Homework #2

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1 Exercise 3.2

The variables in the third refinement can be classified as:

Variable	Type	Belongs to	Description
`A`	`BOOL`	Environment	Physical state of room occupancy
`SR`	`SENSOR`	Environment	Sensor, `on` when someone is on it, `off` otherwise
`a`	`BOOL`	Controller	Logical state of room occupancy
`wire_10`	`BOOL`	Communication	Whether the signal from the sensor just changed to off
`tl`	`COLORS`	Communication	Indicates the color of the light

The requirements are met as described here:

- **FUN1: This system deals with the access control of a room**

  N/A.

- **SAF2 : No more than one person can be in the room**

  As the variable that models the room can only be `TRUE` or `FALSE`, and:

  $$a = \mathsf{TRUE} \Rightarrow \mathsf{tl} = \mathsf{red}$$

  and the guard for the event that indicates that a person leaves the sensor (thus entering the room) requires $tl = green$, there's no way such event can be triggered while the room is already full.

- **FUN3 : The system must not deadlock**

  `inv7` ensures that always some guard is true, therefore the system won't deadlock.

- **EQP4: There is a status light outside the room with two colors: green and red**

  This is done by having the `tl` variable that can have one of those two values.

- **FUN5: When the status light is red, the room cannot be accessed. When the status light is green, the room can be accessed**

  This is modelled by the even in which a person leaves the sensor requiring that $tl = green$.

- **EQP6: There is a presence sensor at the entrance of the room**

  This is modelled by the `SR` variable.

- **FUN7: The presence sensor produces an *on* signal when a person is standing on it and an *off* signal otherwise**

  This is modelled by the events `SR_ARRIVE` setting the variable `SR` to `on` and `SR_DEPARTURE` setting it to `off`.

- **FUN8: A person inside the room can leave at any moment (using a door different from the one used to enter the room)**

  This is modelled by the fact that the only guard for `PERSON_OUT` is just the mere presence of the person inside the room.

- **ENV9: The inside of the room cannot be seen from its outside and vice-versa**

  N/A.

- **ENV10: People obey the status light**

  This is modelled by having $tl = green$ as a guard to the only event that lets a person into the room.

- **FUN11: Anyone wishing to enter the room must step on the sensor, and wait there until the status light is green, if it is not already**

  This is modelled by the fact that the only way to enter the room is through `SR_ARRIVE` and then `SR_DEPARTURE` which precisely describe the required behaviour.

- **ENV12: Anyone who stands on the sensor will wait there for the status light to turn green and enter the room**

  This is modelled by the fact that the only event that changes the variable `SR` from `on` to `off` is `SR_DEPARTURE` which requires $tl = green$ as a guard.