Computationele logica

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Exercise 1

A robot is in a war zone. It doesn't know its location, but all it cares is whether or not there is a mine in front (m), and whether or not there is an enemy approaching (e).

1. *Represent the robot's belief-revision structure using a single-agent plausibility model.*

2. *Suppose now that the robot's sensors indicate some vibrations.*

3. *Immediately after the event in the previous part, the robot's metal detector indicates the presence of a mine.*

4. *Immediately after the previous two events, the robot receives a message from its controller, saying that: "(Right now, your vibration detector malfunctions, so)* **Whatever you currently believe about the enemy (approaching or not) is false."**

   $\varphi := Be \rightarrow \neg e \wedge B\neg e \rightarrow e$

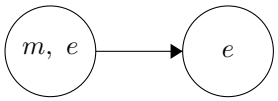
   This is true in states: 1 and 3.

5. *Assume that the controller is known to be infallible, and so that the robot performs an update with the announced sentence. Represent the robots's*

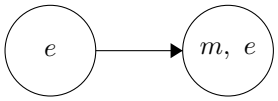
new belief structure (as a plausibility model) after this update. What does the robot believe about e and m after the update?

6. *What would have been the final belief structure (plausibility model) of the robot if the above three events happened in a different order, namely: first the robot received the above message from the (infallible) controller, then its (strongly trusted) sensor indicated vibrations (hence enemies), and then its (strongly trusted) metal detector indicated a mine?*

   After the infallible controller message, and after the sensor indicated vibrations:



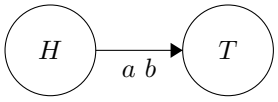
   After the mine presence was detected:



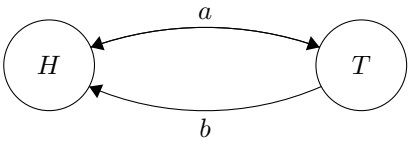
Exercise 2

A covered coin is on the table, lying either Heads up (H) or Tails up (T). There are two agents, Alice and Bob, and it is common knowledge that neither of them can see the coin, but that for some reason they both believe that the coin lies Tails up.

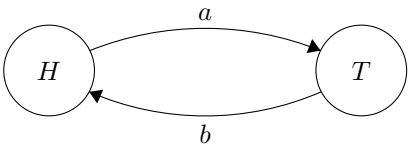
1. *Draw a multi-agent plausibility model M0 (with two agents, a for Alice and b for Bob, and atomic sentence H and T) to accurately represent all the information above.*



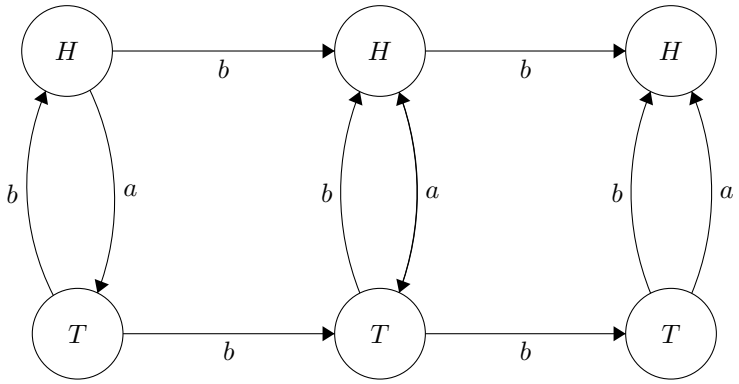
2. *Some external referee publicly announces: "The coin lies Heads up". It is common knowledge that: Bob strongly trusts the referee, but that Alice is neutral towards the referee (neither trusts nor distrusts him).*



3. *Represent (draw) a model for the situation after the action described in the previous part.*



4. *Represent this action as an event plausibility model.*



5. *Starting from the original situation (in part 1), suppose the action that we described in the previous part happens.*