An Event-B Specification of

Vectors

This project tests code generation for vectors.

CONTEXT Context 12a 1

CONSTANTS 1.1

lo
hi
index
loo
hii

AXIOMS

axm1: lo = 1
axm2: hi = 10
axm3: index = lo..hi
axm4: loo ∈ ℤ
axm5: hii ∈ ℤ
axm6: hii > loo
theorem thm1:
card(index) = max(index)
theorem thm2:
lo = min(index)
theorem thm3:
hi = max(index)
theorem thm4:
5 = card(5..9)
theorem thm5:
9 = max(5..9)
theorem thm6:
hii = max(loo..hii)

END

MACHINE Test 7 a 2 i 2

VARIABLES 2.1

bytes
bytes_size

INVARIANTS

inv1: $bytes \in 1..bytes\_size \to 0..255$
inv2: $bytes\_size = \text{card}(\text{dom}(bytes))$

EVENT INITIALISATION
THEN

init1: $bytes := 1..10 \times \{1\}$
init2: $bytes\_size := 10$

END

EVENT cut 2.2
ANY

new_size

WHERE

grd1: $bytes\_size > 1$
grd2: $new\_size = bytes\_size - 1$
grd3: $new\_size \in \mathbb{N}_1$

THEN

act1: $bytes\_size := new\_size$
act2: $bytes := \{x \cdot x \in 1..new\_size \mid x \mapsto bytes(x+1)\}$

END

EVENT split 2.3
ANY

new_size
left_size
out_msg

WHERE

grd1: $new\_size \in \mathbb{N}_1$
grd2: $left\_size \in \mathbb{N}_1$
grd3: $bytes\_size > left\_size$
grd4: $new\_size = bytes\_size - left\_size$
grd5: $out\_msg = 1..new\_size \lhd bytes$

THEN

act1: $bytes\_size := new\_size$
act2: $bytes := \{x \cdot x \in 1..new\_size \mid x \mapsto bytes(x + left\_size)\}$

END
REFINEMENT Test1 1 a

REFINES Test

VARIABLES 2.4

EVENT split

EXTENDS split

WHERE

grd1_1: $2 \in \mathrm{dom}(bytes)$

grd1_2: $left\_size = bytes(1)$

END

2.5

REFINEMENT Test1 1 a 3

REFINES Test

VARIABLES 3.1

EVENT split 3.2
EXTENDS split
WHERE
grd1_1: $2 \in \mathrm{dom}(bytes)$
grd1_2: $left\_size = bytes(1)$
END

MACHINE Vectors 9 a 2 i 4

VARIABLES 4.1

heights	A fixed size vector of heights.
bytes_size	Size of the bytes vector
bytes	A vector of bytes

INVARIANTS

inv_he:	$heights \in (1..100) \to \mathbb{N}$
inv_bs:	$bytes\_size \in \mathbb{N}$
inv_by:	$bytes \in (1..bytes\_size) \to 0..255$

EVENT INITIALISATION

THEN

init_he:	$heights := 1..100 \times \{0\}$
init_ws:	$bytes\_size := 0$
init_we:	$bytes := \varnothing$

END

EVENT setHeight 4.2

ANY

at
h

WHERE

grd_p:	$at \in \mathrm{dom}(heights)$
grd_h:	$h \in \mathbb{N}$

THEN

act_1:	$heights(at) := h$

END

EVENT setHeights 4.3

ANY

hs

WHERE

grd_hs:	$hs \in (1..100) \to \mathbb{N}$

THEN

act_1:	$heights := hs$

END

EVENT findHeight 4.4

ANY

h
out_i

WHERE

grd1:	$h \in \mathbb{N}$
grd3:	$out\_i \in \mathrm{dom}(heights)$
grd4:	$\exists x \cdot x \in \mathrm{dom}(heights) \land heights(x) = h \land out\_i = x$

END

EVENT addByte 4.5

ANY

b

WHERE

grd_b: $b \in 0..255$

THEN

act_1: $bytes := bytes \cup \{bytes\_size + 1 \mapsto b\}$

act_2: $bytes\_size := bytes\_size + 1$

END

EVENT cut 4.6

ANY

new_size

WHERE

grd1: $bytes\_size > 1$

grd2: $new\_size \in \mathbb{N}_1$

grd3: $new\_size = bytes\_size - 1$

THEN

act1: $bytes\_size := new\_size$

act2: $bytes := \{x \cdot x \in 1..new\_size \mid x \mapsto bytes(x + 1)\}$

END