

ECE374 Fall2020

Lab2: Deterministic Finite-state Automata

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Question 1: All strings containing the substring **aaa**.

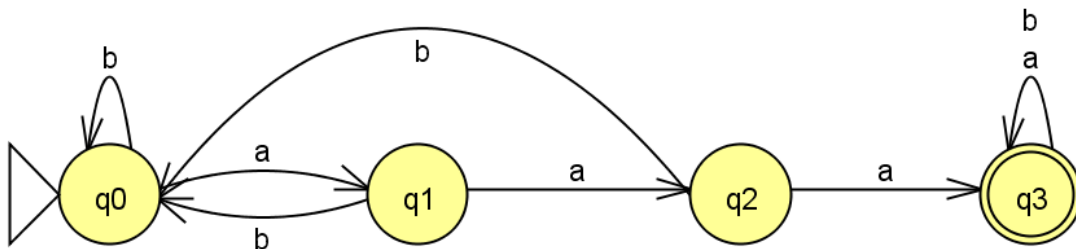


Figure 1: All strings containing the substring **aaa**.

q0: Start state. No **a** so far, or **b** interrupts the continuous **as**.

q1: There exists substring **a**.

q2: There exists substring **aa**.

q3: Final state. There exists substring **aaa**.

Question2: All strings not containing the substring **aaa**.

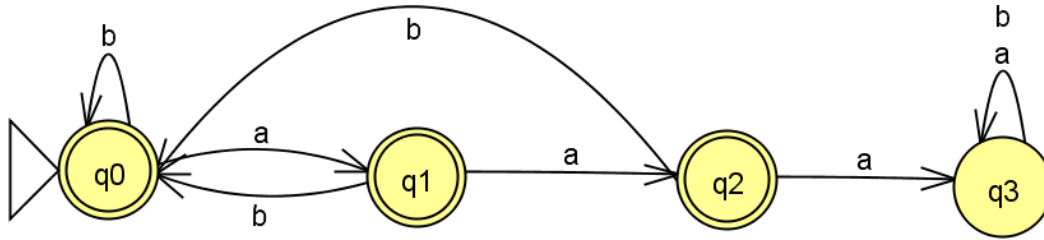


Figure 2: All strings not containing the substring **aaa**.

- q0: Start state and final state. No **a** so far, or **b** interrupts the continuous **as**.
- q1: Final state. There exists substring **a**.
- q2: Final state. There exists substring **aa**.
- q3: There exists substring **aaa**. Already failed no matter what comes next.

Question3: All strings in which every run of **as** has length at least 3.

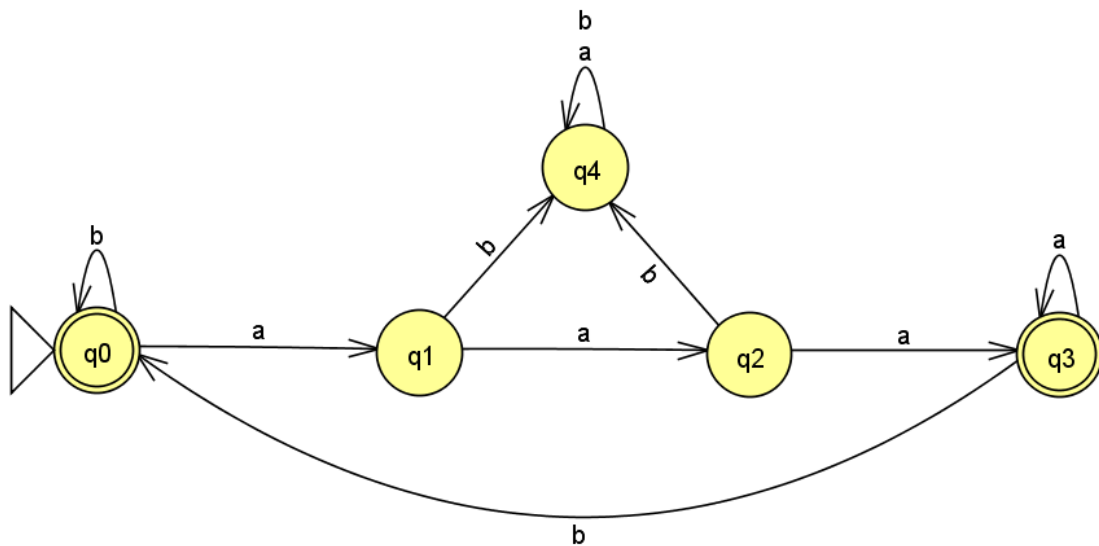


Figure 3: All strings in which every run of **as** has length at least 3.

- q0: Start state and final state. No **a** so far, or **b** interrupts the continuous 3 **as**.

- q1: There exists substring **a**.
q2: There exists substring **aa**.
q3: Final state. Every run of **as** has length at least 3.
q4: There exists substring **a** or **aa**. Thus, it has already failed no matter what comes next.

Question4: All strings in which all the **bs** appear before any substring **aaa**.

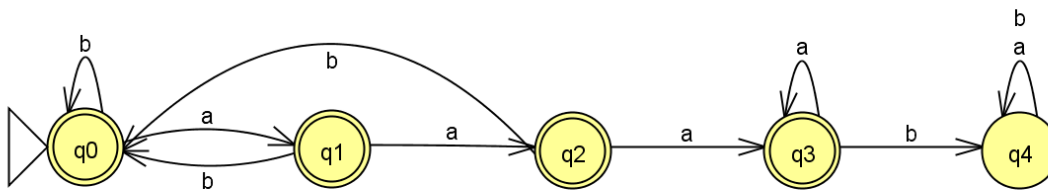


Figure 4: All strings in which all the **bs** appear before any substring **aaa**.

- q0: Start state and final state. No **a** so far or **b** interrupts **aaa**.
q1: Final state. There exists substring **b(s)** with **a** after it.
q2: Final state. There exists substring **b(s)** with **aa** after it.
q3: Final state. There exists substring **b(s)** with **aaa** after it.
q4: There exists substring **b(s)** after **aaa**. Therefore, it has already failed no matter what comes next.

Question5: All strings containing at least three **as**.

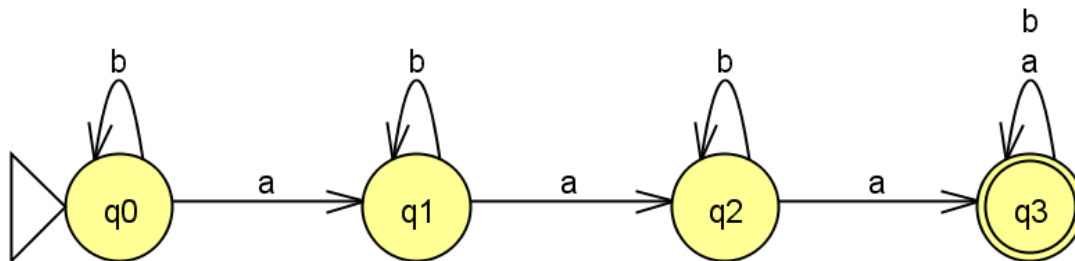


Figure 5: All strings containing at least three **as**.

q0: Start state. No **a** so far.

q1: One **a** so far.

q2: Two **a**s so far.

q3: Final state. There exists three or more **a**s in the string. It has already succeeded no matter what comes next.

Question6: Every string except **aaa**.

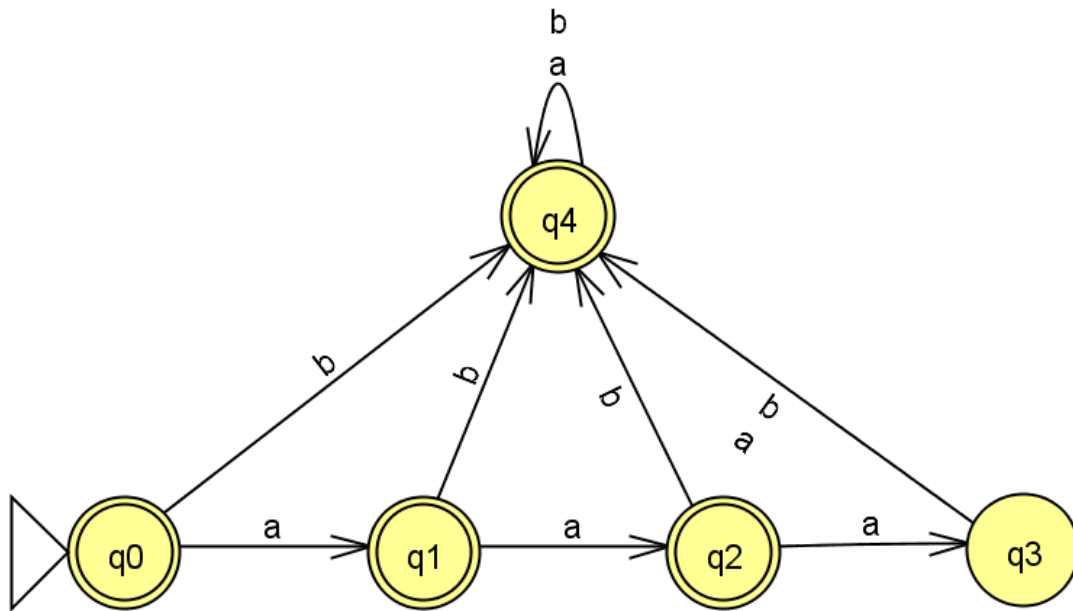


Figure 6: Every string except **aaa**.

q0: Start state and final state. Nothing so far.

q1: Final state. **a**.

q2: Final state. **aa**.

q3: **aaa**.

q4: **b** or **aaaa** occurs in the string so the string is not **aaa**. It has already succeeded no matter what comes next.