A Sample Document
for the Usages of lstEventB Package

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For convenient, we define macro `\EventB` for Event-B.

We start first with some inline Event-B code by embedding them using a pair of |, for example |@grd1: SNSR = FALSE| gives @grd1: $SNSR = FALSE$. Any Event-B formulae including Unicode symbols will be typeset using the `bsymb` package accordingly.

ASCII	Symbols	Explanation
`!:`	$\in$	Set membership
`/:`	$\notin$	Set non-membership
`<:`	$\subseteq$	Subset
`/<:`	$\not\subseteq$	Not a subset
`<<:`	$\subset$	Proper subset
`/<<:`	$\not\subset$	Not a proper subset
`!finite`	finite	Finite
`!partition`	partition	Partition

Table 1: Set predicates

ASCII	Symbols	Explanation
`!BOOL`	BOOL	BOOL set
`!TRUE`	TRUE	TRUE
`!FALSE`	FALSE	FALSE
`!bool`	bool	bool predicate

Table 2: BOOL and bool

More complete piece of code (including the Unicode symbols) can be typeset using the `EventBcode` environment. Below is the typesetting of an Event-B machine.

ASCII	Symbols	Explanation
`!INT`	$\mathbb{Z}$	Set of integer numbers
`!NAT`	$\mathbb{N}$	Set of natural numbers
`!NAT1`	$\mathbb{N}_1$	Set of positive natural numbers
`!min`	min	Mininum
`!max`	max	Maximum
`-`	$-$	Difference
`*`	$*$	Product
`!/`	$\div$	Quotient
`!mod`	mod	Remainder
`..`	..	Interval

Table 3: Numbers

ASCII	Symbols	Explanation
`>`	$>$	Greater
`<`	$<$	Less
`>=`	$\geq$	Greater or equal
`<=`	$\leq$	Less or equal

Table 4: Number predicates

ASCII	Symbols	Explanation
`<->`	$\leftrightarrow$	Relations
`!dom`	dom	Domain
`!ran`	ran	Range
`<<->`	$\leftarrowtail$	Total relations
`<->>`	$\leftrightarrow\!\!\!\rightarrow$	Surjective relations
`<<->>`	$\leftrightarrow\!\!\!\twoheadrightarrow$	Total surjective relations
`!circ`	$\circ$	Backward composition
`!id`	id	Identity
`<|`	$\lhd$	Domain restriction
`<<|`	$\vartriangleleft\!\!\!-$	Domain subtraction
`|>`	$\rhd$	Range restriction
`|>>`	$\vartriangleright\!\!\!-$	Range subtraction
`~`	$\sim$	Inverse
`<+`	$\Leftarrow$	Overriding
`><`	$\otimes$	Direct product
`||`	$\parallel$	Parallel product
`!prj1`	prj_1	First projection
`!prj2`	prj_2	Second projection

Table 5: Relations

ASCII	Symbols	Explanation
`+->`	$\nrightarrow$	Partial functions
`-->`	$\rightarrow$	Total functions
`>+>`	$\rightarrowtail\mkern-14mu\nrightarrow$	Partial injections
`>->`	$\rightarrowtail$	Total injections
`+>>`	$\twoheadrightarrow\mkern-14mu\nrightarrow$	Partial surjections
`->>`	$\twoheadrightarrow$	Total surjections
`>->>`	$\rightarrowtail\mkern-14mu\twoheadrightarrow$	Bijections
`%`	λ	Lambda abstraction

Table 6: Functions

ASCII	Symbols	Explanation
`:=`	$:=$	Becomes equal to
`::`	$:\in$	Choice from a set
`:|`	$:\|$	Choice by predicate

Table 7: Functions

```
1   machine Sensor_m0_SNSR
2   variables
3     SNSR
4   invariants
5     theorem @thm0_1: SNSR ∈ BOOL
6   events
7
8     INITIALISATION
9     begin
10      @act1: SNSR := FALSE
11     end
12
13    SNSR_on
14    when
15      @grd1: SNSR = FALSE
16    then
17      @act1: SNSR := TRUE
18    end
19
20    SNSR_off
21    when
22      @grd1: SNSR = TRUE
23    then
24      @act1: SNSR := FALSE
25    end
26
27  end
```

One can change the different colour options. For example, `\EventBSetKeywordColour{blue!50!black}` will change the keyword colour to dark blue. (This has effects only when

```
1   machine Sensor_m0_SNSR
2   variables
```

```
 3   SNSR
 4   invariants
 5    theorem @thm0_1: SNSR ∈ BOOL
```

One can includes external file containing Event-B code using the `\EventBinputlisting` command. For example the following is the result of including the code in the file `Sensor_m1_DEP.bumx` using `\EventBinputlisting{Sensor_m1_DEP.bumx}`.

```
 1   machine Sensor_m1_DEP
 2   refines Sensor_m0_SNSR
 3   variables
 4    SNSR
 5    DEP
 6   invariants
 7    @inv0_1: DEP ∈ ℕ
 8   events
 9
10    INITIALISATION extended
11    begin
12     @act2: DEP := 0
13    end
14
15    SNSR_on extends SNSR_on
16    end
17
18    SNSR_off extends SNSR_off
19    begin
20     @act2: DEP := DEP + 1
21    end
22
23   end
```

More specifically, one can specify more details on the inclusion, e.g., the ranges, as the following example
`\EventBinputlisting[firstline=16,lastline=20]{Sensor_m2_snsr.bumx}`
gives

```
 1    @inv1_1: Snsr_01 = TRUE ⇒ SNSR = TRUE
 2
 3    @inv1_2: Snsr_10 = TRUE ⇒ SNSR = FALSE
 4
 5    @inv1_3: Snsr_01 = FALSE ∨ Snsr_10 = FALSE
```

```
 1   machine Sensor_m3_Ctrl
 2
 3   refines
 4
 5    Sensor_m2_Snsr
 6
 7   variables
```

```
 8
 9    SNSR
10
11    DEP
12
13    Snsr_01
14
15    Snsr_10
16
17    ctrl_snsr
18
19    ctrl_dep
20
21    ctrl_snsr_01
22
23    ctrl_snsr_10
24
```

invariants

```
26
27    @inv2_1:
28    Snsr_01 = FALSE ∧ Snsr_10 = FALSE ∧ ctrl_snsr_01 = FALSE ∧ ctrl_snsr_10 = FALSE ⇒
             ctrl_snsr = SNSR
29
30    @inv2_2: ctrl_dep ∈ ℕ
31
32    @inv2_3: Snsr_10 = FALSE ∧ ctrl_snsr_10 = FALSE ⇒ ctrl_dep = DEP
33
34    @inv2_4: Snsr_10 = TRUE ∨ ctrl_snsr_10 = TRUE ⇒ ctrl_dep = DEP − 1
35
36    @inv2_5: ctrl_snsr_01 = TRUE ⇒ SNSR = TRUE
37
38    @inv2_6: ctrl_snsr_10 = TRUE ⇒ SNSR = FALSE
39
40    @inv2_7: ctrl_snsr_01 = TRUE ⇒ Snsr_01 = FALSE
41
42    @inv2_8: ctrl_snsr_10 = TRUE ⇒ Snsr_10 = FALSE
43
```

events

```
45
46    INITIALISATION extends INITIALISATION
47    begin
48     @act5: ctrl_snsr := FALSE
49     @act6: ctrl_dep := 0
50     @act7: ctrl_snsr_01 := FALSE
51     @act8: ctrl_snsr_10 := FALSE
52    end
53
54    SNSR_on extends SNSR_on
55    when
56     @grd3: ctrl_snsr_10 = FALSE
57    end
58
59    SNSR_off extends SNSR_off
60    when
61     @grd3: ctrl_snsr_01 = FALSE
62    end
```

```
63
64   ctrl_Senses_Snsr_01 extends ctrl_Senses_Snsr_01
65   begin
66    @act2: ctrl_snsr_01 := TRUE
67   end
68
69   ctrl_Senses_Snsr_10 extends ctrl_Senses_Snsr_10
70   begin
71    @act2: ctrl_snsr_10 := TRUE
72   end
73
74   ctrl_on
75   when
76    @grd1: ctrl_snsr_01 = TRUE
77   then
78    @act1: ctrl_snsr_01 := FALSE
79    @act2: ctrl_snsr := TRUE
80   end
81
82   ctrl_off
83   when
84    @grd1: ctrl_snsr_10 = TRUE
85   then
86    @act1: ctrl_snsr_10 := FALSE
87    @act2: ctrl_snsr := FALSE
88    @act3: ctrl_dep := ctrl_dep + 1
89   end
90
91  end
```