A note on the traceback involved in the maximum weighted independent set problem on a tree.

The book is not very explicit on how to do the traceback for the problem of finding a maximum weighted independent set in a tree. Here is a more explicit version.

When the algorithm does the computation for a node u, it determines $M_{in}(u)$ and $M_{out}(u)$. At that point it can record which of those values is larger. That means it can leave a "bread-crumb" $B(u)$ at node u, which either says "in" or "out". After the M values have been computed for all nodes, including for the root node r, we can do a traceback to find the actual maximum weighted independent set S. We start by looking at $B(r)$; if $B(r)$ is 'in', then node r should be placed into set S, and we continue with the traceback by looking at all of the *grandchildren* of r. Otherwise, if $B(r)$ is 'out', r is not put into S and we recurse by looking at all of the *children* of r. In general, when we look at a node u, we look at $B(u)$; If $B(u)$ is 'in', then node u will be put into S, and we continue with the traceback by looking at all of the *grandchildren* of u. Otherwise, if $B(u)$ is 'out', u is not put into S, and we recurse by looking at all of the *children* of u.

Clearly, the time for the traceback is proportional to the size of the tree.