

CS 3313:

Foundations of Computing

Lab 2: JFLAP

<http://gw-cs3313.github.io>

CS 3313 Lab 2

- Using JFLAP
- Exercises/Examples

Recall Definitions

- DFA $M = (Q, \Sigma, \delta, q_0, F)$
- Language accepted by DFA:

$$L(M) = \{ w \mid \delta(q_0, w) \in F \}$$

In terms of transition graph, there is a path labeled w from start state to a final state.

State: summarizes properties of input processed thus far

Next: Using JFLAP to build and test your automata

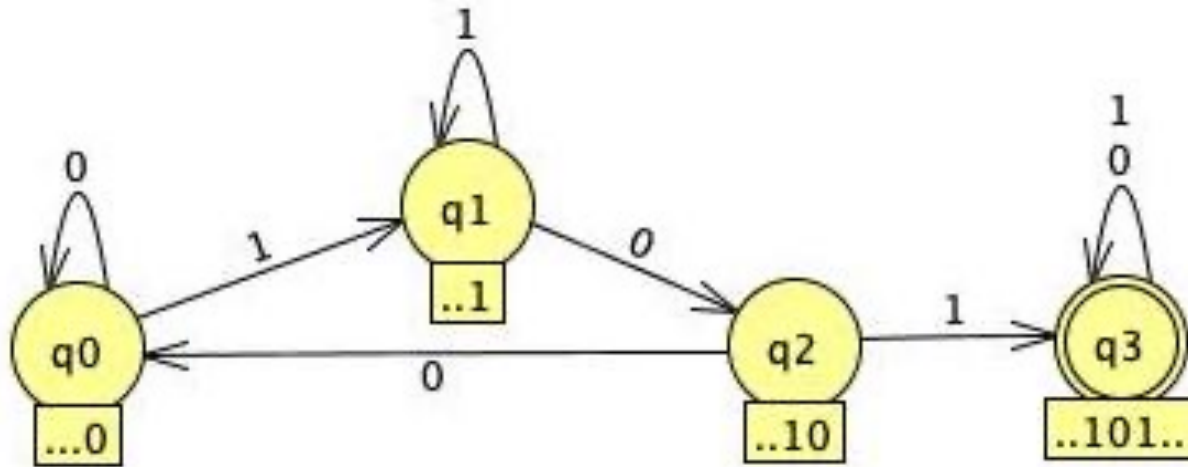
- JFLAP is a simulation tool
 - Specify your automaton
 - Test behavior of automaton on test input
 - Visualization of automaton

- Why use JFLAP
 - To test/debug your design
 - This means you need to come up with interesting test cases (including edge cases)

JFLAP Example

- Provide a DFA for $L = \{ w \mid w \text{ is a string in } \{0,1\}^* \text{ and } w \text{ contains (a) the substring } 101 \text{ or (b) substring } 010 \}$
- We did the first part of this in lecture
 - Let's start with the DFA for property (a) only
 - Then property (b) only
 - Then, we will try to merge them
 - First, we do it incorrectly – and identify test cases that reveal the error
 - Finally, the correct solution

JFLAP Example: DFA that recognizes Substring 101



Note: you can label the states with what they summarize!

q0: not read first 1 in substring 101

q1: last input read was a 1, could be start of substring 101

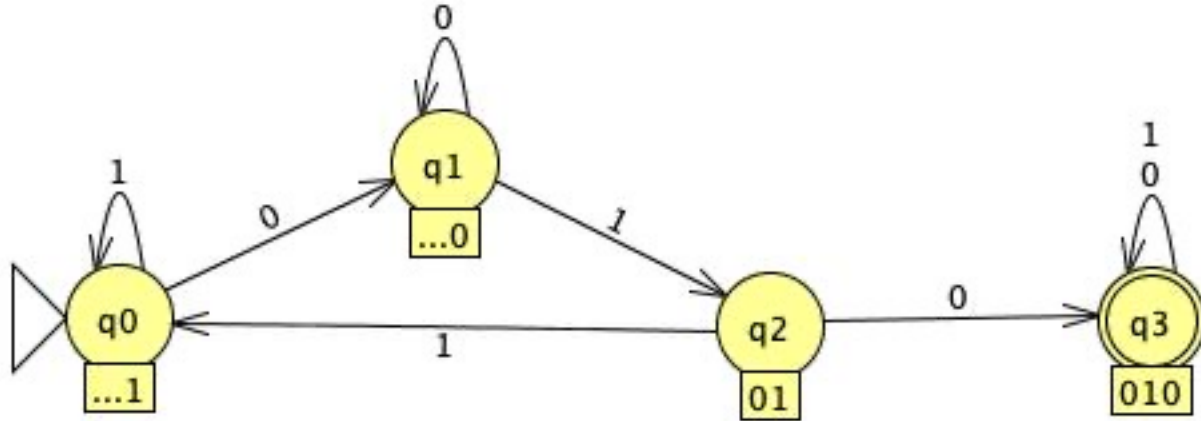
q2: last two inputs read were 10 which is part of substring 101

q3: last three inputs read were 101 which means substring 101 is in input

Test:

1. Run test case 0100: step through states
2. Run test case 011011

JFLAP Example: DFA that recognizes 010



Q: What do the states summarize?

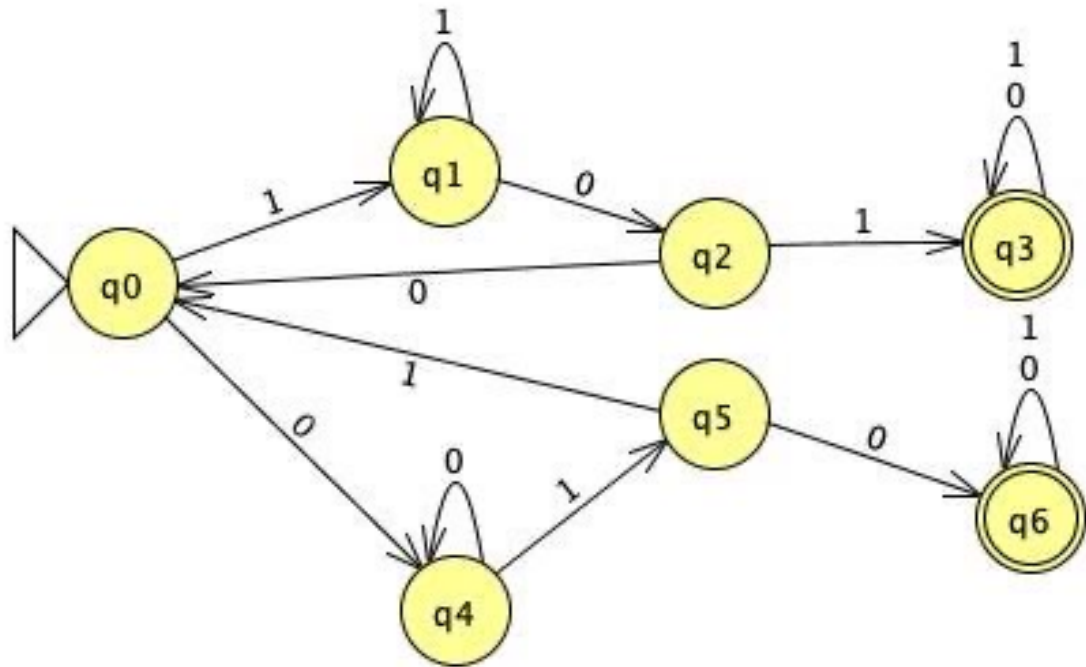
Test:

1. Run test case 0100: step through states
2. Run test case 011011

JFLAP Example – combining the two

- Provide a DFA for $L = \{ w \mid w \text{ is a string in } \{0,1\}^* \text{ and } w \text{ contains (a) the substring } 101 \text{ or (b) substring } 010 \}$
- A first attempt – just combine the DFA
- Run tests:

1. Input = 1011
2. Input = 011011
3. Input = 10010

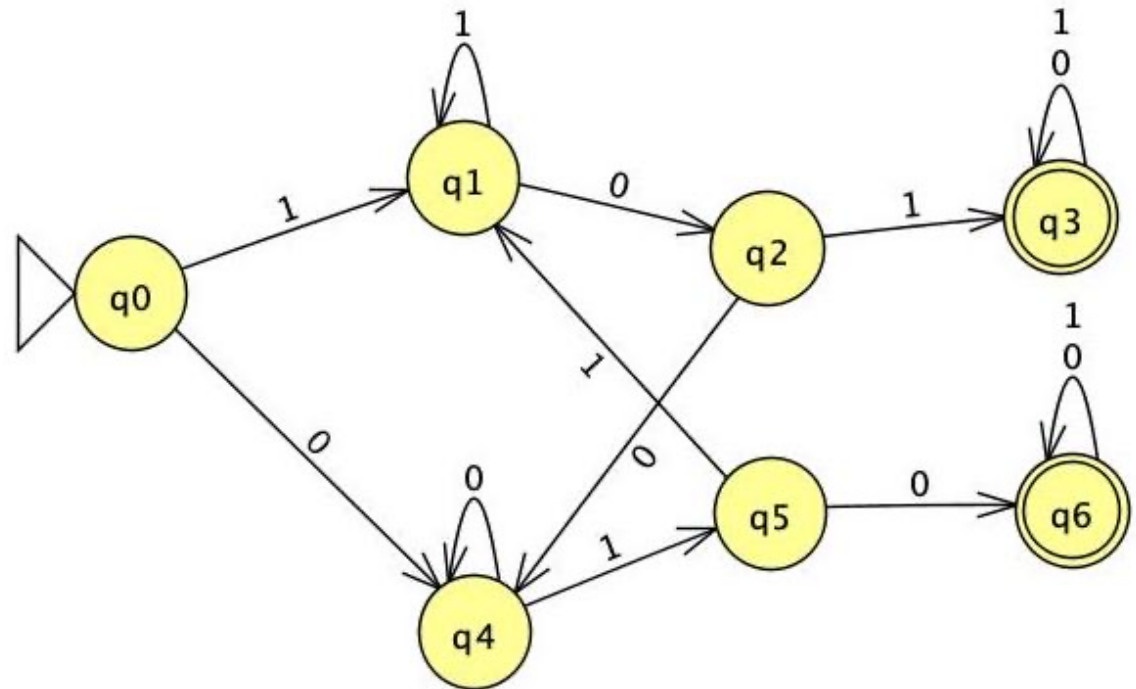


Does this accept L?

JFLAP Example

- $L = \{ w \mid w \text{ is a string in } \{0,1\}^* \text{ and } w \text{ contains (a) the substring } 101 \text{ or (b) substring } 010 \}$
- The correct answer...
- Run tests:

1. Input = 1011
2. Input = 011011
3. Input = 10010
4. Input = 111000



What do the states summarize?

Questions ?

JFLAP Exercise: Work in breakout groups and submit one submission (JFLAP files) with all names at the table

- Ques 1: Provide a DFA for $L = \{ w \mid w \text{ is a string in } \{0,1\}^* \text{ and } w \text{ contains (a) the substring } 101 \text{ or (b) substring } 100 \}$
- Ques 2a: Provide a DFA in JFLAP for $L = \{ w \mid w \text{ is a string in } \{0,1\}^* \text{ and } w \text{ contains the substring } 101 \text{ with at most 1-bit of mis-match. } \}$
 - Hint: If we allow one bit of mis-match then what are the substrings you need to match ?
- Ques 2b (bonus): Provide an NFA for the same L as in 2a