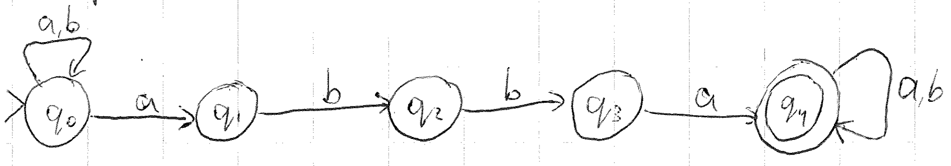
# FLGA - exercises lecture 3

3.2

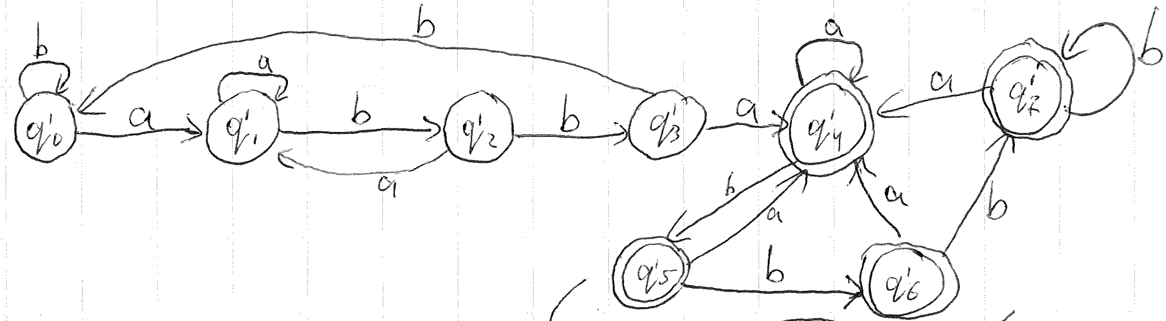
1. We willen een automaat (NFA) die alleen woorden accepteert waar abba in voorkomt:



2.

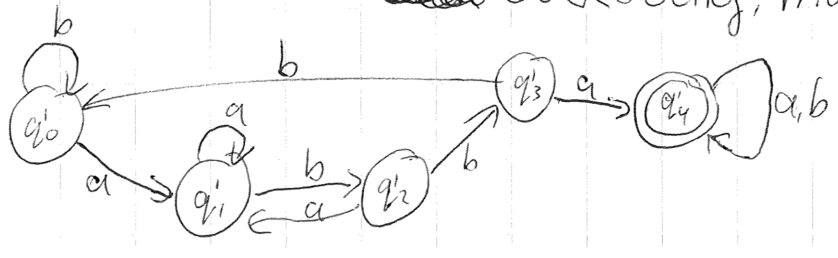
| nieuwe naam | toestanden | a | b |
|---|---|---|---|
| $q'_0$ | $\{q_0\}$ | $\{q_0, q_1\}$ | $\{q_0\}$ |
| $q'_1$ | $\{q_0, q_1\}$ | $\{q_0, q_1\}$ | $\{q_0, q_2\}$ |
| $q'_2$ | $\{q_0, q_2\}$ | $\{q_0, q_1\}$ | $\{q_0, q_3\}$ |
| $q'_3$ | $\{q_0, q_3\}$ | $\{q_0, q_1, q_4\}$ | $\{q_0\}$ |
| $q'_4$ | $\{q_0, q_1, q_4\}$ | $\{q_0, q_1, q_4\}$ | $\{q_0, q_2, q_4\}$ |
| $q'_5$ | $\{q_0, q_2, q_4\}$ | $\{q_0, q_1, q_4\}$ | $\{q_0, q_3, q_4\}$ |
| $q'_6$ | $\{q_0, q_3, q_4\}$ | $\{q_0, q_1, q_4\}$ | $\{q_0, q_4\}$ |
| $q'_7$ | $\{q_0, q_4\}$ | $\{q_0, q_1, q_4\}$ | $\{q_0, q_4\}$ |

Waar $q_4$ in voorkomt is een eindtoestand



overbodig, maar niet fout!

Beter:



3. Maak van de gewone toestanden een eindtoestand en andersom.

4. $R_0 = aR_1 + bR_0 + \lambda$
$R_1 = aR_1 + bR_2 + \lambda$
$R_2 = aR_1 + bR_3 + \lambda$
$R_3 = bR_0 + \lambda$ (vanaf $q_4$ kan je niet meer in een eindtoestand komen.)

$$\left.\begin{aligned} R_0 &= b^*(aR_1 + \lambda) \\ R_1 &= a^*(bR_2 + \lambda) \end{aligned}\right\} \begin{aligned} R_0 &= b^*(a(a^*(bR_2+\lambda)) + \lambda) \\ &= b^*aa^*bR_2 + b^*aa^* + b^* \end{aligned}$$

$$\begin{aligned} R_2 &= aR_1 + b(bR_0+\lambda) + \lambda \\ &= a(a^*(bR_2+\lambda)) + b(bR_0+\lambda) + \lambda \\ &= aa^*bR_2 + aa^* + b(bR_0+\lambda) + \lambda \\ &= (aa^*b)^*(aa^* + b(bR_0+\lambda) + \lambda) \\ &= (aa^*b)^*bbR_0 + (aa^*b)^*b + (aa^*b)^*aa^* + (aa^*b)^* \end{aligned}$$

Samen met $R_0$ geeft dit:

$$\begin{aligned} R_0 &= b^*aa^*b(aa^*b)^*bbR_0 + b^*aa^*b(aa^*b)^*b \\ &\quad + b^*aa^*b(aa^*b)^*aa^* + b^*aa^*b(aa^*b)^* + b^*aa^* + b^* \\ &= (b^*aa^*b(aa^*b)^*bb)^*(b^*aa^*(b(aa^*b)^*(b+aa^*+\lambda)+\lambda)+b^*) \end{aligned}$$