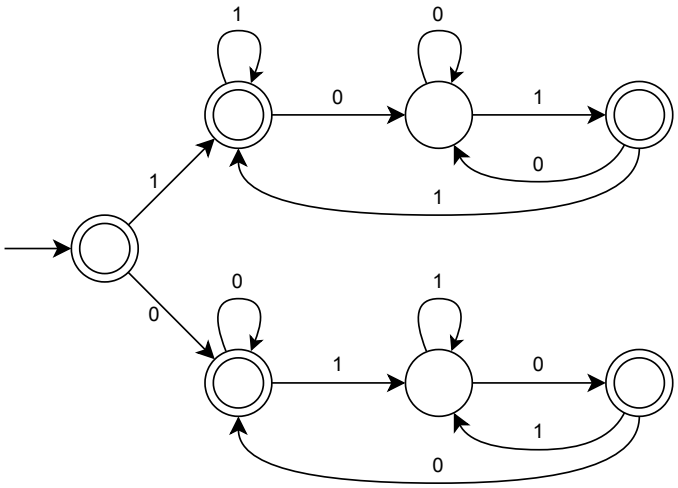

Problem 1.48. Let $\Sigma = \{0, 1\}$ and let

$$D = \{w \mid w \textit{ contains an equal number of occurrences of the substrings } 01 \textit{ and } 10\}.$$

Thus $101 \in D$ because 101 contains a single 01 and a single 10, but $1010 \notin D$ because 1010 contains two $10s$ and one 01. Show that D is a regular language.

Proof. The proof is by construction.



The state diagram of a DFA that recognizes D.

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