Computationele logica

Kamans, Jim   Roosingh, Sander   Stefan, Schenk
-000000001   11983957   11881798

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1 Exercise 1: Singapore problem

ϕ = date of Cheryl's birthday

(a) Model M of the situation immediately after Cheryl gives the boys their pieces of information:

(b) Epistemic sentence encoding Albert's first announcement:
$!_a(\neg K_a\phi \wedge K_a\neg K_b\phi)$

(c) Updated model M' after Albert's first announcement:

(d) Epistemic sentence and updated model M" after Bernard's announcement:
$!_b(K_b\phi)$

(e) Epistemic sentence and updated model M"' after Albert's second announcement:
$!_a(K_a\phi)$

2 Exercise 2

Prove formally that, for every sentence φ, the sentence

$$\neg K_a\varphi \Rightarrow K_a\neg K_a\varphi$$

(expressing "Negative Introspection of Knowledge") is *valid* on (the family of all) **epistemic** models.

3 Exercise 3

Using the semantics of knowledge K_a and common knowledge Ck, show that the following is NOT valid on *epistemic models with (only) 2 agents a and b:*

$$(K_a K_b \phi \wedge K_b K_a \psi) \Rightarrow Ck(\phi \wedge \psi)$$

* = The representation of the world
P = ϕ
Q = ψ

The epistemic model holds the beliefs that both a and b know P and Q, but they are not sure whether they know the fact that both a and b know P and Q.

a, b

a, b

a

b

a, b

*P, Q

P

Q