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EXTENDS *Naturals, TLC*

```

--algorithm threads{
  variables x = 0, y = 0;

  process ( thread1 = "thr1" )
  { start1: skip; Do nothing at beginning
    1a: if ( y = 0 ) {
    1b:   x := 1; } ;
    end1a: if ( pc["thr2"] = "Done" ) { If other guy is done
      print <"x, y:", x, y> ;
    end1b: assert ¬(x = 1 ∧ y = 1); Condition "not(x == 1 && y == 1)" can fail
    }
  } end process block

  process ( thread2 = "thr2" )
  { start2: skip; Do nothing at beginning
    2a: if ( x = 0 ) {
    2b:   y := 1; } ;
    end2a: if ( pc["thr1"] = "Done" ) { If other guy is done
      print <"x, y:", x, y> ;
    end2b: assert ¬(x = 1 ∧ y = 1); Condition "not(x == 1 && y == 1)" can fail
    }
  } end process block

  } \* end algorithm

```

BEGIN TRANSLATION

VARIABLES x, y, pc

$vars \triangleq \langle x, y, pc \rangle$

$ProcSet \triangleq \{ "thr1" \} \cup \{ "thr2" \}$

$Init \triangleq$ Global variables
 $\wedge x = 0$
 $\wedge y = 0$
 $\wedge pc = [self \in ProcSet \mapsto \text{CASE } self = "thr1" \rightarrow "start1"$
 $\quad \square self = "thr2" \rightarrow "start2"]$

$start1 \triangleq$ $\wedge pc["thr1"] = "start1"$
 $\wedge \text{TRUE}$
 $\wedge pc' = [pc \text{ EXCEPT } !["thr1"] = "1a"]$
 $\wedge \text{UNCHANGED } \langle x, y \rangle$

$1a \triangleq$ $\wedge pc["thr1"] = "1a"$
 $\wedge \text{IF } y = 0$
 $\quad \text{THEN } \wedge pc' = [pc \text{ EXCEPT } !["thr1"] = "1b"]$
 $\quad \text{ELSE } \wedge pc' = [pc \text{ EXCEPT } !["thr1"] = "end1a"]$
 $\wedge \text{UNCHANGED } \langle x, y \rangle$

$1b \triangleq$ $\wedge pc["thr1"] = "1b"$
 $\wedge x' = 1$
 $\wedge pc' = [pc \text{ EXCEPT } !["thr1"] = "end1a"]$
 $\wedge y' = y$

$$\begin{aligned}
end1a &\triangleq \wedge pc["thr1"] = "end1a" \\
&\wedge \text{IF } pc["thr2"] = "Done" \\
&\quad \text{THEN } \wedge PrintT(\langle "x, y:", x, y \rangle) \\
&\quad \quad \wedge pc' = [pc \text{ EXCEPT } !["thr1"] = "end1b"] \\
&\quad \quad \text{ELSE } \wedge pc' = [pc \text{ EXCEPT } !["thr1"] = "Done"] \\
&\wedge \text{UNCHANGED } \langle x, y \rangle \\
end1b &\triangleq \wedge pc["thr1"] = "end1b" \\
&\wedge Assert(\neg(x = 1 \wedge y = 1), \\
&\quad \text{"Failure of assertion at line 17, column 14."}) \\
&\wedge pc' = [pc \text{ EXCEPT } !["thr1"] = "Done"] \\
&\wedge \text{UNCHANGED } \langle x, y \rangle \\
thread1 &\triangleq start1 \vee 1a \vee 1b \vee end1a \vee end1b \\
start2 &\triangleq \wedge pc["thr2"] = "start2" \\
&\wedge \text{TRUE} \\
&\wedge pc' = [pc \text{ EXCEPT } !["thr2"] = "2a"] \\
&\wedge \text{UNCHANGED } \langle x, y \rangle \\
2a &\triangleq \wedge pc["thr2"] = "2a" \\
&\wedge \text{IF } x = 0 \\
&\quad \text{THEN } \wedge pc' = [pc \text{ EXCEPT } !["thr2"] = "2b"] \\
&\quad \text{ELSE } \wedge pc' = [pc \text{ EXCEPT } !["thr2"] = "end2a"] \\
&\wedge \text{UNCHANGED } \langle x, y \rangle \\
2b &\triangleq \wedge pc["thr2"] = "2b" \\
&\wedge y' = 1 \\
&\wedge pc' = [pc \text{ EXCEPT } !["thr2"] = "end2a"] \\
&\wedge x' = x \\
end2a &\triangleq \wedge pc["thr2"] = "end2a" \\
&\wedge \text{IF } pc["thr1"] = "Done" \\
&\quad \text{THEN } \wedge PrintT(\langle "x, y:", x, y \rangle) \\
&\quad \quad \wedge pc' = [pc \text{ EXCEPT } !["thr2"] = "end2b"] \\
&\quad \quad \text{ELSE } \wedge pc' = [pc \text{ EXCEPT } !["thr2"] = "Done"] \\
&\wedge \text{UNCHANGED } \langle x, y \rangle \\
end2b &\triangleq \wedge pc["thr2"] = "end2b" \\
&\wedge Assert(\neg(x = 1 \wedge y = 1), \\
&\quad \text{"Failure of assertion at line 27, column 14."}) \\
&\wedge pc' = [pc \text{ EXCEPT } !["thr2"] = "Done"] \\
&\wedge \text{UNCHANGED } \langle x, y \rangle \\
thread2 &\triangleq start2 \vee 2a \vee 2b \vee end2a \vee end2b \\
Next &\triangleq thread1 \vee thread2 \\
&\quad \vee \text{Disjunct to prevent deadlock on termination} \\
&\quad \quad ((\forall self \in ProcSet : pc[self] = "Done") \wedge \text{UNCHANGED } vars) \\
Spec &\triangleq Init \wedge \square[Next]_{vars} \\
Termination &\triangleq \diamond(\forall self \in ProcSet : pc[self] = "Done")
\end{aligned}$$

END TRANSLATION