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.

1		HINE Comprehensive
	1.1	aboolean bools coords numbers
	1.2	assignzPF
	1.3	assignFPSpecialForm
	1.4	assignFPSpecialFormPair
	1.5	assignFPSpecialCase
	1.6	assignFPSpecialCaseWithGlobal
	1.7	assignFPSpecialCaseWithGloball

1

1.1

1.2

1.3

1.4

1.5

```
VARIABLES
```

numbers coords bools aboolean

INVARIANTS

```
\begin{array}{ll} \text{inv1:} & numbers \subseteq \mathbb{N} \\ \text{inv2:} & coords \subseteq \mathbb{N} \times \mathbb{N} \\ \text{inv3:} & bools \subseteq \mathbb{N} \times \text{BOOL} \\ \text{inv4:} & aboolean \in \text{BOOL} \end{array}
```

EVENT INITIALISATION

THEN

```
\begin{array}{ll} \text{init1:} & numbers := \varnothing \\ \text{init2:} & coords := \varnothing \\ \text{init3:} & bools := \varnothing \\ \text{init4:} & aboolean := \text{FALSE} \end{array}
```

END

EVENT assignzPF

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

THEN

```
\mbox{act1:} \quad numbers := \{x \cdot x \in \mathbb{N} \land x < 10 \mid x\} END
```

EVENT assignFPSpecialForm

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
```

${\tt EVENT} \ assign FP Special Form Pair$

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
```

${\tt EVENT} \ assign FP Special Case$

The single non-free variable case.

THEN

```
\mbox{act1:} \quad numbers := \{x \mid x \in \mathbb{N} \land x < \mbox{10}\} END
```

${\tt EVENT} \ assign FP Special Case With Global$

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

THEN

```
\mbox{act1:} \quad bools := \{x \mapsto y \mid x \in \mathbb{N} \land aboolean = y\} END
```

${\tt EVENT} \ assign FP Special Case With Globall$

1.7

1.6

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

THEN

```
\mbox{act1:} \quad numbers := \{x + aboolean \mid x \in \mathbb{N} \land aboolean = \mathbf{1}\} END
```

aboolean, 2 assignFPSpecialCase, 2 assignFPSpecialCaseWithGlobal, 3 assignFPSpecialCaseWithGloball, 3 assignFPSpecialForm, 2 assignFPSpecialFormPair, 2 assignzPF, 2

bools, 2

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INITIALISATION, 2

numbers, 2