An Event-B Specification of

SetComprehensions

Set comprehension syntax is the most complex part of the Event-B grammar. This project tests all the ways of expressing set comprehension.

It also demonstrates that a machine variable can be overridden with a non-free variable in a set comprehension.

MACHINE Comprehensive 9a 1

VARIABLES 1.1

numbers
coords
bools
aboolean

INVARIANTS

inv1: $numbers \subseteq \mathbb{N}$
inv2: $coords \subseteq \mathbb{N} \times \mathbb{N}$
inv3: $bools \subseteq \mathbb{N} \times \mathrm{BOOL}$
inv4: $aboolean \in \mathrm{BOOL}$

EVENT INITIALISATION
THEN

init1: $numbers := \varnothing$
init2: $coords := \varnothing$
init3: $bools := \varnothing$
init4: $aboolean := \mathrm{FALSE}$

END

EVENT assignzPF 1.2
Create a calculated set using set comprehension. The non-free variables are explicit before the dot.

THEN

act1: $numbers := \{x \cdot x \in \mathbb{N} \land x < 10 \mid x\}$

END

EVENT assignFPSpecialForm 1.3
Create another calculated set, the non-free variables are implicit the expression before |.

THEN

act1: $numbers := \{x + 2 \mid x \in \mathbb{N} \land x < 10\}$

END

EVENT assignFPSpecialFormPair 1.4
Another set comprehension, the non-free variables are implicit in the expression.

THEN

act1: $coords := \{x \mapsto y \mid x \in \mathbb{N} \land y \in \mathbb{N} \land y < x \land x < 10\}$

END

EVENT assignFPSpecialCase 1.5
The single non-free variable case.

THEN

act1: $numbers := \{x \mid x \in \mathbb{N} \land x < 10\}$

END

EVENT assignFPSpecialCaseWithGlobal 1.6

The variable aboolean is used to assign the right hand side in the pairs.

THEN

act1: $bools := \{x \mapsto y \mid x \in \mathbb{N} \land aboolean = y\}$

END

EVENT assignFPSpecialCaseWithGloball 1.7

Oups, here aboolean becomes a non-free variable! Which is the reason why it can be typed to $\mathbb{N}$ in this formula.

THEN

act1: $numbers := \{x + aboolean \mid x \in \mathbb{N} \land aboolean = 1\}$

END