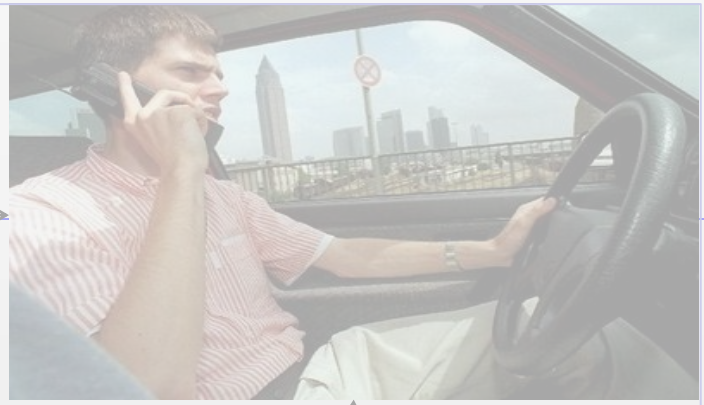

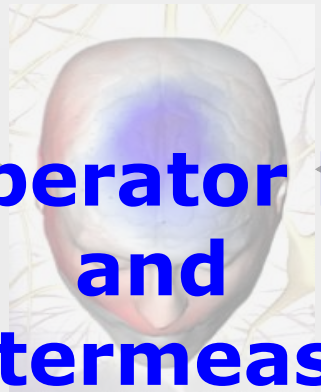

Rationality of Operator Percept-Actions and Countermeasures

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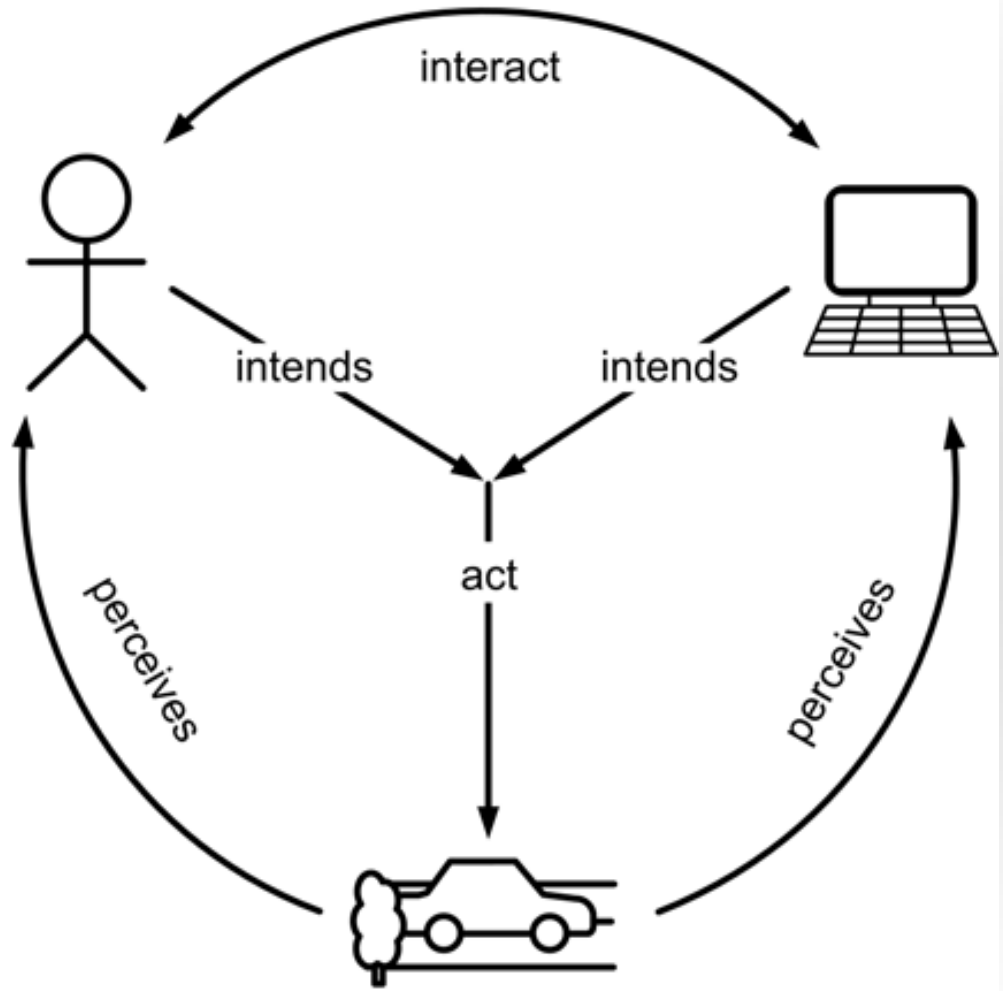
Scenario of Interest: Cooperative Control

Löper, Ch., Kelsch, J., Flemisch, F.O.,2008

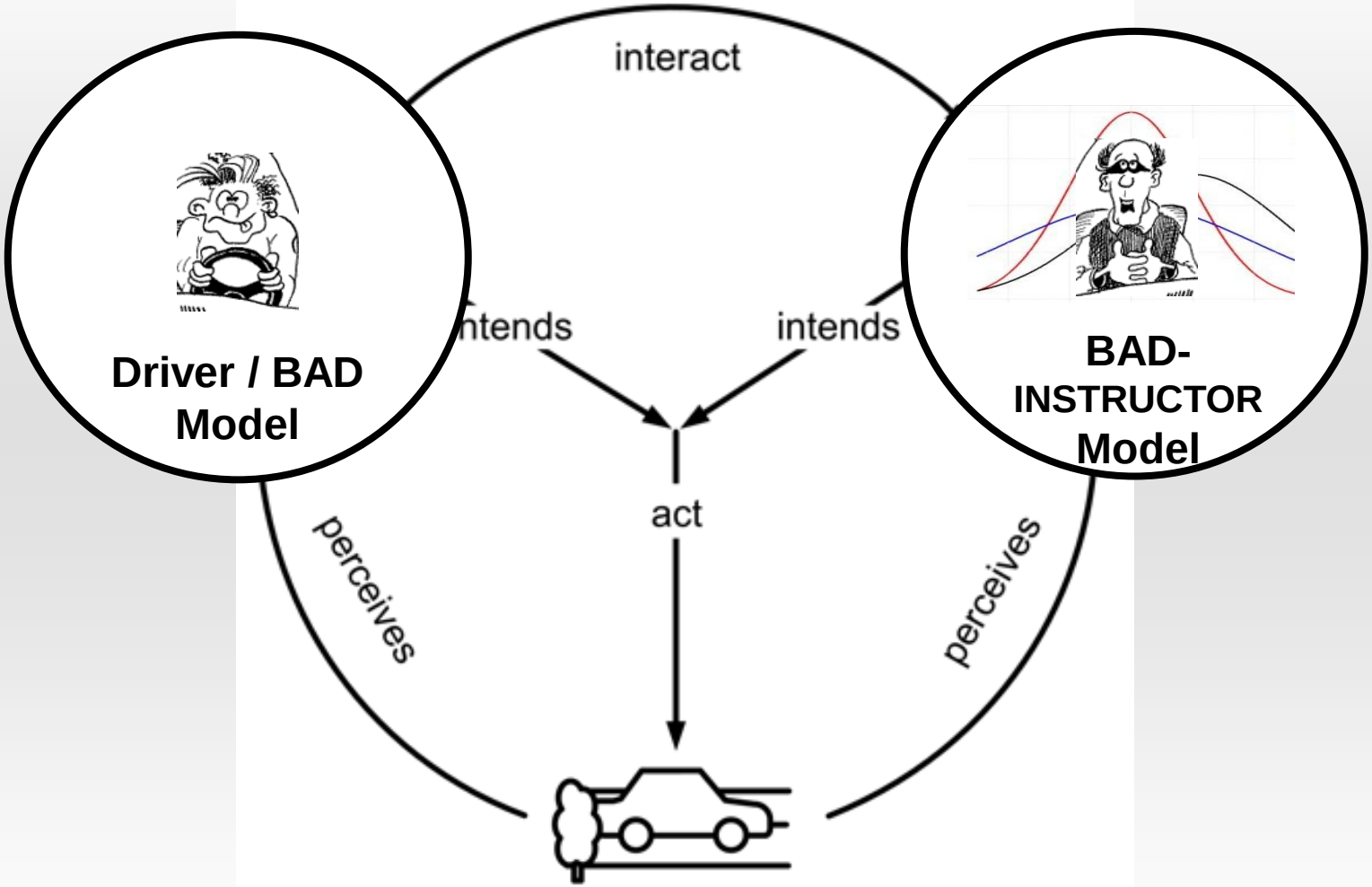
Human Driver



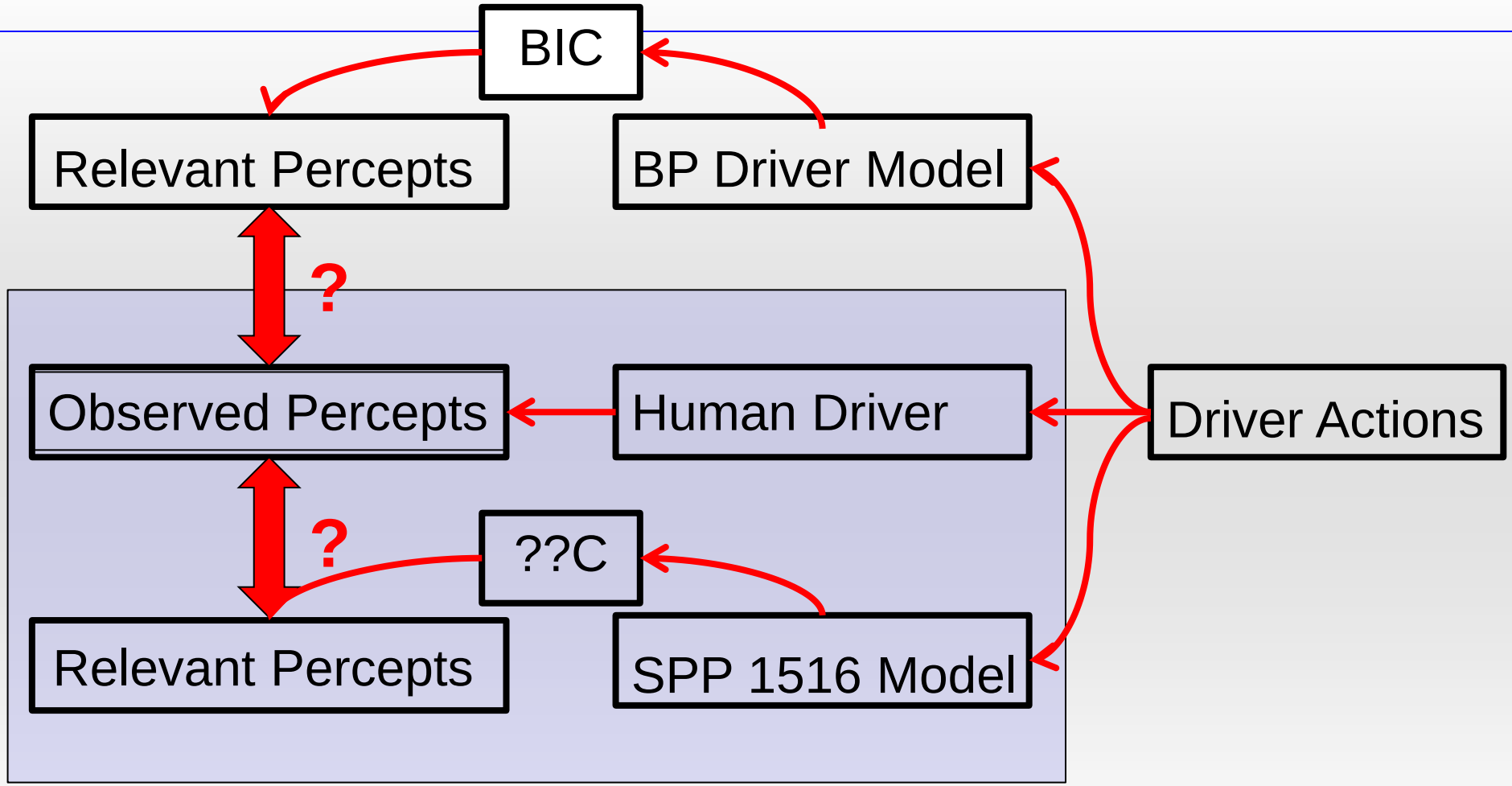
Partial
Autonomous
Assistant
System

Scenario of Interest: Compensatory Control

Löper, Ch., Kelsch, J., Flemisch, F.O.,2008

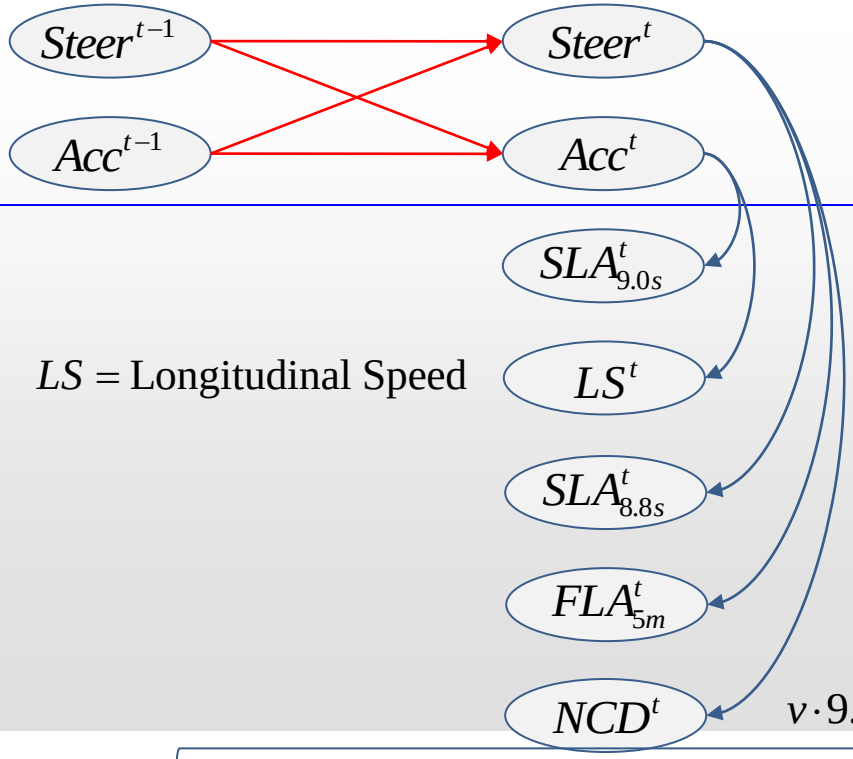


1. Research Idea: Rational Percept-Actions

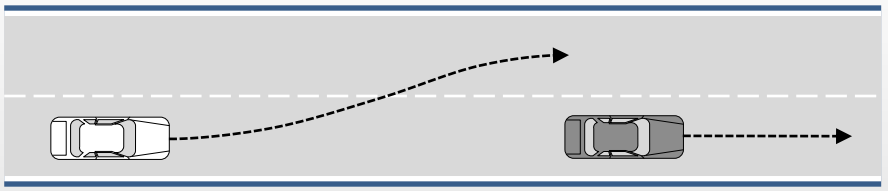


hard constraint: inferences each 50 msec for BP Driver Model.

Action-model: *PassOut*



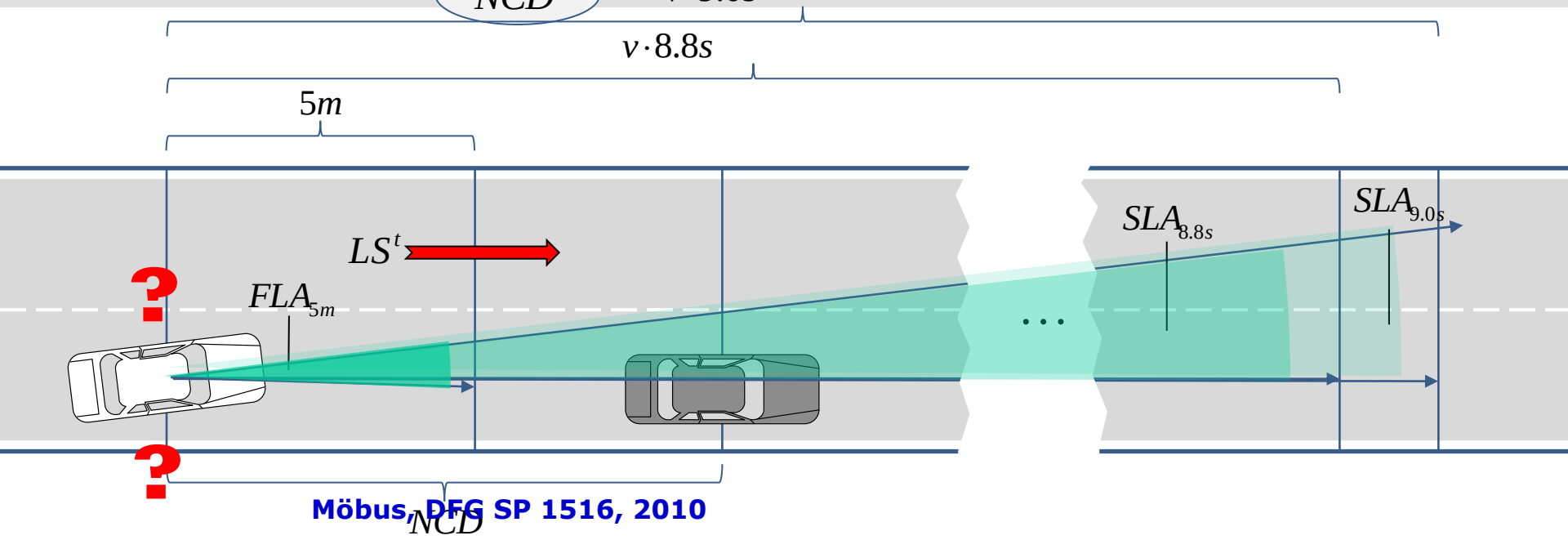
LS = Longitudinal Speed



Questions:

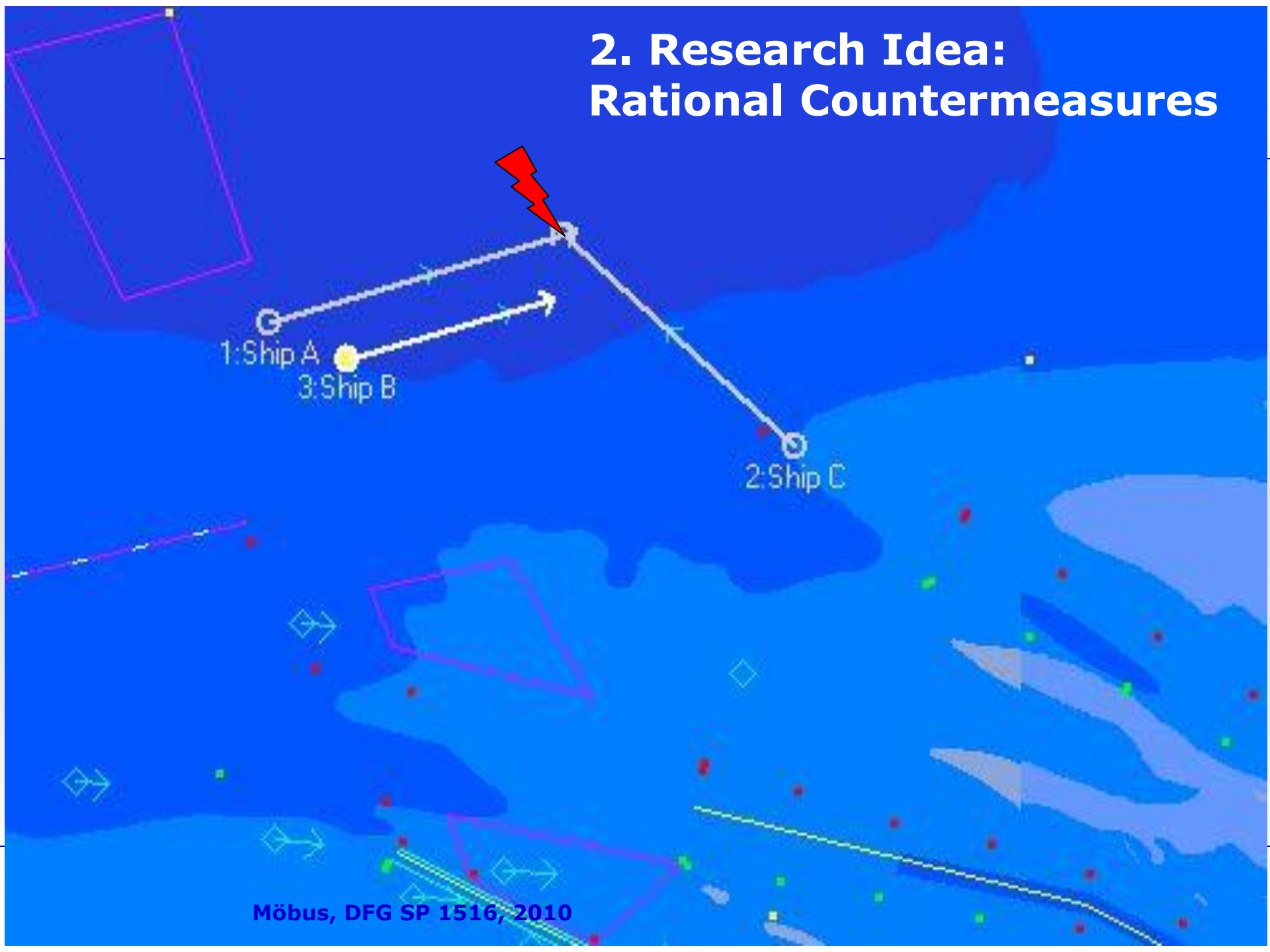
$$P\left(Steer^{t} \mid Steer^{t-1}, Acc^{t-1}, ..., p_{A_{PO}}, d_{A_{PO}}\right)$$

$$P\left(Acc^{t} \mid Steer^{t-1}, Acc^{t-1}, ..., p_{A_{PO}}, d_{A_{PO}}\right)$$

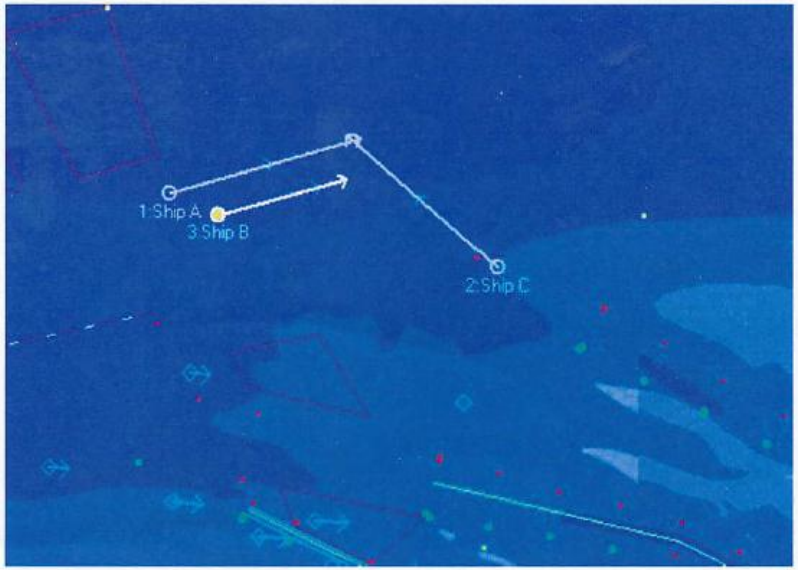


Möbus, DFG SP 1516, 2010

2. Research Idea: Rational Countermeasures



Möbus, DFG SP 1516, 2010



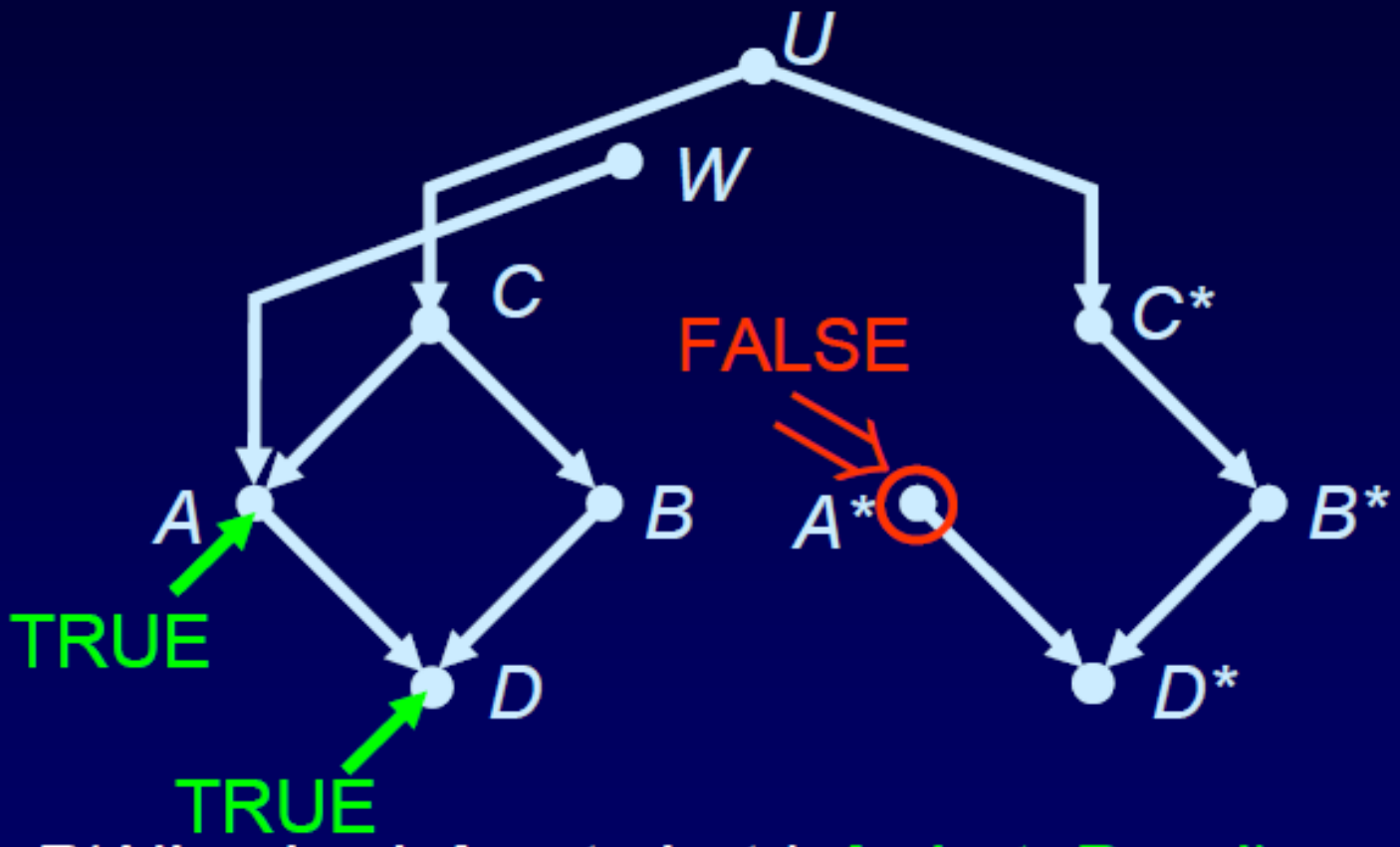
Scenario:

- Vessel A is in conflict with C; A has to give way, C has to keep course and speed.
- B can keep course and speed, no conflict with A or C.
- A can choose to reduce the speed or to alter course to starboard. Reducing speed (depending on the vessel) in most cases is not effective. A has to alter course and will create a conflict with B or has to make a full turn to portside.
- The situation is monitored by VTS and in some cases (depending on national regulations) VTS has the right to override the rules of the road for A, B and C.

An information-exchange and cooperation between the participating vessels could have helped in the past to avoid the situation:

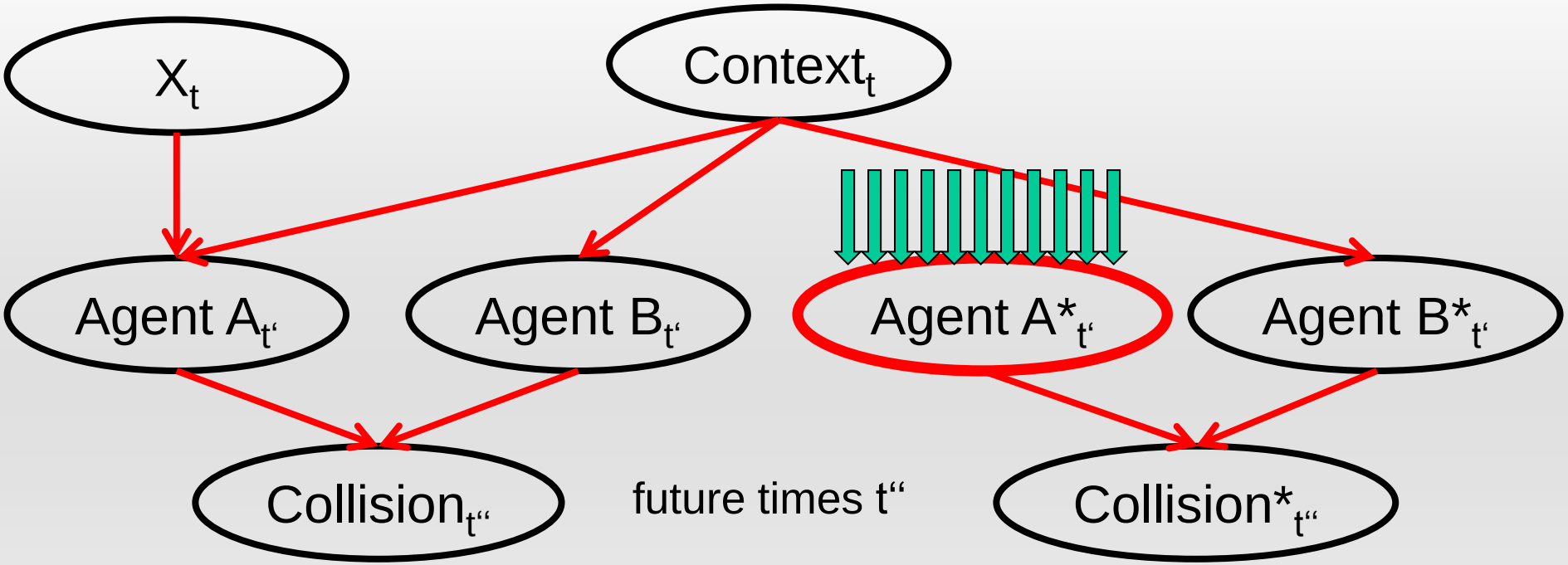
- For all vessels information about manoeuvring abilities (including navigational status) of the participants are of interest.
- For C it is essential to know, if A intents to follow the ENE-course (i) or if A will alter course in a few minutes to NNW to follow the NNW-going lane (ii). In case (i) C has to observe if A follows the colregs or not. In case (ii) A and C will proceed on parallel courses.
- For A it is helpful to know if B will follow the ENE-course or if B soon will turn to south into the fairway.
- In case A has to give way to C it is helpful for A to know if B will assist by altering course to starboard as well.
- Information about the next waypoints and the intended routes of the vessels might have helped to avoid the problem already in the past.
- In all cases it is essential for the VTS to gain all information of intended routes and planned manoeuvres.

PROBABILITY OF COUNTERFACTUALS
THE TWIN NETWORK



P(Alive had *A* not shot | *A* shot, Dead) =
P(¬*D*) in model <$M_{\neg A}$, *P*(*u*,*w*|*A*,*D*)> =
P(¬*D**|*D*) in twin-network

Evaluating Countermeasures with Pearl's Twin Network



$$P(Collision^*_{t''} \mid Agent\ A^*_{t'}, Collision_{t''})$$


Thank You for Your Attention