CS 3313:
Foundations of Computing

Lab 1: JFLAP

http://gw-cs3313.github.io

CS 3313 Lab 2

- Using JFLAP
- Exercises/Examples

Recall Definitions

- DFA $M = (Q, \Sigma, \delta, q_0, F)$
  - Q – states
  - Σ - alphabet
  - δ – transition function
  - q_0 – start state
  - F – accept states
- 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

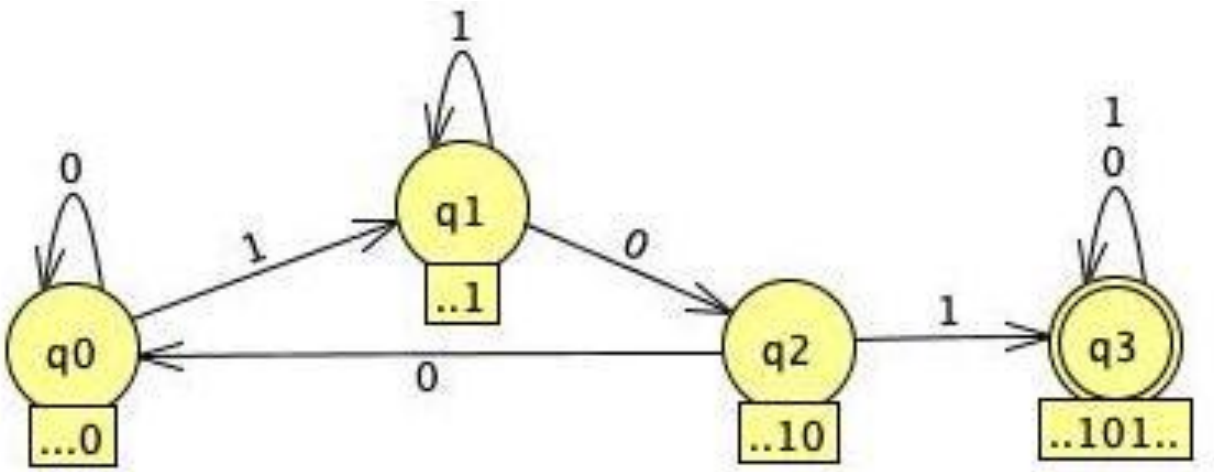
- Why use JFLAP
  - To test/debug your design
  - This means you need to come up with interesting test cases (including edge cases)

JFLAP Example

- Provide a DFA for L = { w | w is a string in $\{0,1\}^*$ and w contains (a) the substring 101 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

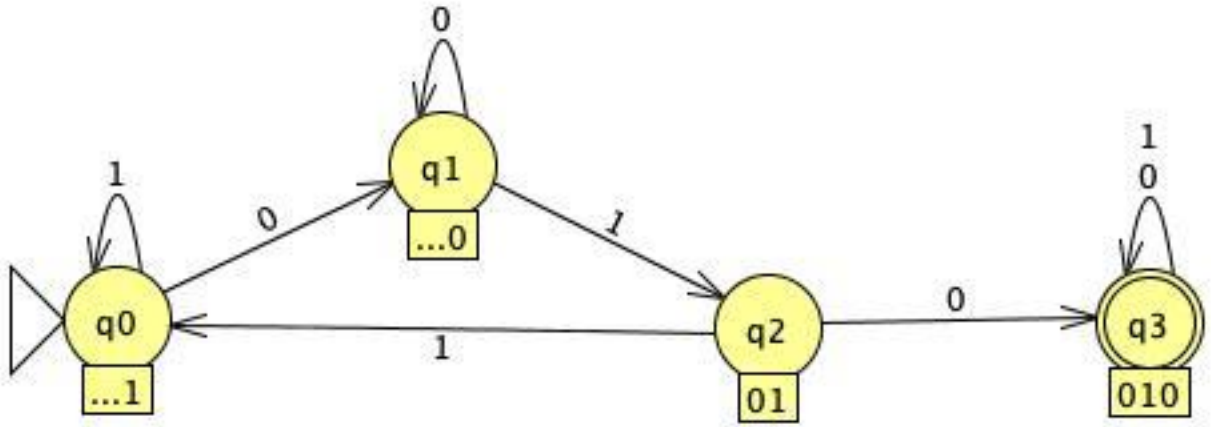


Note: you can label the states with what they summarize!
q0: not read first 1 in substring 101
q1: last input read was a 1, could be start of substring 101
q2: last two inputs read were 10 which is part of substring 101
q3: last three inputs read were 101 which means substring 101 is in input

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?

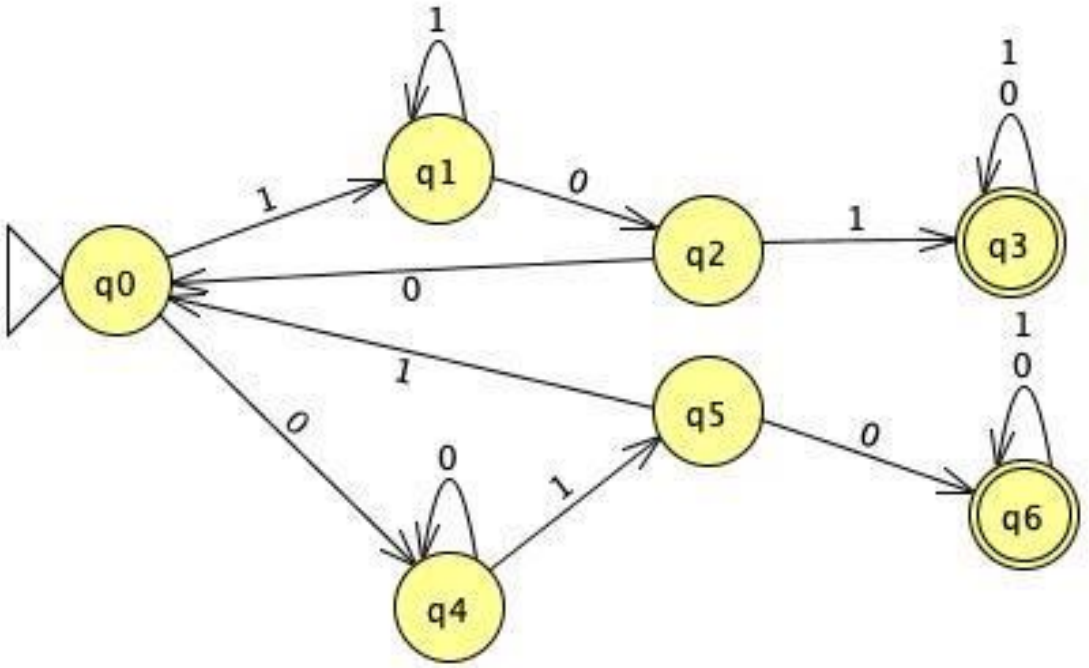
Test:

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

JFLAP Example – combining the two

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

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

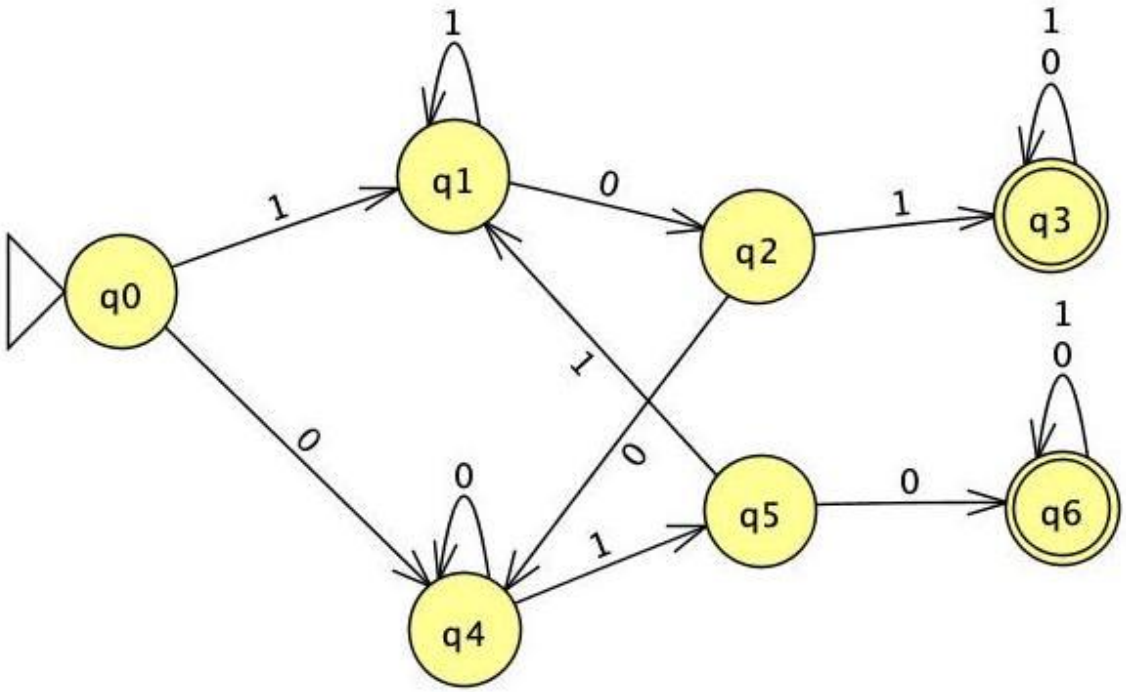


Does this accept L?

JFLAP Example

- L = { w | w is a string in $\{0,1\}^*$ and w contains (a) the substring 101 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 saved as an image) with all names at the table

- Ques 1: Provide a DFA for L = { w | w is a string in $\{0,1\}^*$ and w contains (a) the substring 101 or (b) substring 100 }
- Ques 2a: Provide a DFA in JFLAP for L = { w | w is a string in $\{0,1\}^*$ and w contains the substring 101 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

You can submit solutions after lab (until midnight), but make sure you know the names of all of your teammates.