MODULE *SendSet*

This module and modules *SendSetUndo* and *SendSetUndoP* are the specifications in Section 4.3 of the paper "Auxiliary Variables in TLA+".

This module specifies a system in which a sender sends data values in an unspecified set *Data* to a receiver. A data value d is sent by setting the variable x to d, and it is received by setting x to a value *NotData* that is not an element of *Data*. The sender maintains a set y of data values that is has chosen to send. The sender's actions are *Choose* , which adds to y an arbitrary data value not already in y; and *Send* , which sends an arbitrarily chosen value in y and remove it from y. The definitions, leading up to the definition of the specification Spec, are straightforward.

We consider x to be externally visible and y to be an internal variable. The sender's *Send* action and the receiver's *Rcv* action, which change x, are therefore considered to be externally visible; the sender's *Choose* action, which changes only y, is considered to be an internal action. In other words, we consider $\exists\, y : \mathit{Spec}$ to be the "real" specification.

CONSTANT Data

$\mathit{NonData} \triangleq \text{CHOOSE } d : d \notin \mathit{Data}$

VARIABLES $x,\ y$

$\mathit{vars} \triangleq \langle x,\ y \rangle$

$$\mathit{TypeOK} \triangleq \begin{array}{l} \land\ x \in \mathit{Data} \cup \{\mathit{NonData}\} \\ \land\ y \in \text{SUBSET } \mathit{Data} \end{array}$$

$\mathit{Init} \triangleq (x = \mathit{NonData}) \land (y = \{\})$

$$\mathit{Choose} \triangleq \begin{array}{l} \land\ \exists\, d \in \mathit{Data} \setminus y : y' = y \cup \{d\} \\ \land\ x' = x \end{array}$$

$$\mathit{Send} \triangleq \begin{array}{l} \land\ x = \mathit{NonData} \\ \land\ x' \in y \\ \land\ y' = y \setminus \{x'\} \end{array}$$

$$\mathit{Rcv} \triangleq \begin{array}{l} \land\ x \in \mathit{Data} \\ \land\ x' = \mathit{NonData} \\ \land\ y' = y \end{array}$$

$\mathit{Next} \triangleq \mathit{Choose} \lor \mathit{Send} \lor \mathit{Rcv}$

$\mathit{Spec} \triangleq \mathit{Init} \land \Box[\mathit{Next}]_{\mathit{vars}}$

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