

Algorithm Design
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Solution of Exercise C-2.13

Examining the Euler tree traversal, we have the following method for finding $\text{tourNext}(v, \alpha)$

- If v is a leaf, then:
 - if $\alpha = \mathbf{left}$, then w is v and $\beta = \mathbf{below}$,
 - if $\alpha = \mathbf{below}$, then w is v and $\beta = \mathbf{right}$,
 - if $\alpha = \mathbf{right}$, then
 - * if v is a left child, then w is v 's parent and $\beta = \mathbf{below}$,
 - * if v is a right child, then w is v 's parent and $\beta = \mathbf{right}$.
- If v is internal, then:
 - if $\alpha = \mathbf{left}$, then $\beta = \mathbf{left}$ and w is v 's left child,
 - if $\alpha = \mathbf{below}$, then $\beta = \mathbf{left}$ and w is v 's right child,
 - if $\alpha = \mathbf{right}$, then
 - * if v is a left child, then $\beta = \mathbf{below}$ and w is v 's parent,
 - * if v is a right child, then $\beta = \mathbf{right}$ and w is v 's parent.

For every node v but the root, we can find whether v is a left or right child, by asking “ $v = T.\text{leftChild}(T.\text{parent}(v))$ ”. The complexity is always $O(1)$.