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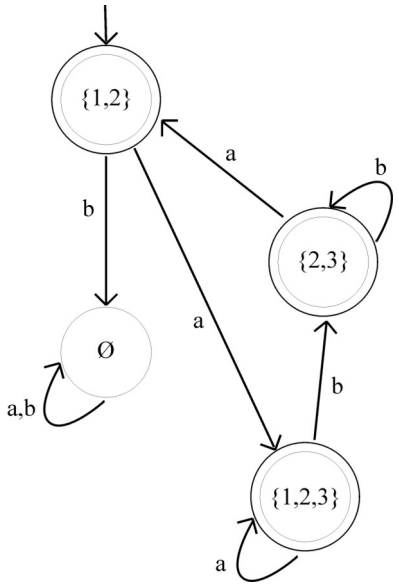
CS154 Assignment 2, Problem 1 Solution




The formal definition of this DFA would be the 5-tuple $(Q, \Sigma, \delta, q_0, F)$ such that:

$Q = \{ø, \{1,2\}, \{2,3\}, \{1,2,3\}\}$
$\Sigma = \{a,b\}$
$\delta$:

| δ | ø | {1,2} | {2,3} | {1,2,3} |
|---|---|---|---|---|
| a | ø | {1,2,3} | {1,2} | {1,2,3} |
| b | ø | ø | {2,3} | {2,3} |

$q_0 = \{1,2\}$
$F = \{\{1,2\}, \{2,3\}, \{1,2,3\}\}$

Note that the algorithm to convert an NFA with set of states Q' to a DFA requires initially that the DFA have set of states $Q = P(Q')$, where $P(Q')$ is the power set of Q'. Q should therefore include states {1}, {2}, {3}, and {1,3}; however, these states prove to be redundant (there exists no state $q_i$ such that $\delta(q_i, s) = \{1\}$ or {1,3} for all $s \in \Sigma$; therefore, these states can never be reached by any input string; with these removed, {3} becomes redundant, followed by {2}), and thus are omitted.