CSE 326: Data Structures
Deletion of the Minimum Key from an AVL Tree
October 19, 2009

```
function AVLTreeDeleteMin(locative $T$) returns (key, info, boolean)
comment: In the tree pointed to by $T$, deletes the minimum key and returns that record's Key
         and Info fields, and also returns true if and only if the deletion caused the height of
         the tree to decrease;
begin
    declare $K$: key;
    declare $I$: info;
    declare decreased: boolean;
    declare $B$: integer;
    if $T = \Lambda$ then error;
    if LC($T$) $= \Lambda$
        then begin
            $K \leftarrow$ Key($T$);
            $I \leftarrow$ Info($T$);
            $T \Leftarrow$ RC($T$);
            return ($K$, $I$, true)
        end
        else begin
            ($K, I$, decreased) $\leftarrow$ AVLTreeDeleteMin(LC($T$));
            if not decreased
                then return ($K$, $I$, false);
                else case Balance($T$) of
                    $-1$: Balance($T$) $\leftarrow 0$;
                          return ($K$, $I$, true);
                     $0$: Balance($T$) $\leftarrow +1$;
                          return ($K$, $I$, false);
                    $+1$: case Balance(RC($T$)) of
                              $+1$: Rotate($T, -1$);
                                    Balance($T$) $\leftarrow 0$;
                                    Balance(LC($T$)) $\leftarrow 0$;
                                    return ($K$, $I$, true);
                               $0$: Rotate($T, -1$);
                                    Balance($T$) $\leftarrow -1$;
                                    Balance(LC($T$)) $\leftarrow +1$;
                                    return ($K$, $I$, false);
                              $-1$: $B \leftarrow$ Balance(LC(RC($T$)));
                                    Rotate(RC($T$), $+1$);
                                    Rotate($T, -1$);
                                    Balance($T$) $\leftarrow 0$;
                                    if $B = +1$
                                        then Balance(LC($T$)) $\leftarrow -1$
                                        else Balance(LC($T$)) $\leftarrow 0$;
                                    if $B = -1$
                                        then Balance(RC($T$)) $\leftarrow +1$
                                        else Balance(RC($T$)) $\leftarrow 0$;
                                    return ($K$, $I$, true);
                          end case
                end case
        end
end .
```