MODULE *ExtraSimpleEuclid*

EXTENDS *Integers*, *GCD*

CONSTANTS M, N

ASSUME $\{M, N\} \subseteq Nat \setminus \{0\}$ *subset* doesn't seem to work

```
***************************************************************************
--fair algorithm Euclid
  {  variables x = M, y = N ;
     { while ( x ≠ y )
         The Greek word for the following process of repeated subtraction
         is antanaresis.
       { if ( x < y ) { y := y − x ;  }
         else         { x   := x − y ;  }
       }
  }  }
***************************************************************************
```

BEGIN TRANSLATION

VARIABLES x, y, pc

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

$Init \triangleq$ Global variables
$\land x = M$
$\land y = N$
$\land pc = \text{"Lbl\_1"}$

$Lbl\_1 \triangleq \land pc = \text{"Lbl\_1"}$
$\land$ IF $x \neq y$
THEN $\land$ IF $x < y$
THEN $\land y' = y - x$
$\land x' = x$
ELSE $\land x' = x - y$
$\land y' = y$
$\land pc' = \text{"Lbl\_1"}$
ELSE $\land pc' = \text{"Done"}$
$\land$ UNCHANGED $\langle x, y \rangle$

$Next \triangleq Lbl\_1$
$\lor$ Disjunct to prevent deadlock on termination
$(pc = \text{"Done"} \land \text{UNCHANGED } vars)$

$Spec \triangleq \land Init \land \Box[Next]_{vars}$
$\land \text{WF}_{vars}(Next)$

$Termination \triangleq \Diamond(pc = \text{"Done"})$

END TRANSLATION

PC means $PartialCorrectness$, but it's a lot easier to write and read.

$PC \triangleq (pc = \text{"Done"}) \Rightarrow (x = y) \land (x = GCD(M, N))$

$Inv \triangleq \text{TRUE}$

$I1 \triangleq Init \Rightarrow Inv$
$I2 \triangleq Inv \land Next \Rightarrow Inv'$
$I3 \triangleq Inv \Rightarrow PC$

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