplification rules:

(1) $\alpha = \lambda\alpha = \alpha\lambda$

$L(\lambda) = \{\} \rightarrow$ identity of λ

$L(ab) = L(a)L(b)$

$L(\alpha\lambda) = L(\alpha)L(\lambda) = L(\alpha)\{\} = L(\alpha)$

$L(\lambda\alpha) = L(\lambda)L(\alpha) = \{\}L(\alpha) = L(\alpha)$

$\therefore \alpha = \lambda\alpha = \alpha\lambda$

(2) $(\alpha\beta)\gamma = \alpha(\beta\gamma)$

$L((\alpha\beta)\gamma) = L(\alpha\beta)L(\gamma)$

$= L(\alpha)L(\beta)L\gamma$

$L(\alpha(\beta\gamma)) = L(\alpha)L(\beta\gamma)$

$= L(\alpha)L(\beta)L(\gamma)$

$\therefore (\alpha\beta)\gamma = \alpha(\beta\gamma) = \alpha\beta\gamma$

DATE

TOPIC

(3) $\alpha + \alpha = \alpha$

let $P = L(\alpha) = \{x \mid (x \text{ is accepted by } \alpha)\}$

$$L(\alpha + \alpha) = L(\alpha) + L(\alpha)$$
$$= P \cup P$$
$$= P$$

Union of a set with itself is ~~the~~ set

(10) $\alpha^* = \alpha^* \alpha^*$

$\alpha^* = \cancel{\alpha^*}\ \alpha_1 \alpha_2 \ldots \alpha_n \mid n \geq 0$

$\forall\, n \geq 0\ \exists (x, y) \mid x + y = n$

$\therefore\ \exists\, x, y \mid \alpha_1 \alpha_2 \ldots \alpha_n = (\alpha_1 \alpha_2 \ldots \alpha_x)(\alpha_1 \alpha_2 \ldots \alpha_y)$

$\therefore\ \alpha^* = \alpha^* \alpha^*$

(4) $\alpha + \beta = \beta + \alpha$

$L(\alpha + \beta) = L(\alpha) + L(\beta)$

$L(\alpha) = \{x \mid x \text{ accepted by } \alpha\}$

$L(\beta) = \{y \mid y \text{ accepted by } \beta\}$

$L(\alpha + \beta) = \{x\} \cup \{y\} = \{x\, y\}$

$L(\beta + \alpha) = \{y\} \cup \{x\} = \{xy\}$

$\therefore\ \alpha + \beta = \beta + \alpha$

GoldFibre.