

The EXCEPT Notation

Don't try to make any sense of the EXCEPT and the !. They are just meaningless pieces of syntax. Just remember that

$$[fcn \text{ EXCEPT } ![a] = d]$$

is the value that a function fcn has after executing the assignment statement

$$fcn[a] := d$$

(assuming that a is in the domain of fcn). Since assignments to arrays are common in algorithms, we need some simple way of writing this function. Mathematics does not provide it, so I had to invent one. It looks weird, but you'll get used to it.

The notation has some useful generalizations. In particular

$$[fcn \text{ EXCEPT } ![a][b] = d]$$

is the value of fcn after executing the assignment

$$fcn[a][b] := d$$

and

$$[fcn \text{ EXCEPT } ![a] = d, ![b] = e]$$

is the value of fcn after executing the two assignment statements

$$fcn[a] := d; fcn[b] := e$$

You understand the notation if you understand that:

$$\begin{aligned} [fcn \text{ EXCEPT } ![a] = d, ![b] = e] &= \\ [[fcn \text{ EXCEPT } ![a] = d] \text{ EXCEPT } ![b] = e] & \\ [fcn \text{ EXCEPT } ![a][b] = d] &= \\ [fcn \text{ EXCEPT } ![a] = [fcn[a] \text{ EXCEPT } ![b] = d]] & \end{aligned}$$