

1 STACK

Erweitern Sie die algebraische Spezifikation des Stacks um 2 weitere Funktionen...

Sorten

Integer: Boolean, Stack, length, top2

Signatur

new : \rightarrow Stack

push: Integer x Stack \rightarrow Stack

pop: Stack \rightarrow Stack

top: Stack \rightarrow Integer

is_empty: Boolean \rightarrow Boolean

top2: Stack \rightarrow Integer

length: Stack \rightarrow Integer

Axiome (Gleichungen)

$\text{top}(\text{push}(e,s)) = e$

$\text{pop}(\text{push}(e,s)) = s$

$\text{is_empty}(\text{new}) = \text{true}$

$\text{is_empty}(\text{push}(e,s)) = \text{false}$

$\text{top2}(\text{length}) = \text{true}$

$\text{length}(\text{is_empty}) = \text{false}$

mit Fehlersituation:

$\text{top}(\text{new}) : \text{ERROR}$

$\text{top2}(\text{new}) : \text{ERROR}$

$\text{length}(\text{new}) : \text{ERROR}$

$\text{pop}(\text{new}) : \text{new (oder : ERROR)}$

2 QUEUE

Erstellen Sie eine formale Spezifikation für eine Queue unter Verwendung der Z-Notation.

Queue
 $queue_elements : seq\ \mathbb{N}$

create
 $\Delta Queue$
 $queue_elements' = \langle \rangle$

append
 $\Delta Queue$
 $elem? : \mathbb{N}$
 $queue_elements' = queue_elements \frown elem?$

getSecondLeast2
 $\exists Queue$
 $elem2! : \mathbb{N}$
 $\#queue_elements \geq 2$
 $elem2! = head\ (tail\ queue_elements)$

deleteSecondLeast2
 $\Delta Queue$
 $\#queue_elements \geq 2$
 $queue_elements' = head\ queue_elements \frown tail\ (tail\ queue_elements)$

moveFirstToLast
 $\Delta Queue$
 $\#queue_elements \geq 1$
 $queue_elements' = tail\ queue_elements \frown head\ queue_elements$

top2
 $top2 - OK \vee top2 - FAIL$

top2 - OK
 $\exists Queue\ elem! : \mathbb{N}$
 $\#queue_elements \geq 2$
 $elem! = head\ (tail\ queue_elements)$

<i>top2</i> – FAIL
$\exists Queue$
$r! : \text{seq } CHAR$
$\#queue_elements \leq 1$
$r! = \text{“Queue has not enough elements”}$

<i>length</i>
$\exists Queue$
$n! : \mathbb{N}$
$n! = \#queue_elements$

3 BENZINTANK

<i>Container</i>
<i>Contents</i> : \mathbb{N}
<i>Capacity</i> : \mathbb{N}
$Contents \geq Capacity$

<i>Indicator</i>
<i>Danger_Light</i> : $\{1,0\}$
<i>Light95</i> : $\{1,0\}$
<i>Reading</i> : \mathbb{N}
<i>Danger_Level</i> : \mathbb{N}
<i>Contents95</i> : \mathbb{N}
$Danger_Light = 0 \Leftrightarrow Reading \leq Danger_Level$
$Light95 = 0 \Leftrightarrow Reading \geq Contents95$

...

4 RAUMSTATION COLUMBUS

[ACS_ID, CMD]

ACS_ID ≥ 110 $max_cmds_per_acs : \mathbb{N}$ $max_cmds_per_acs \geq 50$ *Defined_ACSs* $commands : ACS_ID \rightarrow seq\ CMD$ $enabled : \mathbb{P}\ ACS_ID$ $\forall id : ACS_ID \bullet 1 \leq \# commands(id) \leq max_cmds_per_acs$ *Pending_ACSs**Defined_ACSs* $queue : seq\ commands$ $pending : seq\ commands$ $current_id : ACS_ID$ $current_cmds : seq_1\ CMD$ $queue = \diamond \Rightarrow pending = \diamond$ $queue \neq \diamond \Rightarrow queue = \langle current_id, current_cmds \rangle \frown pending$ $\#pending \geq 30$