Let T be a not–necessarily binary tree where each vertex v in T has the two fields $v.min$ and $v.dat$. Suppose that the $.dat$ field of every vertex in T already stores a number.

Problem: Present an efficient algorithm that for each vertex v in T stores in $v.min$ the minimum of the $.dat$ values in the subtree rooted by v (including the value $v.dat$).

> **global** the tree T: its vertex set with preloaded $.dat$ values, and its child lists;
>   each vertex v in T has the field $v.min$ and preloaded field $v.dat$;
> **function** $MinT(;; v)$;
>   **output**: $v.min$ will equal the minimum of all $.dat$ values in v's subtree;
> $v.min \leftarrow v.dat$;   { *a preorder initialization* }
>   **foreach** child w of v **do**
> $v.min \leftarrow \min\{v.min, MinT(w)\}$ { *use solution for subtree rooted by w to update $v.min$* }
>   **endfor**;
>   **return**$(v.min)$
> **end_$MinT$**;

The program is initiated with the call $y \leftarrow MinT(T)$.

These problems and solutions illustrate a fundamental property that is typical of many DFS–based solutions to real problems, and more. The problem description will usually be defined in terms of data or records that are in some sense the same for each record. (For each vertex v, store in $v.min$ the smallest value in **any of the many vertices** in the subtree $\cdots$.) But instead of implementing a "democratic" trip to poll each vertex in the tree, the problem was translated into a hierarchical characterization that used just the local–root vertex v and the subtree–solutions for each of child w of v.

> **global** the tree T: its vertex set with preloaded $.dat$ values, and its child lists;
> **procedure** $MinT(;; v)$;
>   **output**: $v.min$ will equal the minimum of all $.dat$ values in v's subtree;
> 1 $v.min \leftarrow v.dat$;   { *a preorder initialization* }
> 2   **foreach** child w of v **do**
> 3 $MinT(w)$;
> 4 $v.min \leftarrow \min\{v.min, w.min\}$ { *use solution for subtree rooted by w to update $v.min$* }
> 5   **endfor**;
> **end_$MinT$**;

This program is initiated with the call $MinT(T)$.