

# Computationele logica

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## 1 Exercise 1

1. The sentence  $\theta$  encoding all information:

The Queen knows the following:

Alice knows Bob has a red hat. Alice knows Bob doesn't know it, and she knows the Queen knows this. Alice doesn't know her own hat.

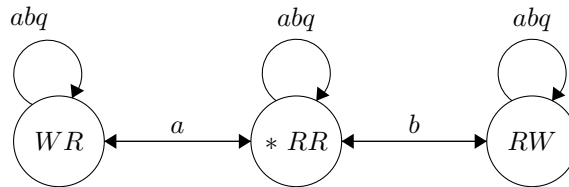
Bob knows Alice has a red hat. Bob knows Alice doesn't know it, and he knows the Queen knows this. Bob doesn't know his own hat.

$$\theta = K_q(K_a(r_b \wedge \neg K_b(r_b \vee w_b)) \wedge K_q((r_a \vee r_w) \wedge (r_b \vee r_w))) \wedge \neg K_a(r_a \vee w_a) \wedge K_b(r_a \wedge \neg K_a(r_a \vee w_a) \wedge K_q((r_a \vee r_w) \wedge (r_b \vee r_w))) \wedge \neg K_b(r_b \vee w_b))$$

2. A representation of the situation model **M**:

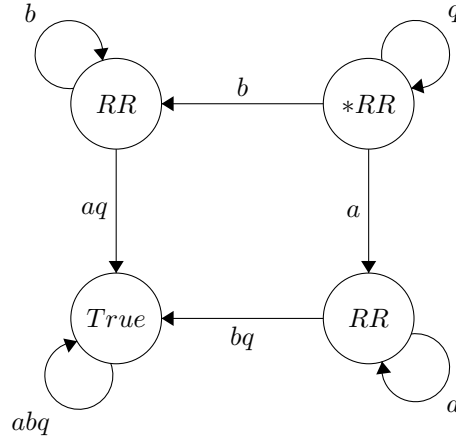
$\mathcal{A} = \{a, b, q\}$  the agents Alice, Bob, and the Queen

$\Phi = \{r_a, w_a, r_b, w_b\}$  written as WR for: a is white and b is red



This is an epistemic model: YES

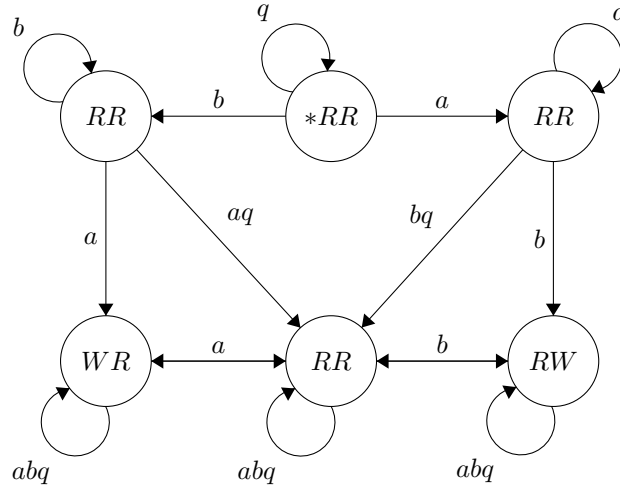
3. Separately a and b look in their mirrors and see their red hats, the queen sees everything, represented in the event model  $\Sigma$  with four actions:



This is an epistemic model: NO

This is a doxastic model: YES

4. The update product of the two models  $\mathbf{M} \otimes \Sigma$  :

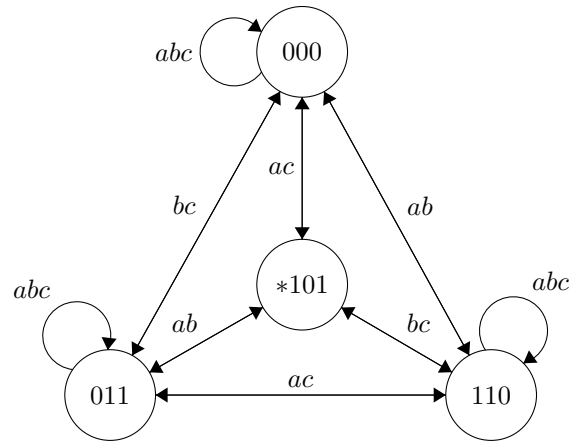


This is an epistemic model: NO

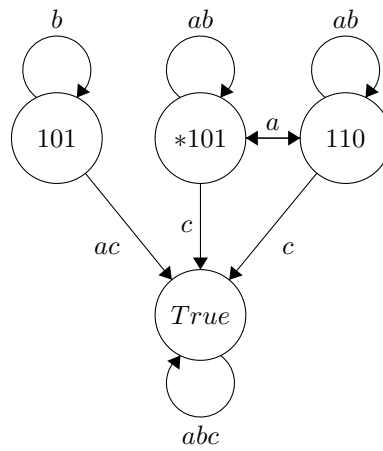
This is a doxastic model: YES

## 2 Exercise 2

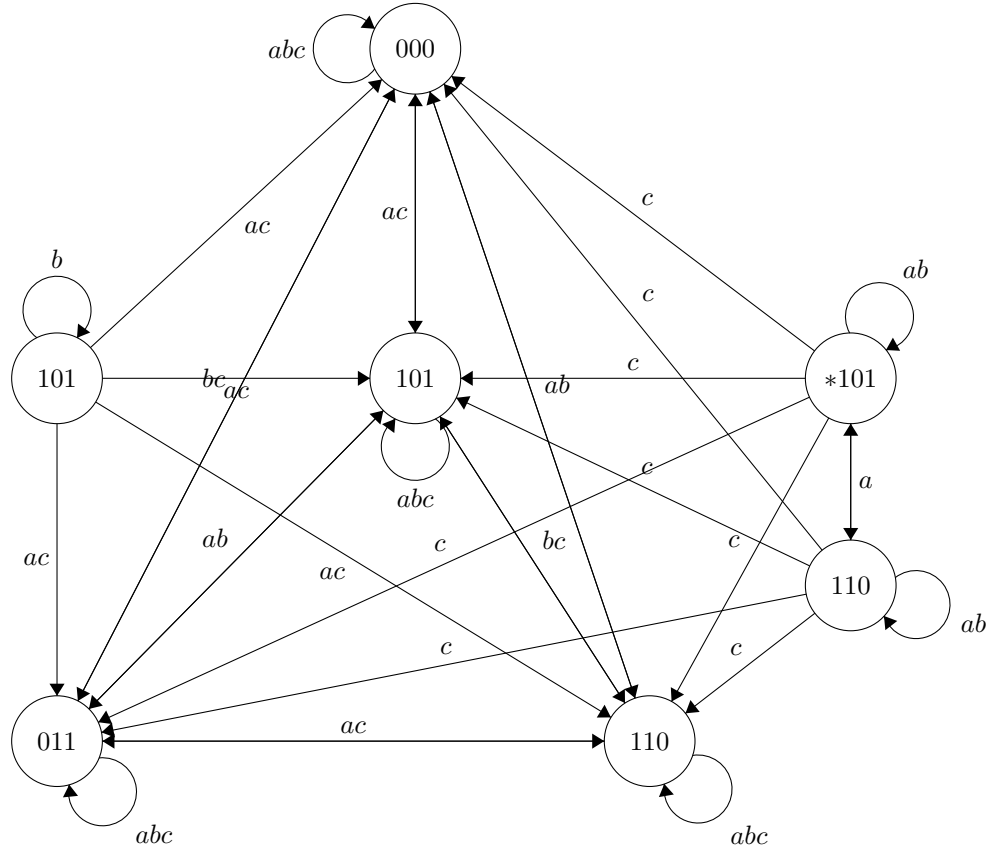
1. Representation of the bits world as an epistemic model  $\mathbf{M}$ :



2. Representation of event model  $\Sigma$ :



3. Representation of model  $\mathbf{M}'$ :



4. Representation of event model  $\Sigma'$ :

5. The update product of the two models  $\mathbf{M}'' = \mathbf{M} \otimes \Sigma'$ :

### 3 Exercise 3

- 1.
- 2.
- 3.
- 4.
- 5.

- 6.
- 7.
- 8.
- 9.