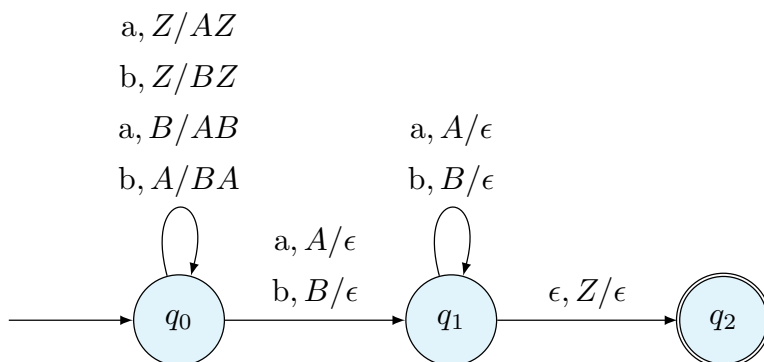


「離散数学・オートマトン」演習問題 13 (解答例)

2022/1/18

1 プッシュダウンオートマトン

課題 1 以下のようなプッシュダウンオートマトン M を考える。



$$Q = \{q_0, q_1, q_2\}$$

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

$$\Gamma = \{A, B, Z\}$$

$$F = \{q_2\}$$

$$\delta(q_0, a, Z) = (q_0, AZ),$$

$$\delta(q_0, b, Z) = (q_0, BZ),$$

$$\delta(q_0, a, B) = (q_0, AB),$$

$$\delta(q_0, b, A) = (q_0, BA),$$

$$\delta(q_0, a, A) = (q_1, \epsilon),$$

$$\delta(q_0, b, B) = (q_1, \epsilon),$$

$$\delta(q_1, b, B) = (q_1, \epsilon),$$

$$\delta(q_1, a, A) = (q_1, \epsilon),$$

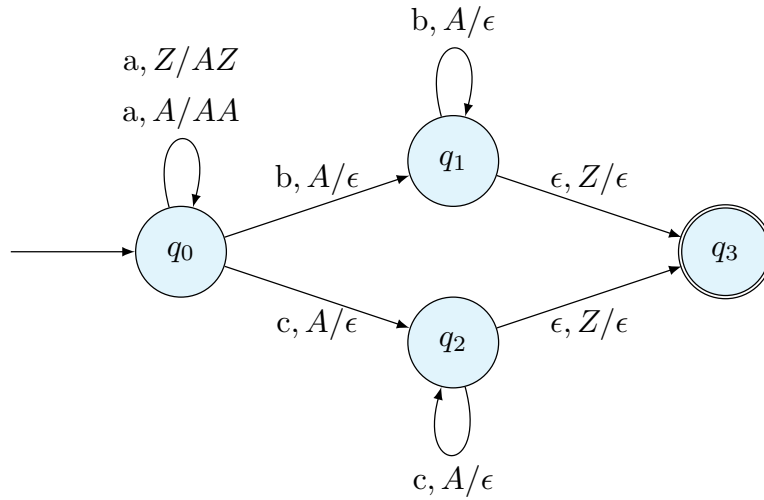
$$\delta(q_1, \epsilon, Z) = (q_2, \epsilon)$$

このとき、入力 ababbaba 及び babaabab に対する動作を示しなさい。

解答例

$$\begin{aligned}(q_0, ababbaba, Z) &\vdash (q_0, babbaba, AZ) \\ &\vdash (q_0, abbaba, BAZ) \\ &\vdash (q_0, bbaba, ABABZ) \\ &\vdash (q_0, baba, BABABZ) \\ &\vdash (q_1, aba, ABABZ) \\ &\vdash (q_1, ba, BAZ) \\ &\vdash (q_1, a, AZ) \\ &\vdash (q_1, \epsilon, Z) \\ &\vdash (q_2, \epsilon, \epsilon)\end{aligned}$$
$$\begin{aligned}(q_0, babaabab, Z) &\vdash (q_0, abaabab, BZ) \\ &\vdash (q_0, baabab, ABZ) \\ &\vdash (q_0, aabab, BABZ) \\ &\vdash (q_0, abab, ABABZ) \\ &\vdash (q_1, bab, BABZ) \\ &\vdash (q_1, ab, ABZ) \\ &\vdash (q_1, b, BZ) \\ &\vdash (q_1, \epsilon, Z) \\ &\vdash (q_2, \epsilon, \epsilon)\end{aligned}$$

課題 2 以下のようなプッシュダウンオートマトン M を考える。



$$\begin{aligned}
 Q &= \{q_0, q_1, q_2, q_3\} \\
 \Sigma &= \{a, b, c\} \\
 \Gamma &= \{A, Z\} \\
 F &= \{q_3\}
 \end{aligned}$$

$$\begin{aligned}
 \delta(q_0, a, Z) &= (q_0, AZ), & \delta(q_0, a, A) &= (q_0, AA), \\
 \delta(q_0, b, A) &= (q_1, \epsilon), & \delta(q_0, c, A) &= (q_2, \epsilon), \\
 \delta(q_1, b, A) &= (q_1, \epsilon), & \delta(q_2, c, A) &= (q_2, \epsilon), \\
 \delta(q_1, \epsilon, Z) &= (q_3, \epsilon), & \delta(q_2, \epsilon, Z) &= (q_3, \epsilon)
 \end{aligned}$$

このとき、入力 aaabbb 及び aacc に対する動作を示しなさい。

解答例

$$\begin{aligned}
 (q_0, aaabbb, Z) &\vdash (q_0, aabbb, AZ) \\
 &\vdash (q_0, abbb, AAZ) \\
 &\vdash (q_0, bbb, AAAZ) \\
 &\vdash (q_1, bb, AAZ) \\
 &\vdash (q_1, b, AZ) \\
 &\vdash (q_1, \epsilon, Z) \\
 &\vdash (q_3, \epsilon, \epsilon)
 \end{aligned}$$

$(q_0, aacc, Z) \vdash (q_0, acc, AZ)$
 $\vdash (q_0, cc, AAZ)$
 $\vdash (q_2, c, AZ)$
 $\vdash (q_2, \epsilon, Z)$
 $\vdash (q_3, \epsilon, \epsilon)$