Kap 23: Formelle språk og grammatikker

$$A = \{ a, b \}$$

$$L = \{ a, aa, aab, \dots \}$$

- **union** : $L = \{a, b\}$ $\quad L \cup M = \{a, b, bb, c\}$

  $M = \{bb, c\}$

ikke kommutativ

- **konkatenering** : $L = \{a, b\}$ $\quad LM = \{abb, ac, bbb, bc\}$

  $M = \{bb, c\}$ $\quad ML = \{bba, bbb, ca, cb\}$

  $LM \neq ML$

Identitetselement : $\{\Lambda\}$

$L^3 = LLL = \{aa, ab, ba, bb\}\{a, b\} =$

$L = \{a, b\}$

$\Lambda a = a \Lambda = a$

- **tillukning** : $L \Rightarrow L^0 \cup L^1 \cup L^2 \cup \dots \cup L^n$

  $\{\Lambda\}$ $\quad \{a, b\}$

$L^2 = LL = \{a, b\}\{a, b\} =$

$= \{aa, ab, ba, bb\}$

$\emptyset \Rightarrow \{\}$

$L\emptyset = \emptyset L = \emptyset$

$\rightarrow \{\Lambda\} \Rightarrow \{\Lambda\} \Rightarrow L^0$

$S\Lambda = \Lambda S = S$

$L^0 \cup L^1$

$\{a\} \cup \{b\}$

$A = \{a, b\}$

$L = \{a, b\}$

$M = \{bb, c\}$

$A = \{b, c\}$

$\{b\}\ \{c\}$

$\{b\}\{b\} \cup \{c\}$

$\rightarrow A = \{a, b\}$

Def. Reg. språk

- $\emptyset$, $\{\Lambda\}$, $\{a\}$ for hvert $a \in A$
- hvis L og M er reg. språk, så er LM, $L \cup M$, L^*, M^*

Semantikk

$tolke(LM) =$

$= tolke(L)\ tolke(M)$

$tolke(L|M)$

$tolke(L) \cup tolke(M)$

Syntaks

Def: Reg. uttrykk

- $\emptyset$, Λ, a for hvert $a \in A$
- hvis L og M er reg. uttrykk så er LM, $L|M$, L^*, M^*

$\rightarrow (L)$

$0|1^* = \{0, \Lambda, 1, 11, 111, \ldots\}$

$(0|1)^*$ => alle strenger over alfabetet $\{a, b\}$

$0^*|1^* = \{\Lambda, 0, 00, 000, \ldots, 1, 11, 111, \ldots\}$

$(0|1)^* = \{\Lambda, 0, \underbrace{1}_{\text{1tegn}}, \underbrace{00, 01, 10}_{\text{2-tegn}}, 11,$

$\Downarrow$

$\{0, 1, 2\}$

$(0|1|2)^*$

$(01)^* = \{\Lambda, 01, 0101, 010101, \ldots\}$

union

$\downarrow$

$(0|1)^*$ samme som $\underset{\Lambda}{0^*} \overset{\text{konkat}}{\downarrow} 1^*$ => $\{\Lambda, 0, 1, 11, 111, \ldots\}$

ikke 10

$L = \{ \Lambda, a, ab, abb, abbb, \dots \}$

$\Rightarrow \Lambda$

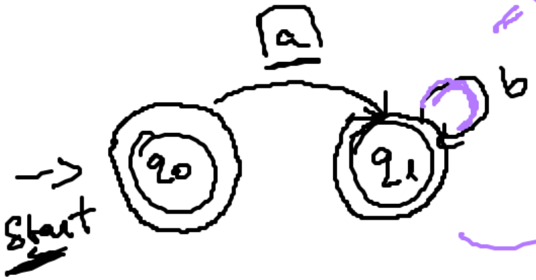
$\Lambda \mid ab^* \Rightarrow \cancel{ab^*}$

ab^*

$a\Lambda, ab, abb, \dots$

a

⇒ tillukning



konkatenering

$S \to \Lambda$

$S \to aS \mid bA \Rightarrow a, ab, ab$

$aS \mid b$

$A \to \Lambda \mid bA$

terminale

ikke-terminale

1 2 3

$\Rightarrow \begin{cases} S \to \Lambda \mid aS \mid bA \\ A \Rightarrow \Lambda \mid bA \end{cases}$

6 4 5

regel

utledning av abbb

$S \Rightarrow aS \Rightarrow abA \Rightarrow abbA \Rightarrow$

$\Rightarrow abbbA \Rightarrow abbb$

$L = \{ \Lambda, ab, aabb, aaabbb, \ldots \} \Rightarrow$ ~~the regular~~

$a^n b^n$

$V_1 \; S \Rightarrow \Lambda \mid aSb \mid ab$

aabb

$S \Rightarrow aSb \Rightarrow aabb$

$V_2 \; S \Rightarrow \Lambda \mid aSb$

$S \Rightarrow aSb \Rightarrow aaSbb \Rightarrow aabb$

$a^* b^*$

$\Rightarrow a^* b^* \quad (ab)^*$

abb, aab, ...

$a^*(ab)b^*$

ab, abab, ababab

$(ab)^*$

23.11 b) $\{0, 1\}$

01 , 010 , 10 , 101

$(10)^* \mid (01)^* \mid 1(01)^* \mid 0(10)^*$

1010 0101 1010101 0101010

partall partall oddetall oddetall

a) 0 eller 111

$(0 \mid 111)(0 \mid 1)^*$

hvilken som streng fra alfabetet