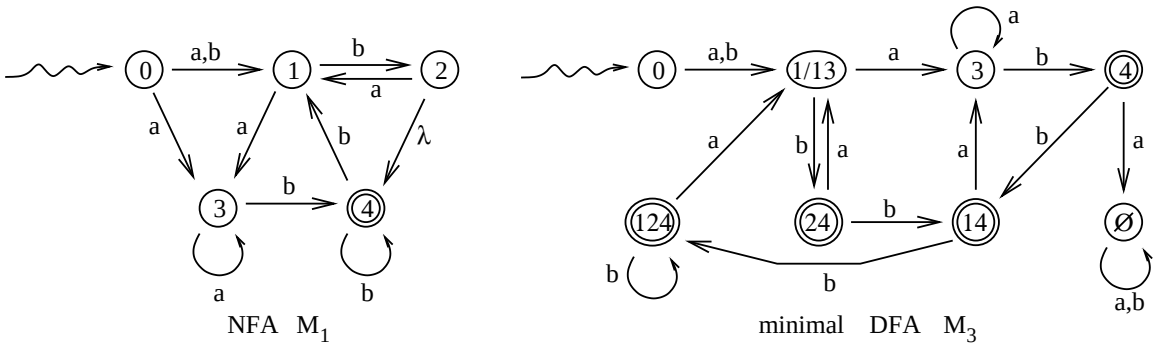
Minimal DFA Equivalent to an NFA

We walk through the construction of a minimal DFA equivalent to a given NFA. We start with the NFA illustrated on the left below, and construct the DFA shown on the right.



The DFA shown on the left of the figure is defined by $\Sigma = \{a, b\}$, $Q = \{0, 1, 2, 3, 4\}$ (I don't bother to write the q's.), the start state is 0, the only final state is 4, and the transition function δ is defined by the transition table. Recall that the image of the transition function is 2^Q, but I will simplify notation by eliminating commas and braces. Thus, the set $\{1, 3\}$ will be written as simply 13.

	a	b
0	13	1
1	3	24
2	1	4
3	3	4
$*4$	$\emptyset$	14

We next construct a transition table for the derived DFA M_2. The states of this M_2 are the members of 2^Q. Since $|Q| = 5$, $\left|2^Q\right| = 32$. However, only nine of those subsets are reachable states of M_2, hence we can ignore them. The emptyset is always a dead state of the M_2, although it is not always reachable.

	a	b
0	13	1
1	3	24
3	3	4
$*4$	$\emptyset$	14
13	3	24
$*14$	3	124
$*24$	1	14
$*124$	13	124
$\emptyset$	$\emptyset$	$\emptyset$

We now minimize M_2 to construct M_3, the minimal DFA equivalent to M_1. We'll skip the steps, but the only equivalence is that 1 and 13 are equivalent. We eliminate all useless states, and thus M_3 has 8 states. Its state diagram is shown on the right side of the figure.