

EXTENDS *Integers*

CONSTANT N

VARIABLES $states, chopsticks$

$TypeOK \triangleq \forall n \in 0 \dots N-1 :$
 $\quad \wedge states[n] \in \{\text{"thinking"}, \text{"hungry"}, \text{"eating"}\}$
 $\quad \wedge chopsticks[n] \in \{\text{"available"}, \text{"heldByLeft"}, \text{"heldByRight"}\}$

$Init \triangleq \wedge states = [n \in 0 \dots N-1 \mapsto \text{"thinking"}]$
 $\quad \wedge chopsticks = [n \in 0 \dots N-1 \mapsto \text{"available"}]$

$rightIndex(n) \triangleq n$
 $leftIndex(n) \triangleq (n-1) \% N$

$hunger(n) \triangleq \wedge states[n] = \text{"thinking"}$
 $\quad \wedge states' = [states \text{ EXCEPT } ![n] = \text{"hungry"}]$
 $\quad \wedge chopsticks' = chopsticks$

$think(n) \triangleq \wedge states[n] = \text{"hungry"}$
 $\quad \wedge chopsticks[rightIndex(n)] \neq \text{"heldByLeft"}$
 $\quad \wedge chopsticks[leftIndex(n)] \neq \text{"heldByRight"}$
 $\quad \wedge states' = [states \text{ EXCEPT } ![n] = \text{"thinking"}]$
 $\quad \wedge chopsticks' = chopsticks$

$pickUpRightChopstick(n) \triangleq \wedge chopsticks[rightIndex(n)] = \text{"available"}$
 $\quad \wedge states[n] = \text{"hungry"}$
 $\quad \wedge states' = states$
 $\quad \wedge chopsticks' = [chopsticks \text{ EXCEPT } ![rightIndex(n)] = \text{"heldByLeft"}]$

$pickUpLeftChopstick(n) \triangleq \wedge chopsticks[leftIndex(n)] = \text{"available"}$
 $\quad \wedge states[n] = \text{"hungry"}$
 $\quad \wedge states' = states$
 $\quad \wedge chopsticks' = [chopsticks \text{ EXCEPT } ![leftIndex(n)] = \text{"heldByRight"}]$

$putDownRightChopstick(n) \triangleq \wedge chopsticks[rightIndex(n)] = \text{"heldByLeft"}$
 $\quad \wedge states[n] = \text{"hungry"}$
 $\quad \wedge states' = states$
 $\quad \wedge chopsticks' = [chopsticks \text{ EXCEPT } ![rightIndex(n)] = \text{"available"}]$

$putDownLeftChopstick(n) \triangleq \wedge chopsticks[leftIndex(n)] = \text{"heldByRight"}$
 $\quad \wedge states[n] = \text{"hungry"}$
 $\quad \wedge states' = states$
 $\quad \wedge chopsticks' = [chopsticks \text{ EXCEPT } ![leftIndex(n)] = \text{"available"}]$

$eat(n) \triangleq \wedge states[n] = \text{"hungry"}$

