[HMU]

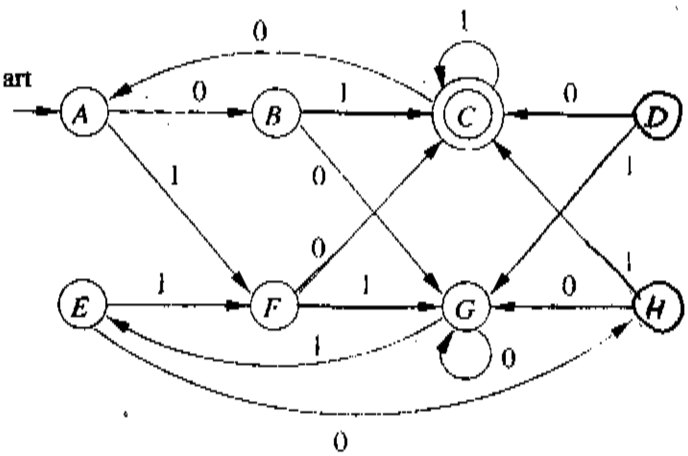

Figure 4.8: An automaton with equivalent states

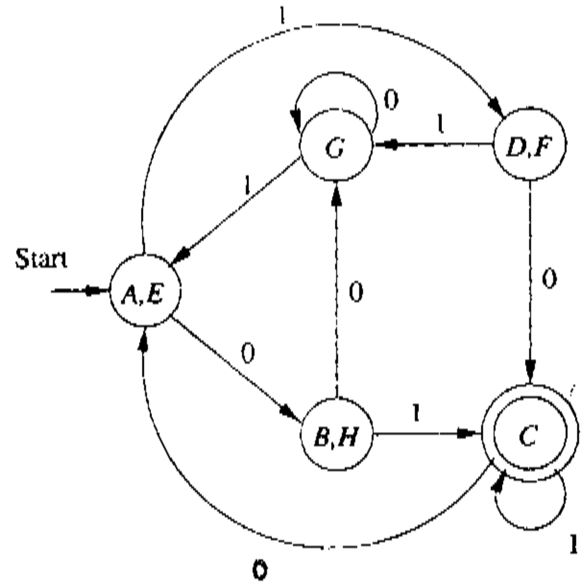

Figure 4.12: Minimum-state DFA equivalent to Fig. 4.8

Example 4.19: Let us execute the table-filling algorithm on the DFA of Fig 4.8. The final table is shown in Fig. 4.9, where an x indicates pairs of distinguishable states, and the blank squares indicate those pairs that have been found equivalent. Initially, there are no x's in the table.

	A	B	C	D	E	F	G
B	x						
C	x	x					
D	x	x	x				
E		x	x	x			
F	x	x	x		x		
G	x	x	x	x	x	x	
H	x		x	x	x	x	x

Figure 4.9: Table of state inequivalences

For the basis, since C is the only accepting state, we put x's in each pair that involves C. Now that we know some distinguishable pairs, we can discover others. For instance, since $\{C, H\}$ is distinguishable, and states E and F go to H and C, respectively, on input 0, we know that $\{E, F\}$ is also a distinguishable pair. In fact, all the x's in Fig. 4.9 with the exception of the pair $\{A, G\}$ can be discovered simply by looking at the transitions from the pair of states on either 0 or on 1, and observing that (for one of those inputs) one state goes to C and the other does not. We can show $\{A, G\}$ is distinguishable on the next round, since on input 1 they go to F and E, respectively, and we already established that the pair $\{E, F\}$ is distinguishable.

However, then we can discover no more distinguishable pairs. The three remaining pairs, which are therefore equivalent pairs, are $\{A, E\}$, $\{B, H\}$, and $\{D, F\}$. For example, consider why we can not infer that $\{A, E\}$ is a distinguishable pair. On input 0, A and E go to B and H, respectively, and $\{B, H\}$ has not yet been shown distinguishable. On input 1, A and E both go to F, so there is no hope of distinguishing them that way. The other two pairs, $\{B, H\}$ and $\{D, F\}$ will never be distinguished because they each have identical transitions on 0 and identical transitions on 1. Thus, the table-filling algorithm stops with the table as shown in Fig. 4.9, which is the correct determination of equivalent and distinguishable states.