

ES 16

$$\sum_{\substack{x: \text{node} \\ \text{of } T}} \text{KEY}[x] \cdot d_T(x) = \sum_{\substack{x: \text{node} \\ \text{of } T}} \text{KEY}[x] (d_{T_L}(x) + 1) + \sum_{\substack{x: \text{node} \\ \text{of } T}} \text{KEY}[x] (d_{T_R}(x) + 1)$$

$$= \sum_{x: \text{node}} \text{KEY}[x] d_{T_L}(x) + \sum_{x: \text{node}} \text{KEY}[x] + \sum_{x: \text{node}} \text{KEY}[x] d_{T_R}(x) + \sum_{x: \text{node}} \text{KEY}[x]$$

ALGO 16 (2)

if $z = \text{NULL}$
return 0

else
return $\text{ALGO 16}(z \rightarrow \text{left}) + \text{ALGO 15}(z \rightarrow \text{left}) + \text{ALGO 16}(z \rightarrow \text{right}) + \text{ALGO 15}(z \rightarrow \text{right})$

ALGO 15(z)

if $z = \text{NULL}$
return 0

else
a = ALGO 15(z → left)
b = ALGO 15(z → right)
if $a + b = 0$ return $\text{KEY}[z]$
else return $a + b$

ES 18

APPLIED 12 QUICKSORT & LA RESOLUTIONS

max(i, j) (max(i, j) - 1) / 2
ALGO 15

3 [] 5 [] []