MODULE *sync_composition*

Initially
$Light0 =$ Red
$Light1 =$ Green Counter $= 20$

Light i
0 : *while*(*True*){
1 : *if*(*counter* $\triangleq$ 0){
1 : *flip color of Light i*
1 : *Set Counter to* 20
1 : }
1 : *else*{
1 : *decrement counter*
1 : }
2 : }
Check if light 0 has color green and light 1 has color green can ever occur in the synchronous composition of these systems

In your model assume that if there is a slog (stutter), both lights stutter together (By default, such a transition is assumed in TLA+)

EXTENDS *Integers*
VARIABLES $pc0$, $pc1$, $l0$, $l1$, *counter*

0 denotes red and 1 denotes green for lights

variables for LIGHT 0 is $pc0$, $l1$, counter ; variables for LIGHT 1 is $pc1$, $l2$, counter

$TypeOK \triangleq$
$\land\ pc0 \in 0 \,..\, 2$
$\land\ pc1 \in 0 \,..\, 2$
$\land\ l0 \in \{0, 1\}$
$\land\ l1 \in \{0, 1\}$
$\land\ counter \in 0 \,..\, 20$

$Init \triangleq$
$\land\ pc0 = 0$
$\land\ pc1 = 0$
$\land\ l0 = 0$
$\land\ l1 = 1$
$\land\ counter = 20$

$P01 \triangleq$
$\land\ pc0 = 0$
$\land\ pc0' = 1$
$\land$ UNCHANGED $\langle l0, counter \rangle$

$P12 \triangleq$
$\land$ IF $counter = 0$

THEN $\land\ l0' = 1 - l0$
$\land\ counter' = 20$
ELSE $\land\ counter' = counter - 1$
$\land$ UNCHANGED $l0$
$\land\ pc0 = 1$
$\land\ pc0' = 2$

$P20\ \triangleq$
$\land\ pc0 = 2$
$\land\ pc0' = 3$
$\land$ UNCHANGED $\langle counter,\ l0\rangle$

$Next0\ \triangleq$
$\lor\ P01$
$\lor\ P12$
$\lor\ P20$

$Q01\ \triangleq$
$\land\ pc1 = 0$
$\land\ pc1' = 1$
$\land$ UNCHANGED $\langle l1,\ counter\rangle$

$Q12\ \triangleq$
$\land$ IF $counter = 0$
THEN $\land\ l1' = 1 - l1$
$\land\ counter' = 20$
ELSE $\land\ counter' = counter - 1$
$\land$ UNCHANGED $l1$
$\land\ pc1 = 1$
$\land\ pc1' = 2$

$Q20\ \triangleq$
$\land\ pc1 = 2$
$\land\ pc1' = 3$
$\land$ UNCHANGED $\langle counter,\ l1\rangle$

$Next1\ \triangleq$
$\lor\ Q01$
$\lor\ Q12$
$\lor\ Q20$

$SLOG\_TOGETHER\ \triangleq$ UNCHANGED $\langle pc0,\ pc1,\ l0,\ l1,\ counter\rangle$

since it's synchronous composition
$Next\ \triangleq\ (Next0 \land Next1) \lor SLOG\_TOGETHER$

$$Both\_Not\_Green \triangleq \neg(l0 = 1 \land l1 = 1)$$

* Modification History
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