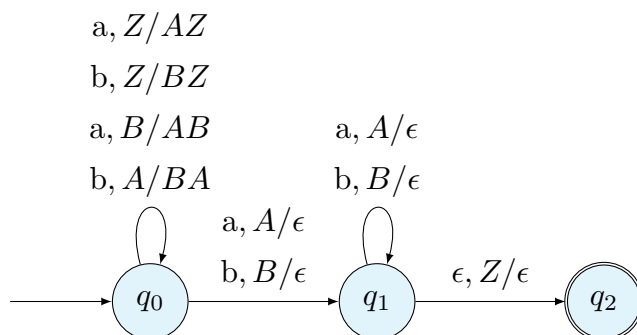


「離散数学・オートマトン」演習問題 13 (解答例)

2024/1/22

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。



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

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

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

$$F = \{q_2\}$$

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

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

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

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

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

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

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

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

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

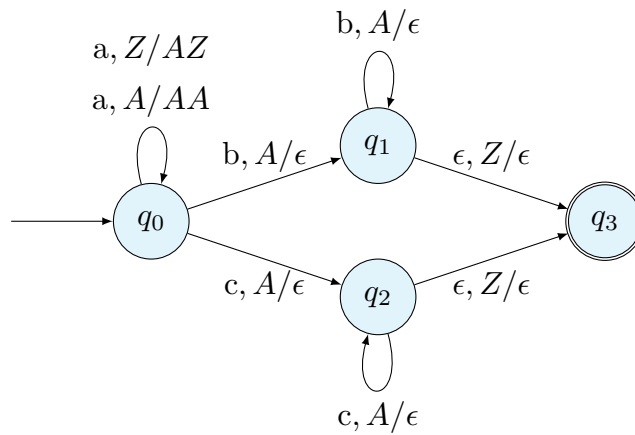
このとき、入力 $ababbaba$ 及び $babaabab$ に対する動作を示しなさい。

解答例

$$\begin{aligned}
 (q_0, \text{ababbaba}, Z) &\vdash (q_0, \text{babbaba}, AZ) \\
 &\vdash (q_0, \text{abbaba}, BAZ) \\
 &\vdash (q_0, \text{bbaba}, ABABZ) \\
 &\vdash (q_0, \text{baba}, BABABZ) \\
 &\vdash (q_1, \text{aba}, ABABZ) \\
 &\vdash (q_1, \text{ba}, BAZ) \\
 &\vdash (q_1, \text{a}, AZ) \\
 &\vdash (q_1, \epsilon, Z) \\
 &\vdash (q_2, \epsilon, \epsilon)
 \end{aligned}$$

$$\begin{aligned}
 (q_0, \text{babaabab}, Z) &\vdash (q_0, \text{abaabab}, BZ) \\
 &\vdash (q_0, \text{baabab}, ABZ) \\
 &\vdash (q_0, \text{aabab}, BABZ) \\
 &\vdash (q_0, \text{abab}, ABABZ) \\
 &\vdash (q_1, \text{bab}, BABZ) \\
 &\vdash (q_1, \text{ab}, ABZ) \\
 &\vdash (q_1, \text{b}, BZ) \\
 &\vdash (q_1, \epsilon, Z) \\
 &\vdash (q_2, \epsilon, \epsilon)
 \end{aligned}$$

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。



$$Q = \{q_0, q_1, q_2, q_3\}$$

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

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

$$F = \{q_3\}$$

$$\delta(q_0, a, Z) = (q_0, AZ), \quad \delta(q_0, a, A) = (q_0, AA),$$

$$\delta(q_0, b, A) = (q_1, \epsilon), \quad \delta(q_0, c, A) = (q_2, \epsilon),$$

$$\delta(q_1, b, A) = (q_1, \epsilon), \quad \delta(q_2, c, A) = (q_2, \epsilon),$$

$$\delta(q_1, \epsilon, Z) = (q_3, \epsilon), \quad \delta(q_2, \epsilon, Z) = (q_3, \epsilon)$$

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

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

$$\begin{aligned} (q_0, aacc, Z) &\vdash (q_0, acc, AZ) \\ &\vdash (q_0, cc, AAZ) \\ &\vdash (q_2, c, AZ) \\ &\vdash (q_2, \epsilon, Z) \\ &\vdash (q_3, \epsilon, \epsilon) \end{aligned}$$