

CSC 4504 : *Langages formels et applications*

(Event-B)

J Paul Gibson, A207

`paul.gibson@it-sudparis.eu`

<http://www-public.it-sudparis.eu/~gibson/Teaching/CSC4504/>

MinimumOfArray

<http://www-public.it-sudparis.eu/~gibson/Teaching/CSC4504/MinimumOfArray.pdf>

Find the minimum element of an array of integers

Consider the following specification, in Event-B, of a machine to find the minimum element of an array.

1) Try to understand the specification

2) Is it correct?

3)

If not ... fix it (using RODIN)

If so ... implement the machine in Java

Is the Java correct?

Find the minimum element of an array of integers

CONTEXT

MinParam

CONSTANTS

n
a0

AXIOMS

axm1 : $n \in \mathbb{N}$
axm2 : $n > 0$
axm3 : $a0 \in 1..n \rightarrow \mathbb{Z}$

END

Find the minimum element of an array of integers

MACHINE

Minim

SEES

MinParam

VARIABLES

a
m
i

INVARIANTS

inv1 : $a \in 1..n \rightarrow \mathbb{Z}$
 inv2 : $i \in 1..n$
 inv3 : $m \in \mathbb{Z}$
 inv4 : $\forall j \cdot j \in 1..i \Rightarrow m \leq a(j)$

EVENTS

VARIANT

$n - i$

END

INITIALISATION \triangleq

STATUS

ordinary

BEGIN

act2 : $a := a0$
 act1 : $i := 1$
 act3 : $m := a0(1)$

END

compute_min1 \triangleq

STATUS

convergent

WHEN

grd1 : $i < n$
 grd2 : $a(i + 1) < m$

THEN

act1 : $m := a(i + 1)$
 act2 : $i := i + 1$

END

compute_min2 \triangleq

STATUS

convergent

WHEN

grd1 : $i < n$
 grd2 : $a(i + 1) \geq m$

THEN

act1 : $i := i + 1$

END

QUESTION: What about finding the minimum element of a set?

Can we re-use some/all of the previous models/code?

Perhaps you already have a solution from the previous week?

Is it directly implementable?