CSC 236 Tutorial 10

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July 26, 2023

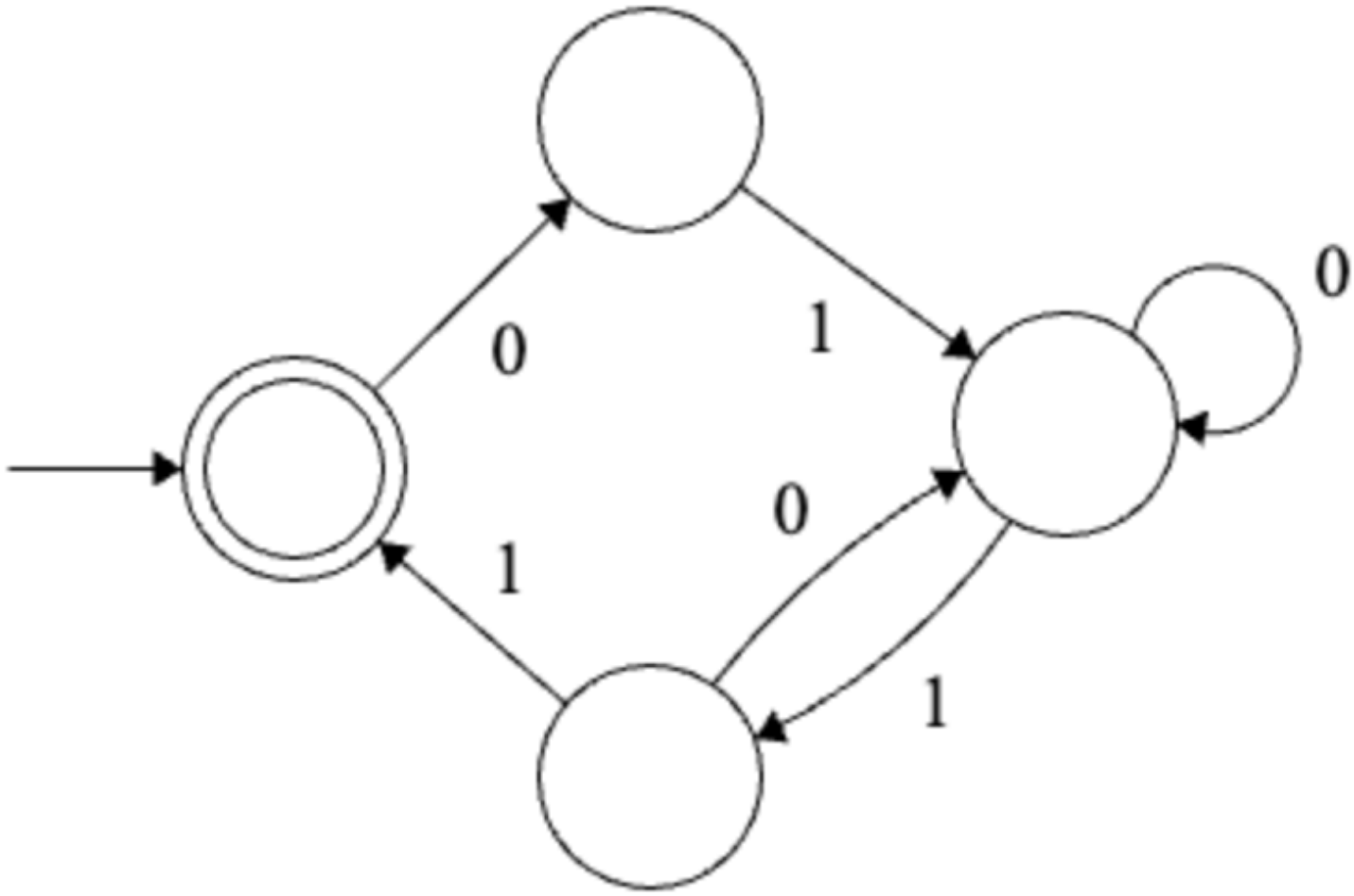
DFA to Language

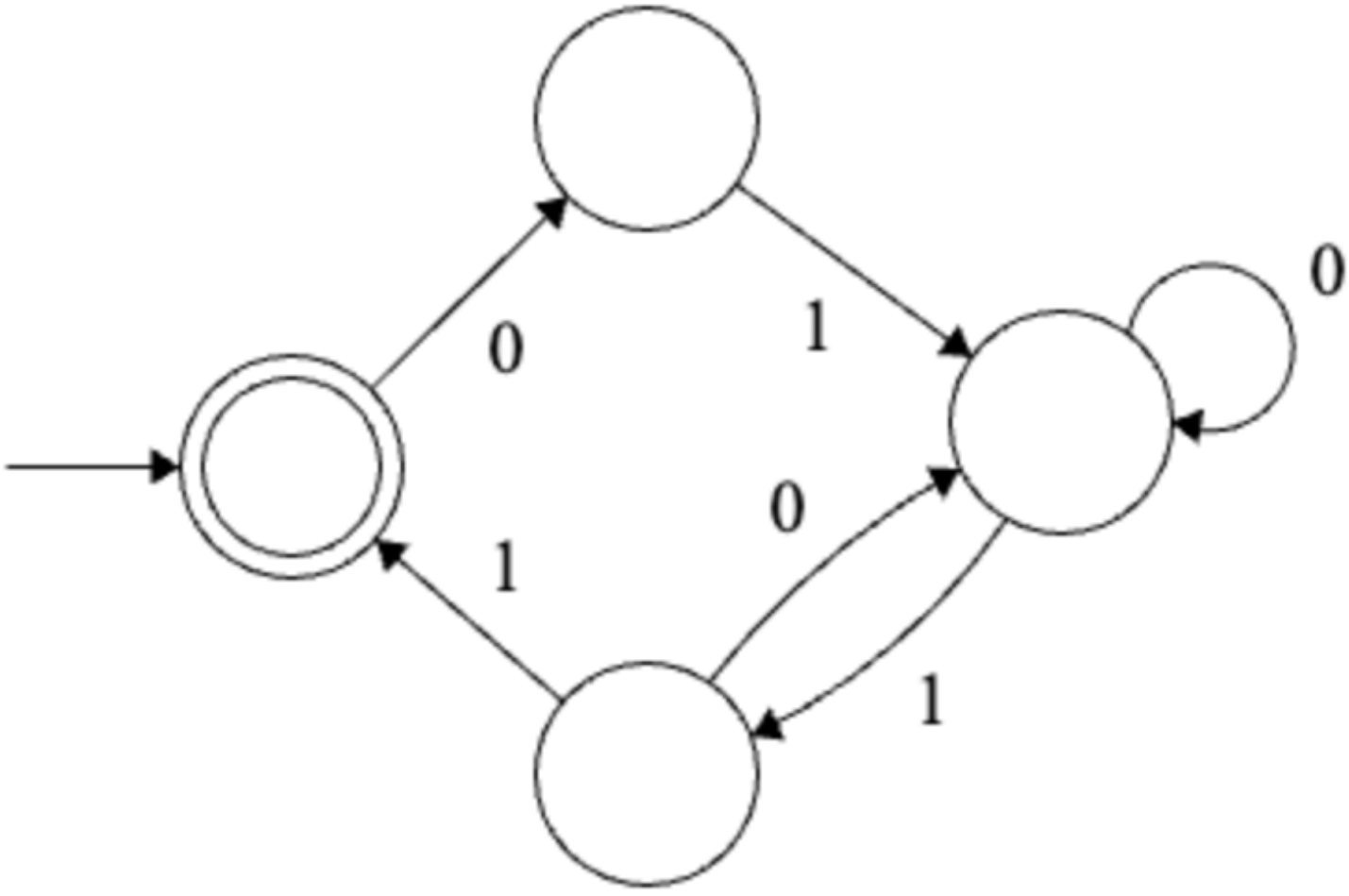
Language to DFA/NFA

Parallel

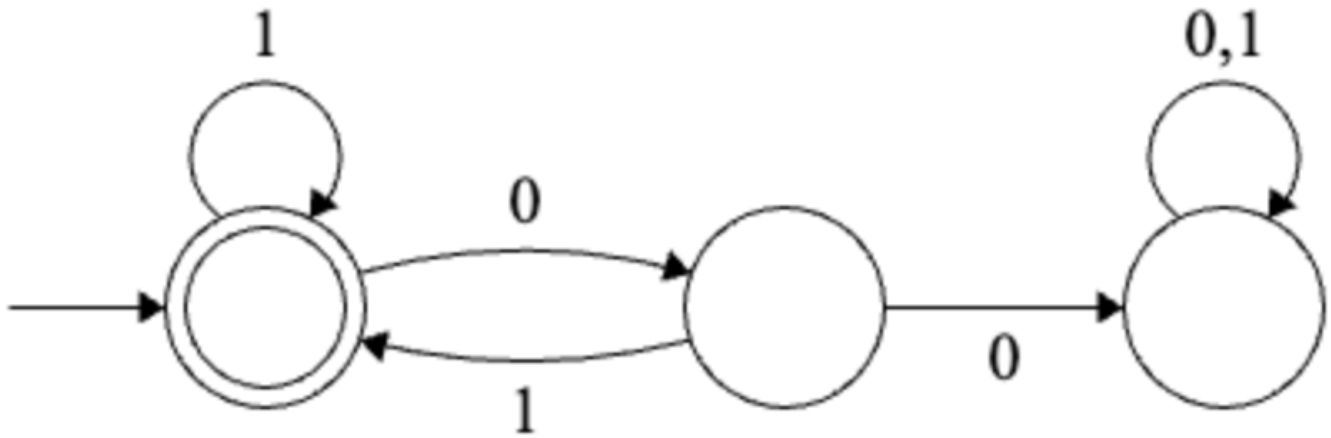
DFAs

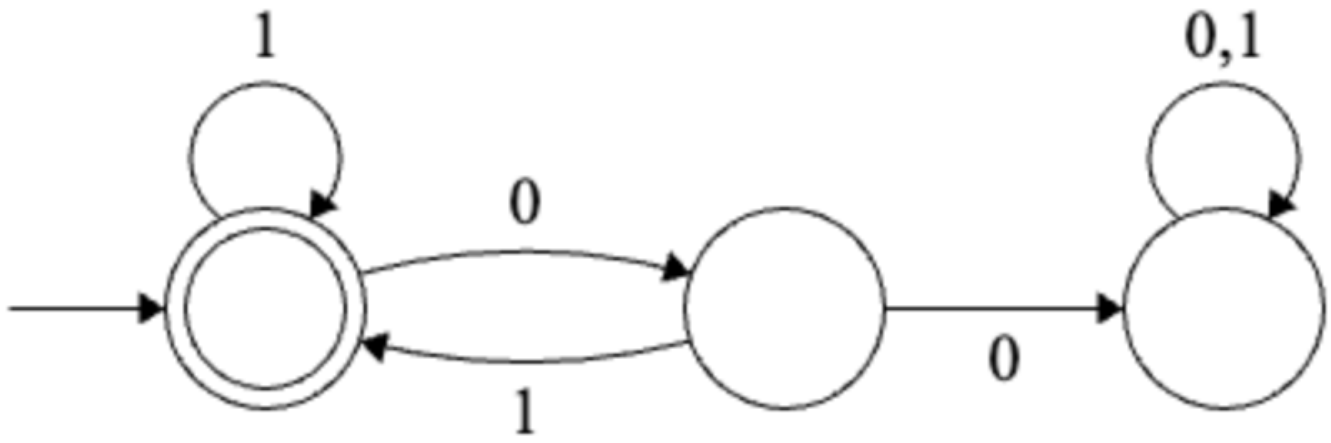
Exercise. Determine whether or not the following are valid DFA definitions. If the DFA is valid, what is the language of the DFA?


0
1
0
1
0
1
0

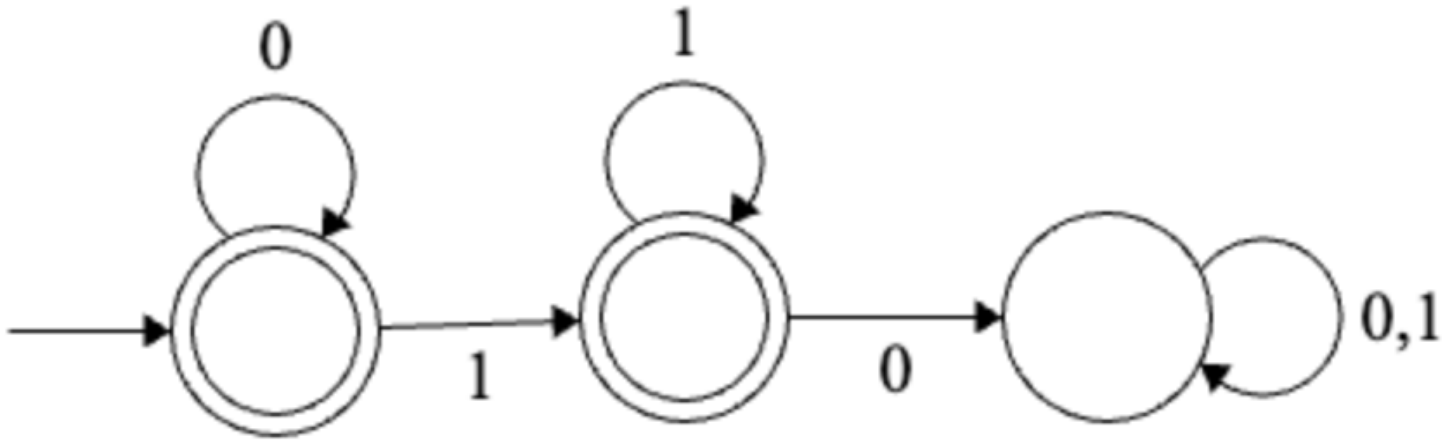


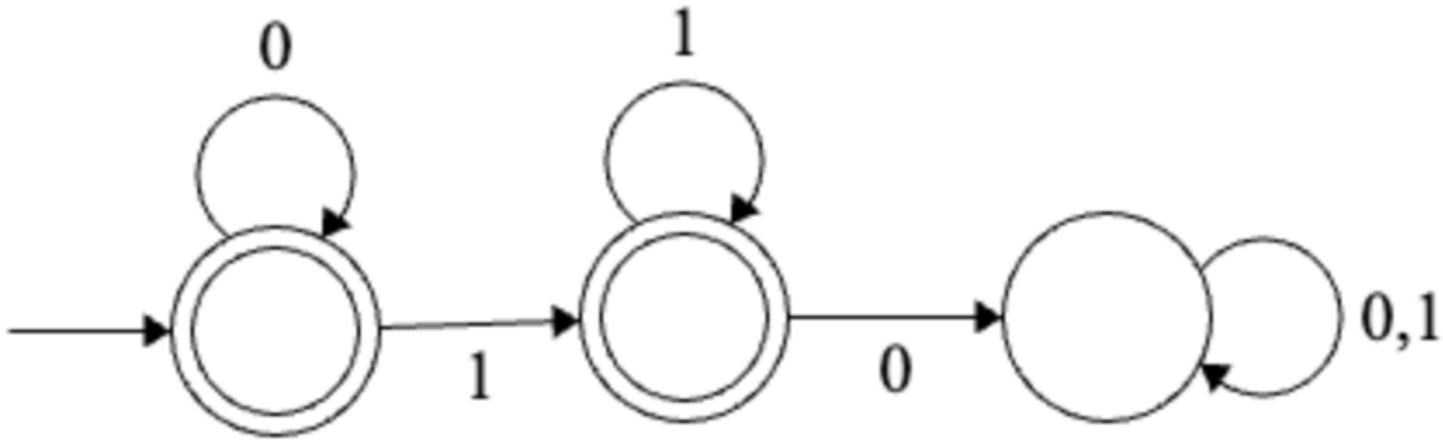
Not valid - the top state has no outgoing 0 transition.


1
0,1
0
1
0



Every 0 is followed by a 1.


0
1
1
0
0,1



Doesn't contain 10

DFA to Language

Language to DFA/NFA

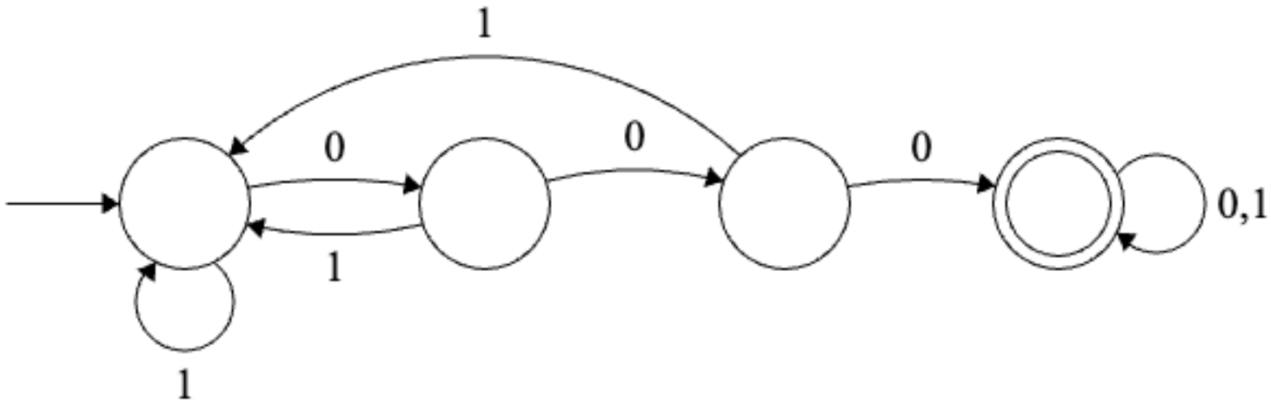
Parallel

Language to DFA/NFA

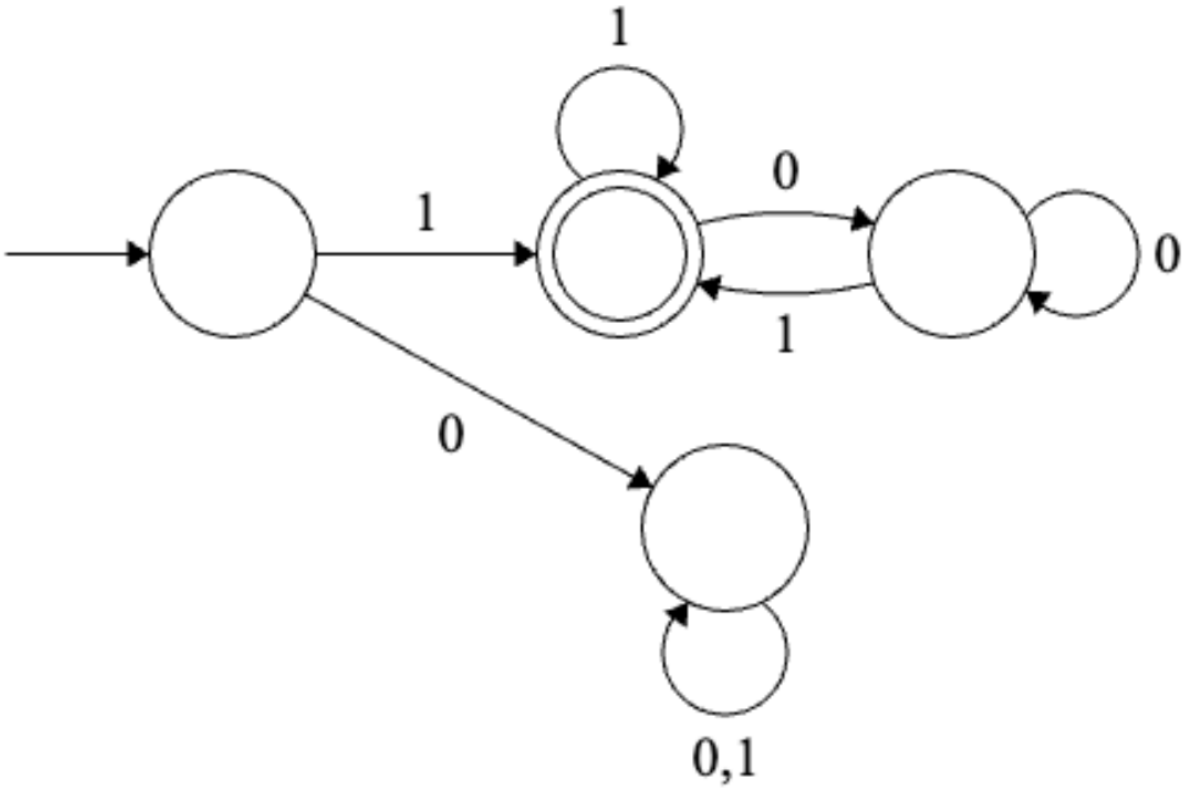
Exercise. Draw a DFA or NFA for each of the following languages.

- $L_1 = \{w : w \text{ contains } 000 \text{ as a substring}\}$
- $L_2 = \{w : w \text{ starts and ends with } 1\}$
- $L_3 = \left\{ w : \begin{array}{l} w \text{ is the binary representation of a number} \\ \text{of the form } 2^n + 1 \text{ for some } n \in \mathbb{N} \end{array} \right\}$
- $L_4 = \left\{ w : \begin{array}{l} \text{the number of 1s in } w \bmod 3 \\ \text{is less than the number of 0s in } w \bmod 3 \end{array} \right\}$

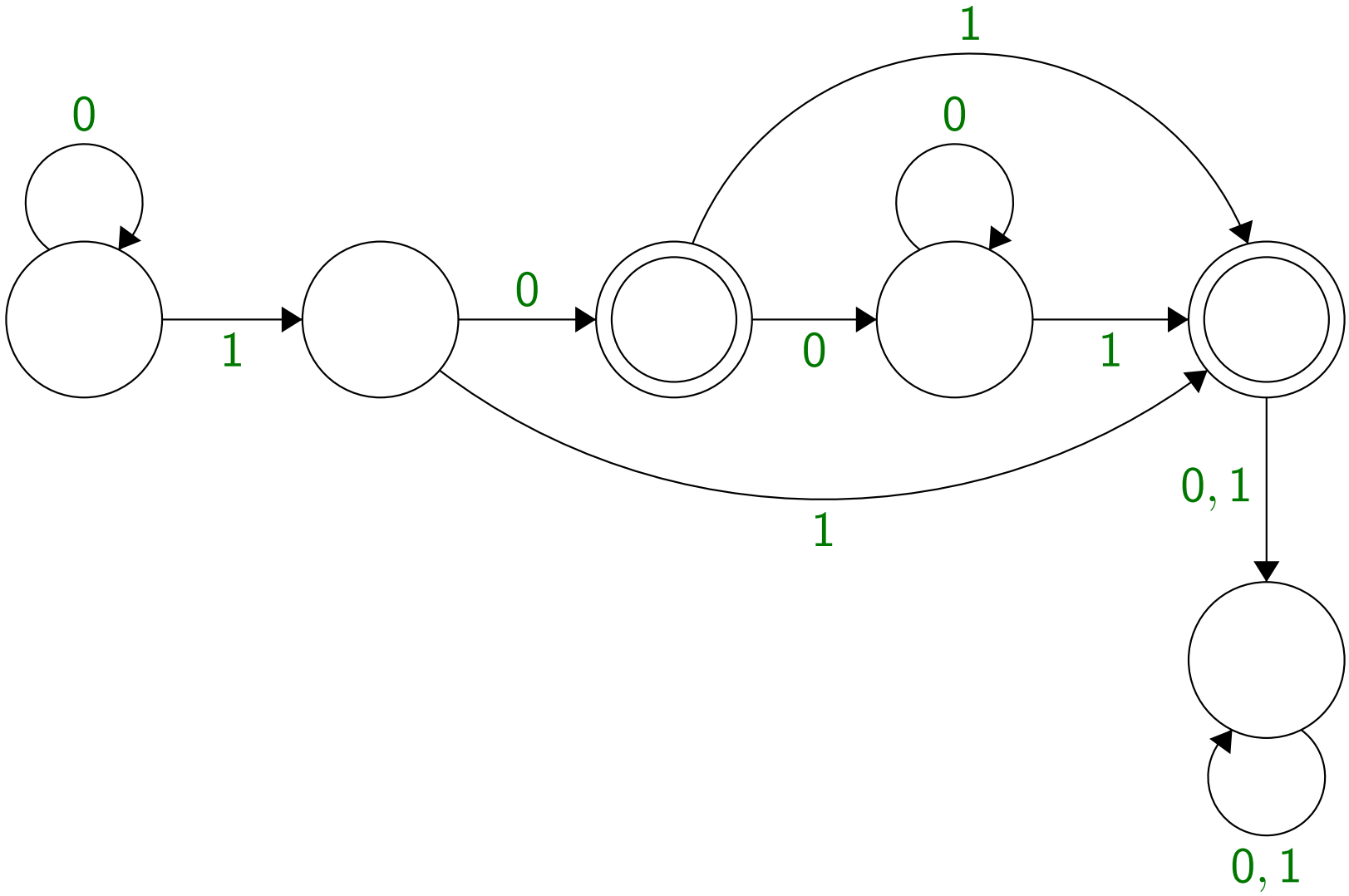
Solutions



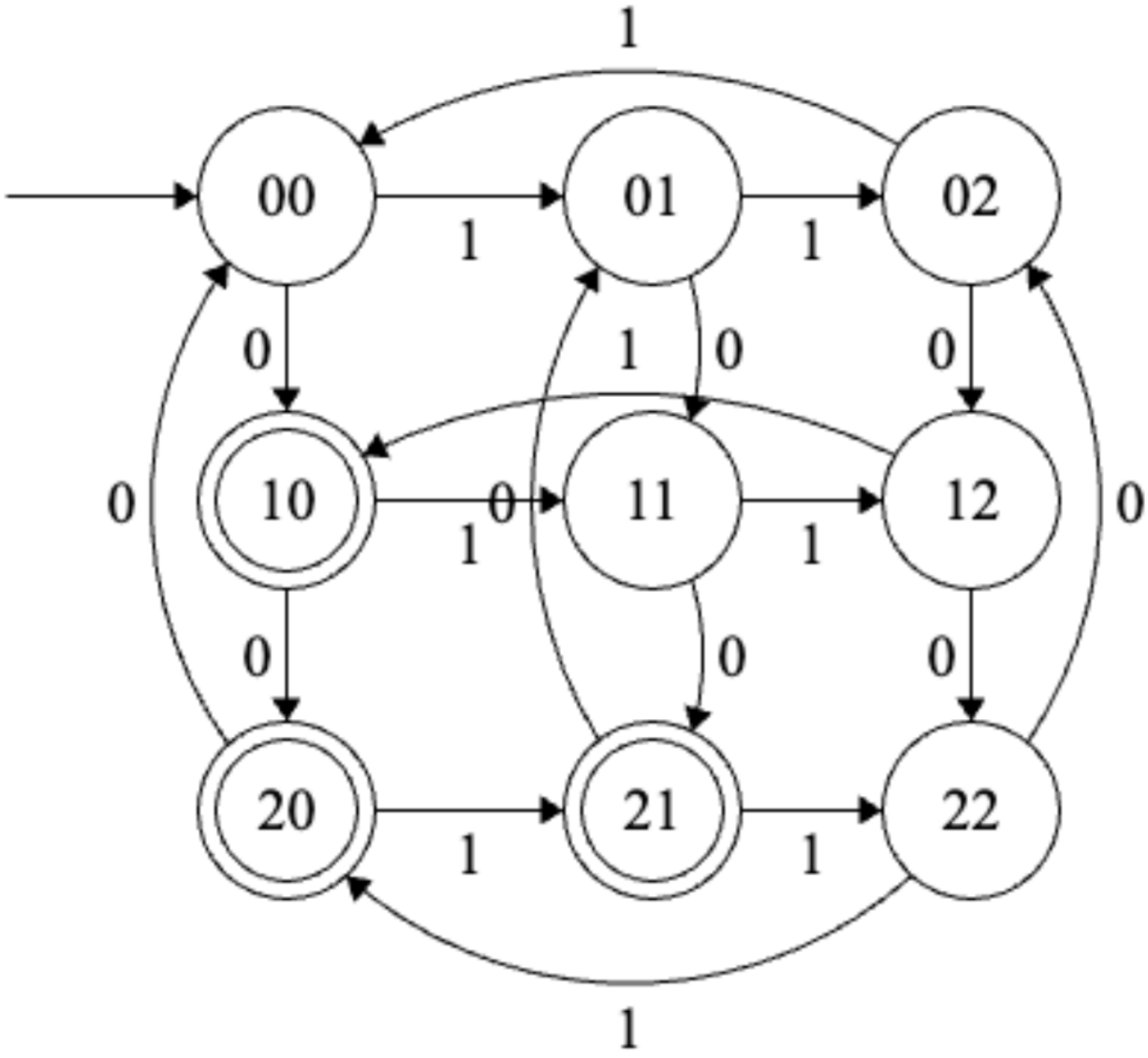
Solutions



Solutions



Solutions



DFA to Language

Language to DFA/NFA

Parallel

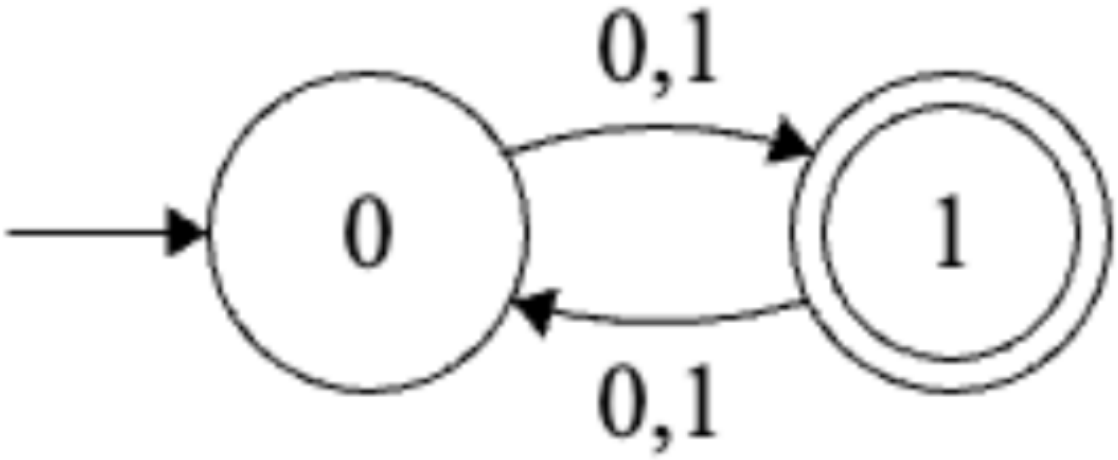
Parallel Construction

Let

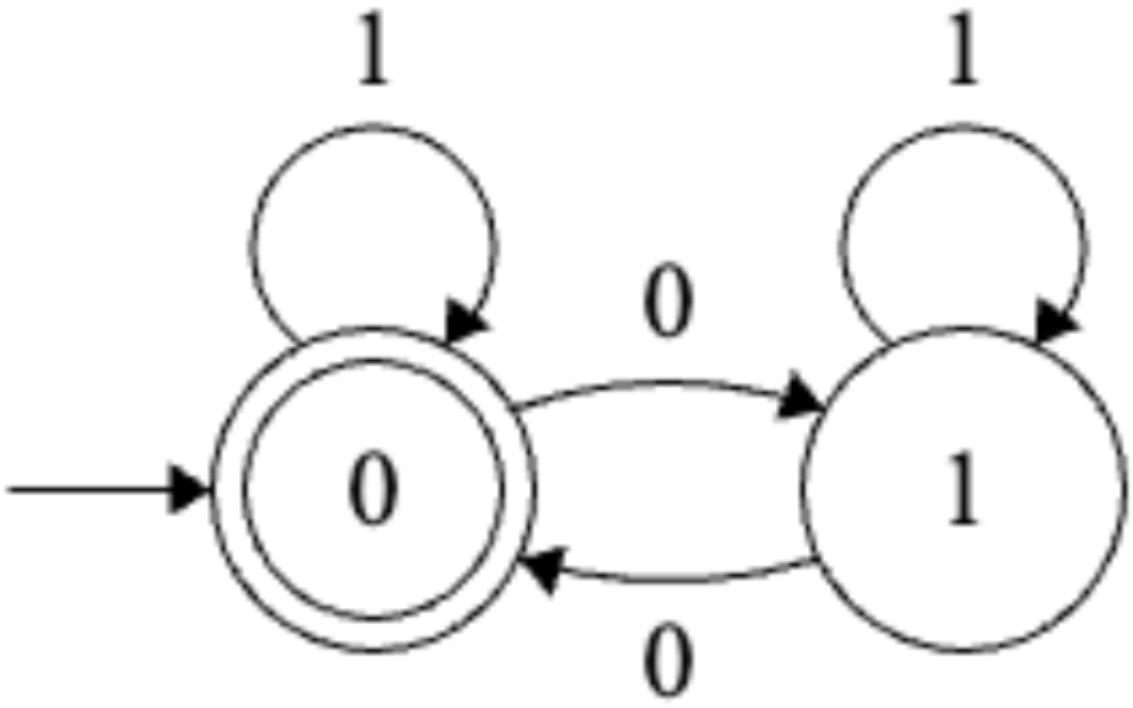
- $L_1 = \{w : w \text{ has odd length}\}$
- $L_2 = \{w : w \text{ has an even number of } 0s\}$

Exercise. Define DFAs for L_1 and L_2. Give a label to each state.
Exercise. Use the previous two DFAs and the 'running in parallel' construction to construct a DFA for $L_1 \cup L_2$.

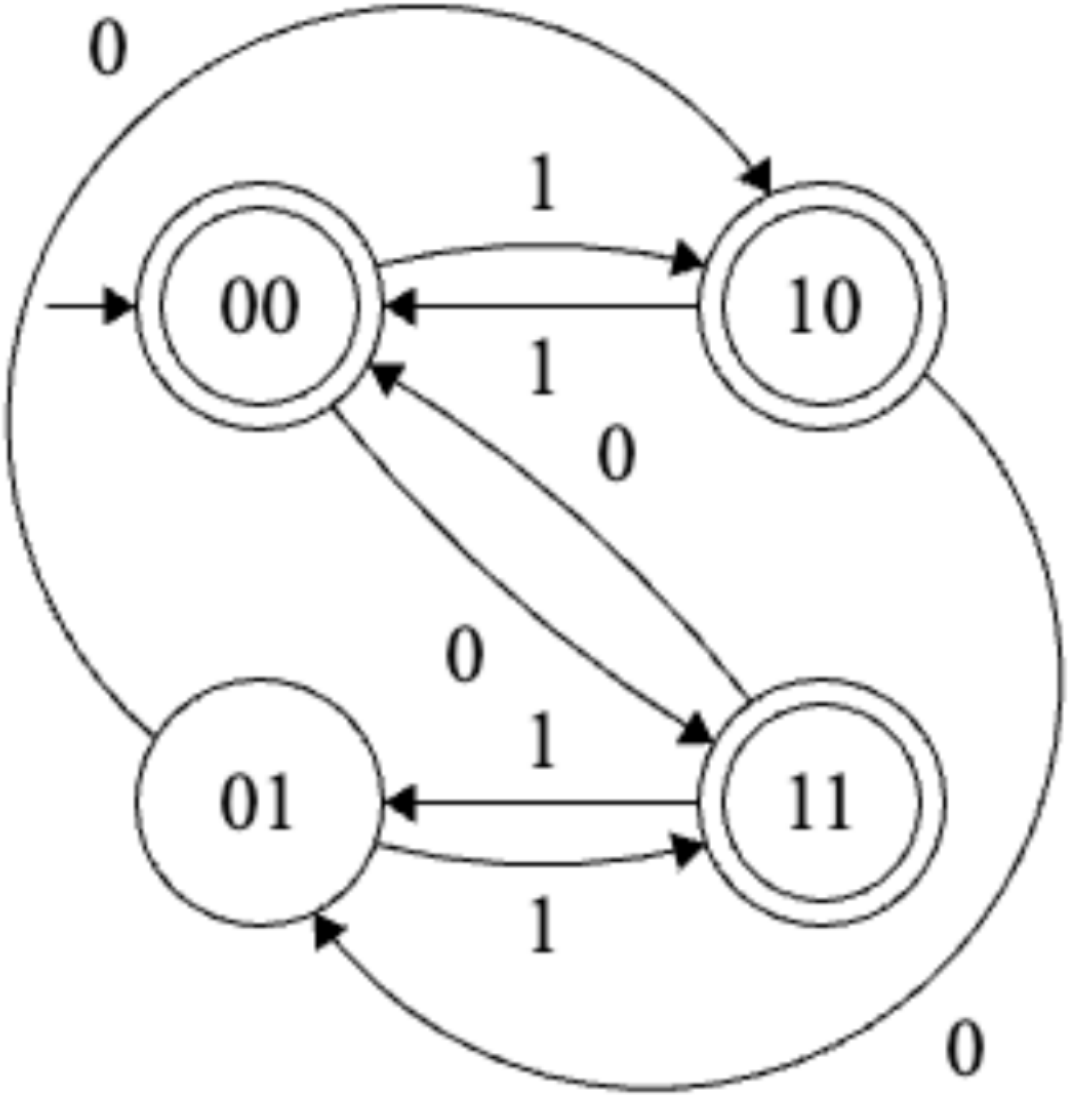
Solutions



Solutions



Solutions



If there's extra time

- For extra practice: find regular expressions for all the languages in this tutorial
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