
MODULE *trash*

EXTENDS *Sequences, TLC, Integers*

VARIABLES

capacity,
bins,
count,
items,
item,
pc

vars $\triangleq \langle capacity, bins, count, items, pc, item \rangle$

Init \triangleq

$\wedge pc = \text{"init"}$
 $\wedge capacity \in [trash : 1 \dots 10, recycle : 1 \dots 10]$
 $\wedge bins = [trash \mapsto \langle \rangle, recycle \mapsto \langle \rangle]$
 $\wedge count = [trash \mapsto 0, recycle \mapsto 0]$
 $\wedge item = [type : \{ \text{"recycle"}, \text{"trash"} \}, size : 1 \dots 6]$
 $\wedge items \in item \times item \times item \times item$

PutIn(*bin*, *it*) \triangleq

$\wedge bins' = [bins \text{ EXCEPT } ![bin] = Append(bins[bin], it)]$
 $\wedge count' = [count \text{ EXCEPT } ![bin] = count[bin] + 1]$
 $\wedge capacity' = [capacity \text{ EXCEPT } ![bin] = capacity[bin] - it.size]$

Process \triangleq

- If the item is labeled as "recycling" and it is under the remaining capacity for the recycling bin, the item goes into recycling.
- If the item is labeled as "trash" OR the item is labeled as "recycling" and there is not enough recycling capacity AND there is sufficient capacity in the trash bin, the item goes into trash.
- Otherwise, it's dropped on the floor and somebody else gets to sweep it up.

$\wedge \text{LET } it \triangleq Head(items) \text{ IN}$
 $\wedge items' = Tail(items)$
 $\wedge \text{IF } it.type = \text{"recycle"} \wedge it.size < capacity.recycle \text{ THEN}$
 $\quad \wedge PutIn(\text{"recycle"}, it)$
 $\quad \text{ELSE}$
 $\quad \wedge \text{IF } it.size < capacity.trash \text{ THEN}$
 $\quad \quad \wedge PutIn(\text{"trash"}, it)$
 $\quad \quad \text{ELSE}$
 $\quad \quad \wedge \text{UNCHANGED } \langle bins, count, capacity \rangle$

ProcessAll \triangleq

$\wedge pc = \text{"init"}$
 $\wedge \text{IF } items \neq \langle \rangle \text{ THEN}$
 $\quad \wedge Process$
 $\quad \wedge \text{UNCHANGED } \langle pc, item \rangle$

$$\begin{array}{l}
\text{ELSE} \\
\wedge pc' = \text{"done"} \\
\wedge \text{UNCHANGED } \langle capacity, bins, count, items, item \rangle \\
\text{Done} \triangleq \\
\wedge pc = \text{"done"} \\
\wedge \text{UNCHANGED } vars \\
\text{Next} \triangleq \text{ProcessAll} \vee \text{Done} \\
\hline
\text{NoOverflow} \triangleq capacity.trash \geq 0 \wedge capacity.recycle \geq 0 \\
\text{RecycleCountOk} \triangleq Len(bins.recycle) = count.recycle \\
\text{RecycleTrashOk} \triangleq Len(bins.trash) = count.trash
\end{array}$$