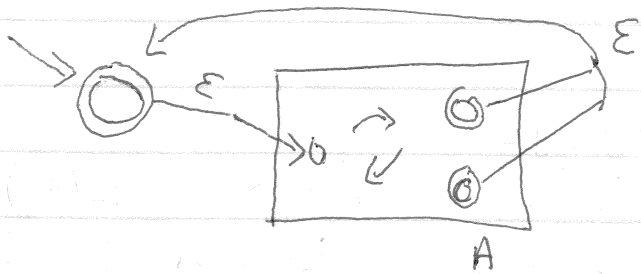


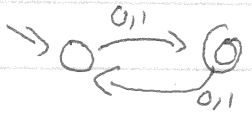
Star: $A^* = \{ \text{~~xyz~~ } x_1 \dots x_n \mid x_i \in A \}$ $n \in [0, \dots)$
 $\epsilon \in A^*$ $A^* = \epsilon \cup A \circ A^*$



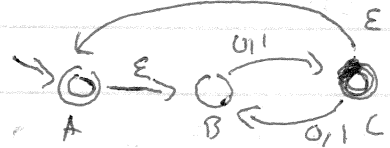
$$Z^{n+1} > Z^{(n+m+1)}$$

$$Z^{m+1}$$

A = odd



A^*

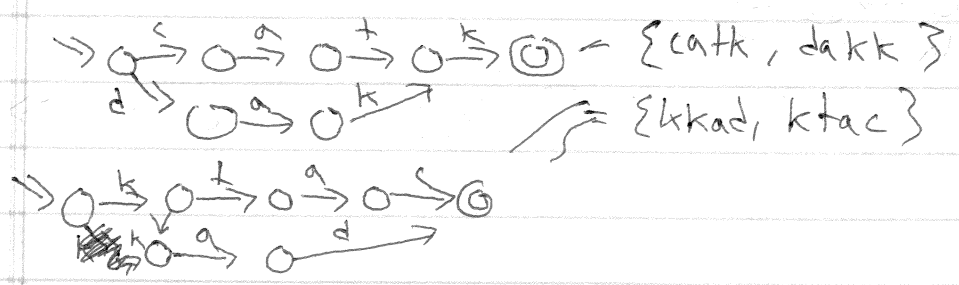
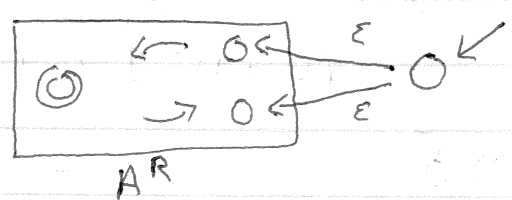
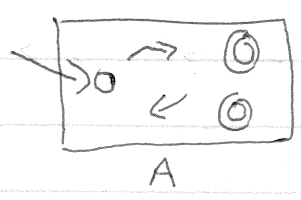


Reversal

$$A^R = \{ x \mid x^R \in A \}$$

$$A = \{ cat \}$$

$$A^R = \{ tac \}$$



2 Regular Operations: $\cup, \circ, *, R, \cap, \sim$

Regular Expression r over $\Sigma =$

- \emptyset r_1^R
- ϵ $r_1 \cap r_2$
- $a \in \Sigma$ $\sim r_1$
- $r_1 \cup r_2 // (r_1 | r_2)$ \cdot $L(\cdot) = \Sigma$
- $r_1 \circ r_2 // r_1 r_2$
- r_1^*

L : regexp \rightarrow language

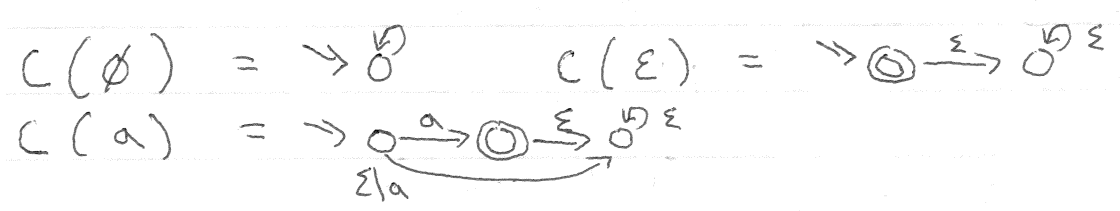
$L(\emptyset) = \emptyset$ $L(\epsilon) = \{\epsilon\}$ $L(a) = \{a\}$
 $L(r_1 \cup r_2) = L(r_1) \cup L(r_2)$ $L(r_1 \circ r_2) = L(r_1) \circ L(r_2)$
 and so on...

$L(cat) = \{cat\} = L(c \circ a \circ t)$
 $L((a \cup d)^* r) = \{cr, can, cdr, cadn, cdan, caaadn, \dots\}$

REG = REG? (PFA = NFA)

- ① $\forall R \in \text{REG}, \exists D \in \text{DFA}, L(R) = L(D)$ ← compiler from regexp to DFA's - C
- ② $\forall D \in \text{DFA}, \exists R \in \text{REG}, L(D) = L(R)$ ← disassembler - D

$D([\exists \text{ from end}]) = \underbrace{\hspace{10em}}_{C(\cdot) = 1 \text{ from end}}$
 $(0 \cup 1)^* 1 (0 \cup 1)(0 \cup 1) = \Sigma^* 1, \Sigma \Sigma = \cdot^* 1 \dots$



$$6-3/ C(\Sigma^* \perp \Sigma \Sigma) = C(\Sigma^* \circ (\perp \circ (\Sigma \circ \Sigma))) =$$

$$C(\Sigma) = C(\perp \cup \perp)$$

$$C(\perp) = \rightarrow \circ \xrightarrow{0} \odot$$

$$C(\perp) = \rightarrow \circ \xrightarrow{1} \odot$$

$$C(\Sigma) = \rightarrow \circ \xrightarrow{\Sigma} \circ \xrightarrow{0} \circ \xrightarrow{\Sigma} \odot \quad = \rightarrow \circ \xrightarrow{01} \odot$$

$$C(\Sigma^*) = \rightarrow \odot \xrightarrow{\Sigma} \circ \xrightarrow{0} \circ \xrightarrow{\Sigma} \circ \xrightarrow{0} \circ \xrightarrow{\Sigma} \odot$$

$$C(\Sigma \circ \Sigma) = \rightarrow \circ \xrightarrow{\Sigma} \circ \xrightarrow{0} \circ \xrightarrow{\Sigma} \circ \xrightarrow{0} \circ \xrightarrow{\Sigma} \odot$$

$$\Sigma \circ \Gamma = \Gamma = \Gamma \circ \Sigma \quad (\circ = \times, \perp = 1, \emptyset = 0)$$

$$\emptyset \circ \Gamma = \emptyset = \Gamma \circ \emptyset$$

$$\emptyset \cup \Gamma = \Gamma = \Gamma \cup \emptyset \quad (\cup = +, \emptyset = 0)$$

$$r_1 \cup r_2 = r_2 \cup r_1$$

$$\Sigma^* = \Sigma \quad (* \text{ is like exponentiation})$$

$$\emptyset^* = \Sigma$$

$$r_1 \circ (r_2 \cup r_3) = r_1 \circ r_2 \cup r_1 \circ r_3 \quad (\cup \text{ and } \circ \text{ distribute})$$

~~$$(r_2 \cup r_3)^* = r_2^* \cup r_3^*$$~~

$$r_1^{RR} = r_1$$

$\cup / \circ / \cap$ obey de-morgan/etc rules

1. The probability of an event occurring is the ratio of the number of favorable outcomes to the total number of possible outcomes.

$$P(A) = \frac{n(A)}{n(S)}$$

2. The probability of the complement of an event A is given by:

$$P(A^c) = 1 - P(A)$$

3. The probability of two independent events A and B occurring together is the product of their individual probabilities:

$$P(A \cap B) = P(A) \cdot P(B)$$

4. The probability of two events A and B occurring together is given by:

$$P(A \cap B) = P(A) \cdot P(B|A)$$

5. The probability of two events A and B occurring together is given by:

$$P(A \cap B) = P(B) \cdot P(A|B)$$

6. The probability of two events A and B occurring together is given by:

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

7. The probability of two events A and B occurring together is given by:

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

8. The probability of two events A and B occurring together is given by:

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

9. The probability of two events A and B occurring together is given by:

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

10. The probability of two events A and B occurring together is given by:

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$