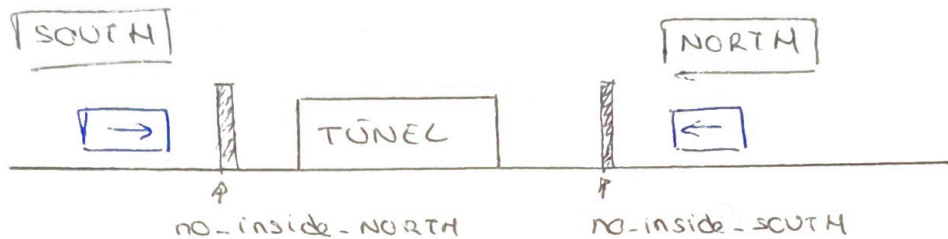


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3 abril 2022

TÚNEL DE KIYOTAKI



Caso base

car-NORTH : coches del norte dentro del túnel
car-SOUTH : coches del sur dentro del túnel

INVARIANTE : $\neg (car-NORTH > 0 \wedge car-SOUTH > 0) \wedge$
 $car-NORTH \geq 0 \wedge car-SOUTH \geq 0$

no-inside-NORTH : Condición ($car-NORTH \stackrel{?}{=} 0$)
no-inside-SOUTH : Condición ($car-SOUTH \stackrel{?}{=} 0$)

def : wants-enter-SOUTH :
no-inside-NORTH.wait ($car-NORTH \stackrel{?}{=} 0$)
car-SOUTH += 1

def : leaves-tunnel-SOUTH :
{ car-SOUTH > 0 }
car-SOUTH -= 1
no-inside-SOUTH.signal()

def : wants-enter-NORTH :
no-inside-SOUTH.wait ($car-SOUTH \stackrel{?}{=} 0$)
car-NORTH += 1

def: leaves - tunnel - NORTH:

{ car - NORTH > 0 }

car - NORTH == 1

no - inside - NORTH . signal ()

Caso turnos

car - NORTH: coches del norte dentro del túnel

car - SOUTH: coches del sur dentro del túnel

queue - NORTH: coches del norte esperando para entrar

queue - SOUTH: coches del sur esperando para entrar

turn: variable que determina la dirección de los coches que pueden pasar

0 \rightarrow si pasan los del norte

1 \rightarrow si pasan los del sur

INVARIANTE: $\neg (car - NORTH > 0 \wedge car - SOUTH > 0) \wedge$

$car - NORTH \geq 0 \wedge car - SOUTH \geq 0 \wedge$

$(turn == 0 \vee turn == 1) \wedge$

$queue - NORTH \geq 0 \wedge queue - SOUTH \geq 0$

no - inside - NORTH: Condición $(car - NORTH == 0 \wedge \begin{matrix} \text{turn} == 1 \\ \vee \\ \text{queue - NORTH} == 0 \end{matrix})$

no - inside - SOUTH: Condición $(car - SOUTH == 0 \wedge \begin{matrix} \text{turn} == 0 \\ \vee \\ \text{queue - SOUTH} == 0 \end{matrix})$

def wants - enter - SOUTH:

queue - SOUTH += 1

no - inside - NORTH . wait $\left(\begin{matrix} car - NORTH == 0 \wedge \\ (turn = 1 \vee queue - NORTH == 0) \end{matrix} \right)$

queue - SOUTH -= 1

car - SOUTH += 1

def : leaves_tunnel_SOUTH :

{ car_SOUTH > 0 }

car_SOUTH -= 1

turn = 0

no_inside_SOUTH.signal()

def : wants_enter_NORTH :

queue_NORTH += 1

no_inside_SOUTH.wait ((car_SOUTH == 0 ^
(turn = 0 ^ queue_SOUTH == 0)))

queue_NORTH -= 1

car_NORTH += 1

def : leaves_tunnel_NORTH :

{ car_NORTH > 0 }

car_NORTH -= 1

turn = 1

no_inside_NORTH.signal()