MODULE *Untitled*

EXTENDS *Naturals*, *TLC*

$NT \triangleq 2$
$FLAG \triangleq 1 \,..\, NT$
$WORDS \triangleq 5$
$TOT\_WORDS \triangleq NT * WORDS$

```
--algorithm WordsCounter

variables rankLock = 1, freq = 0;

define
    FinalValue ≜ ◇(freq = TOT_WORDS)
    MutualExclusion ≜ □¬(∀ i ∈ FLAG : pc[i] = "CS")  Se NT ≤ 2
end define ;

macro acquire(s)begin
  await s = 1;
  s := 0;
end macro ;

macro release(s)begin
  s := 1;
end macro ;

macro count(wrd, frq)begin
    wrd := wrd − 1;
    frq  := frq  + 1;
end macro ;

fair process mainCounting ∈ 1 .. NT
variables words = WORDS;
begin MainLoop:
        while words ≠ 0 do
        l2:  acquire(rankLock);  — Init CS—
        CS: count(words, freq);
        l6:  release(rankLock);  — End CS—
    end while ;
end process ;
end algorithm  ;
```

BEGIN TRANSLATION ($chksum(pcal) =$ "34068bc6" $\wedge\ chksum(tla) =$ "1ef0faff")

VARIABLES *rankLock*, *freq*, *pc*

define statement

$FinalValue \triangleq \Diamond(freq = TOT\_WORDS)$
$MutualExclusion \triangleq \Box\neg(\forall\, i \in FLAG : pc[i] = \text{"CS"})$

VARIABLE $words$

$vars \triangleq \langle rankLock, freq, pc, words \rangle$

$ProcSet \triangleq (1 \,..\, NT)$

$Init \triangleq$ Global variables
$\land\ rankLock = 1$
$\land\ freq = 0$
Process *mainCounting*
$\land\ words = [self \in 1 \,..\, NT \mapsto WORDS]$
$\land\ pc = [self \in ProcSet \mapsto \text{“MainLoop”}]$

$MainLoop(self) \triangleq \land\ pc[self] = \text{“MainLoop”}$
$\land$ IF $words[self] \neq 0$
THEN $\land\ pc' = [pc$ EXCEPT $![self] = \text{“l2”}]$
ELSE $\land\ pc' = [pc$ EXCEPT $![self] = \text{“Done”}]$
$\land$ UNCHANGED $\langle rankLock, freq, words \rangle$

$l2(self) \triangleq \land\ pc[self] = \text{“l2”}$
$\land\ rankLock = 1$
$\land\ rankLock' = 0$
$\land\ pc' = [pc$ EXCEPT $![self] = \text{“CS”}]$
$\land$ UNCHANGED $\langle freq, words \rangle$

$CS(self) \triangleq \land\ pc[self] = \text{“CS”}$
$\land\ words' = [words$ EXCEPT $![self] = words[self] - 1]$
$\land\ freq' = freq + 1$
$\land\ pc' = [pc$ EXCEPT $![self] = \text{“l6”}]$
$\land$ UNCHANGED $rankLock$

$l6(self) \triangleq \land\ pc[self] = \text{“l6”}$
$\land\ rankLock' = 1$
$\land\ pc' = [pc$ EXCEPT $![self] = \text{“MainLoop”}]$
$\land$ UNCHANGED $\langle freq, words \rangle$

$mainCounting(self) \triangleq MainLoop(self) \lor l2(self) \lor CS(self) \lor l6(self)$

Allow infinite stuttering to prevent deadlock on termination.
$Terminating \triangleq \land \forall\, self \in ProcSet : pc[self] = \text{“Done”}$
$\land$ UNCHANGED $vars$

$Next \triangleq (\exists\, self \in 1 \,..\, NT : mainCounting(self))$
$\lor\ Terminating$

$Spec \triangleq \land\ Init \land \Box[Next]_{vars}$
$\land \forall\, self \in 1 \,..\, NT : \mathrm{WF}_{vars}(mainCounting(self))$

$Termination \triangleq \Diamond(\forall\, self \in ProcSet : pc[self] = \text{“Done”})$

END TRANSLATION

\ ∗ Modification History
\ ∗ Last modified *Wed Apr* 07 10:08:18 *CEST* 2021 by *davide*
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