

that the MAC procedure needs to do its job.

Although forward checking detects many inconsistencies, it does not detect all of them. The problem is that it makes the current variable arc-consistent, but doesn't look ahead and make all the other variables arc-consistent. For example, consider the third row of Figure 6.7. It shows that when *WA* is *red* and *Q* is *green*, both *NT* and *SA* are forced to be blue. Forward checking does not look far enough ahead to notice that this is an inconsistency: *NT* and *SA* are adjacent and so cannot have the same value.

The algorithm called MAC (for **Maintaining Arc Consistency (MAC)**) detects this inconsistency. After a variable X_i is assigned a value, the INFERENCE procedure calls AC-3, but instead of a queue of all arcs in the CSP, we start with only the arcs (X_j, X_i) for all X_j that are unassigned variables that are neighbors of X_i . From there, AC-3 does constraint propagation in the usual way, and if any variable has its domain reduced to the empty set, the call to AC-3 fails and we know to backtrack immediately. We can see that MAC is strictly more powerful than forward checking because forward checking does the same thing as MAC on the initial arcs in MAC's queue; but unlike MAC, forward checking does not recursively propagate constraints when changes are made to the domains of variables.