

An Event-B Specification of Vectors

This project tests code generation for vectors.

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CONSTANTS

1.1

lo
hi
index
loo
hii

AXIOMS

axm1: lo = 1
axm2: hi = 10
axm3: index = lo..hi
axm4: loo $\in \mathbb{Z}$
axm5: hii $\in \mathbb{Z}$
axm6: hii > loo

THEOREM

thm1: card(index) = max(index)
thm2: lo = min(index)
thm3: hi = max(index)
thm4: 5 = card(5..9)
thm5: 9 = max(5..9)
thm6: hii = max(loo..hii)

END

VARIABLES

bytes
bytes_size

INVARIANTS

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

EVENT INITIALISATION

THEN

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

END

EVENT cut

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

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: $out_msg = 1..new_size \triangleleft bytes$

THEN

act1: $bytes_size := new_size$
act2: $bytes := \{x \cdot x \in 1..new_size \mid x \mapsto bytes(x + left_size)\}$

END

2.2

2.3

REFINEMENT <code>Test1</code>	1 a	<div>3</div>
<hr/>		
REFINES <code>Test</code>		
VARIABLES		<div>3.1</div>
EVENT <code>split</code>		<div>3.2</div>
EXTENDS <code>split</code>		
WHERE		
<code>grd1_1:</code> <code>2</code> $\in \text{dom}(\text{bytes})$		
<code>grd1_2:</code> <code>left_size = bytes(1)</code>		
END		

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: $heights \in (1..100) \rightarrow \mathbb{N}$
inv_bs: $bytes_size \in \mathbb{N}$
inv_by: $bytes \in (1..bytes_size) \rightarrow 0..255$

EVENT **INITIALISATION**

THEN

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

END

EVENT **setHeight**

4.2

ANY

at
h

WHERE

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

THEN

act_1: $heights(at) := h$

END

EVENT **setHeights**

4.3

ANY

hs

WHERE

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

THEN

act_1: $heights := hs$

END

EVENT **findHeight**

4.4

ANY

h
out_i

WHERE

grd1: $h \in \mathbb{N}$
grd3: $out_i \in \text{dom}(heights)$
grd4: $\exists x \cdot x \in \text{dom}(heights) \wedge height(x) = h \wedge out_i = x$

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

grd 1 : $bytes_size > 1$

grd 2 : $new_size \in \mathbb{N}_1$

grd 3 : $new_size = bytes_size - 1$

THEN

act 1 : $bytes_size := new_size$

act 2 : $bytes := \{x \cdot x \in 1..new_size \mid x \mapsto bytes(x + 1)\}$

END

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