

EXTENDS *Integers*

VARIABLES *bigJug, smallJug*

$$\begin{aligned} TypeOk \triangleq & \quad \wedge \textit{smallJug} \in 0 \dots 3 \\ & \quad \wedge \textit{bigJug} \in 0 \dots 5 \end{aligned}$$

$$\begin{aligned} Init \triangleq & \quad \wedge \textit{bigJug} = 0 \\ & \quad \wedge \textit{smallJug} = 0 \end{aligned}$$

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

$$\begin{aligned} FillSmallJug \triangleq & \quad \wedge \textit{smallJug}' = 3 \\ & \quad \wedge \textit{bigJug}' = \textit{bigJug} \end{aligned}$$

$$\begin{aligned} FillBigJug \triangleq & \quad \wedge \textit{bigJug}' = 5 \\ & \quad \wedge \textit{smallJug}' = \textit{smallJug} \end{aligned}$$

$$\begin{aligned} EmptySmallJug \triangleq & \quad \wedge \textit{smallJug}' = 0 \\ & \quad \wedge \textit{bigJug}' = \textit{bigJug} \end{aligned}$$

$$\begin{aligned} EmptyBigJug \triangleq & \quad \wedge \textit{smallJug}' = \textit{smallJug} \\ & \quad \wedge \textit{bigJug}' = 0 \end{aligned}$$

$$SmallToBig \triangleq$$

LET

$$\textit{pouredAmount} \triangleq Min(\textit{bigJug} + \textit{smallJug}, 5) - \textit{bigJug}$$

IN

$$\begin{aligned} & \quad \wedge \textit{bigJug}' = \textit{bigJug} + \textit{pouredAmount} \\ & \quad \wedge \textit{smallJug}' = \textit{smallJug} - \textit{pouredAmount} \end{aligned}$$

$$BigToSmall \triangleq$$

LET

$$\textit{pouredAmount} \triangleq Min(\textit{bigJug} + \textit{smallJug}, 3) - \textit{smallJug}$$

IN

$$\begin{aligned} & \quad \wedge \textit{bigJug}' = \textit{bigJug} - \textit{pouredAmount} \\ & \quad \wedge \textit{smallJug}' = \textit{smallJug} + \textit{pouredAmount} \end{aligned}$$

$$\begin{aligned} Next \triangleq & \quad \vee FillSmallJug \\ & \quad \vee FillBigJug \\ & \quad \vee EmptySmallJug \\ & \quad \vee EmptyBigJug \\ & \quad \vee SmallToBig \end{aligned}$$

$\vee \textit{BigToSmall}$

$\textit{DefuseBomb} \stackrel{\Delta}{=} \textit{bigJug} \neq 4$  Look for a violation which is the solution....

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