MODULE *DieHarder*

EXTENDS *Integers*, *TLC*

$Min(m, n) \triangleq$ IF $m < n$ THEN m ELSE n

CONSTANTS *Goal*, *Jugs*, *Capacity*

ASSUME $\land Goal \in Nat$
$\land Capacity \in [Jugs \mapsto Nat \setminus \{0\}]$

```
**************************************************************************
--algorithm DieHarder{
  variables injug = [j ∈ Jugs ↦ 0];
  { while ( TRUE )
     { either with ( j ∈ Jugs )   fill jug j
                 { injug[j] := Capacity[j] }
       or        with ( j ∈ Jugs )   empty jug j
                 { injug[j] := 0 }
       or        with ( j ∈ Jugs, k ∈ Jugs \ {j} )   pour from jug j to jug k
                 { with ( poured =
                                 Min(injug[j] + injug[k], Capacity[k]) - injug[k] )
                     { injug[j] := injug[j] - poured ||
                       injug[k] := injug[k] + poured;
                     }
                 }
     }
  }
}
**************************************************************************
```

BEGIN TRANSLATION

VARIABLE *injug*

$vars \triangleq \langle injug \rangle$

$Init \triangleq$ Global variables
$\land injug = [j \in Jugs \mapsto 0]$

$Next \triangleq \lor \land \exists j \in Jugs :$
$injug' = [injug \text{ EXCEPT } ![j] = Capacity[j]]$
$\lor \land \exists j \in Jugs :$
$injug' = [injug \text{ EXCEPT } ![j] = 0]$
$\lor \land \exists j \in Jugs :$
$\exists k \in Jugs \setminus \{j\} :$
LET $poured \triangleq Min(injug[j] + injug[k], Capacity[k]) - injug[k]$ IN
$injug' = [injug \text{ EXCEPT } ![j] = injug[j] - poured,$
$![k] = injug[k] + poured]$

$Spec \triangleq Init \wedge \Box[Next]_{vars}$

END TRANSLATION

* Modification History
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