



HAL
open science

Implementing an implicit false belief task by cascading situation assessment with UNDERWORLDS

Yoan Sallami, Séverin Lemaignan, Aurélie Clodic, Rachid Alami

► To cite this version:

Yoan Sallami, Séverin Lemaignan, Aurélie Clodic, Rachid Alami. Implementing an implicit false belief task by cascading situation assessment with UNDERWORLDS. Workshop "toward a Framework for Joint Action" at Robotics Science and Systems (RSS 2018), Jun 2018, Pittsburg, United States. 2018. hal-02925962

HAL Id: hal-02925962

<https://hal.science/hal-02925962>

Submitted on 31 Aug 2020

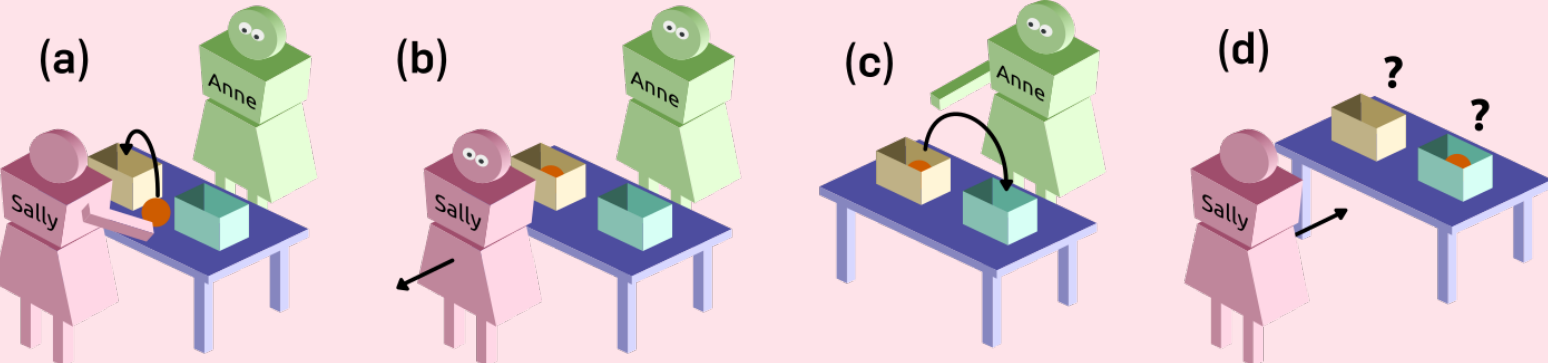
HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Implementing an implicit false belief task^[1] by cascading situation assessment with UNDERWORLDS^[2]

Y. Sallami, S. Lemaignan, A. Clodic, R. Alami

From the classic false belief task

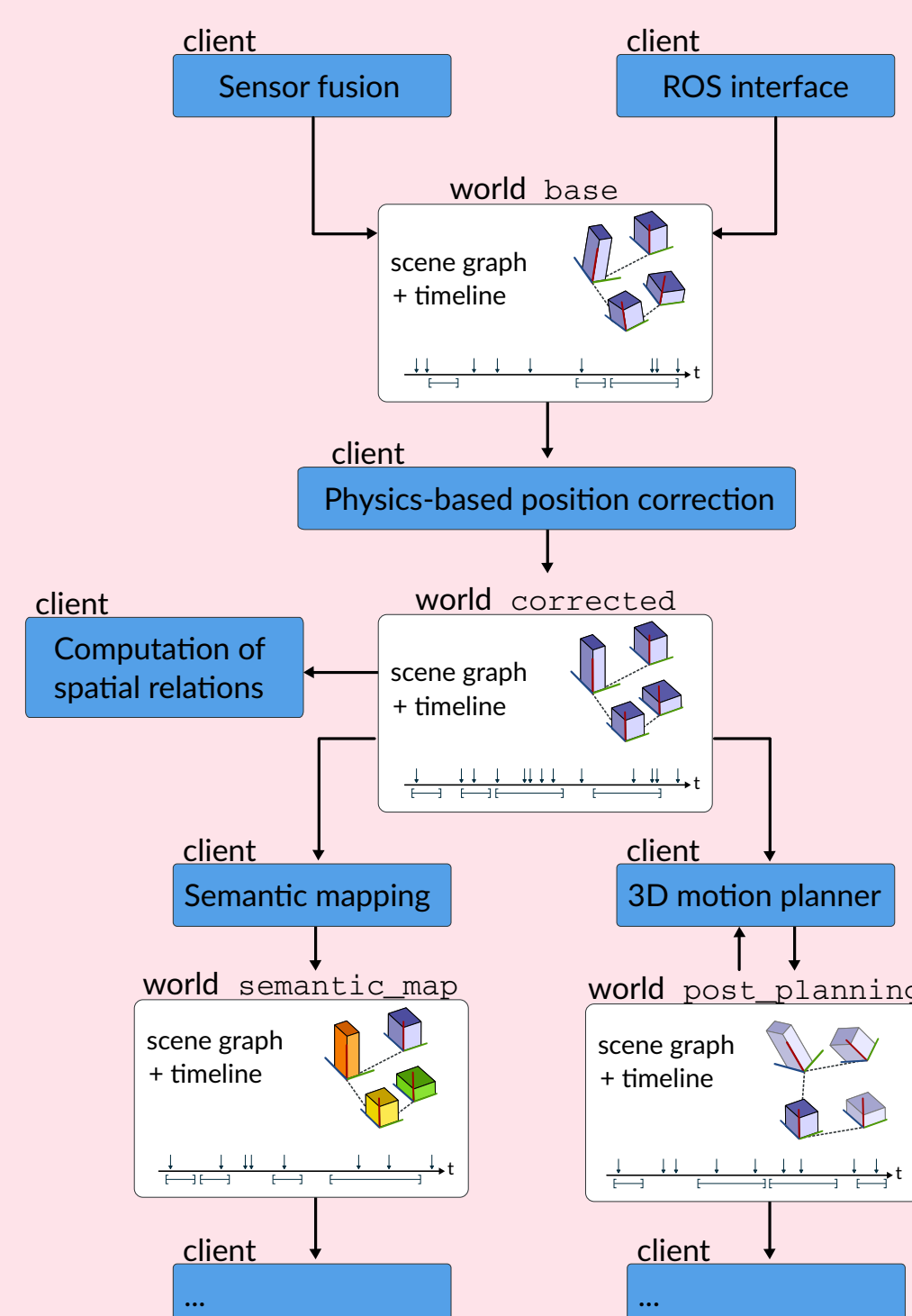


Theory of Mind, how we understand others mental states, have been well studied in psychology. Recently it has been used for human robot collaboration because understanding others intentions and beliefs is a key capability for robots in order to interact with humans. However, inferring and reasoning about mental states during a Human-Robot interaction remains difficult.

We present here how we apply Theory of Mind by implementing an implicit false belief task with UNDERWORLDS. In this task we explicitly maintain alternative world states associated to the beliefs of the humans and we show the interest of this approach.

...to cascading situation assessment

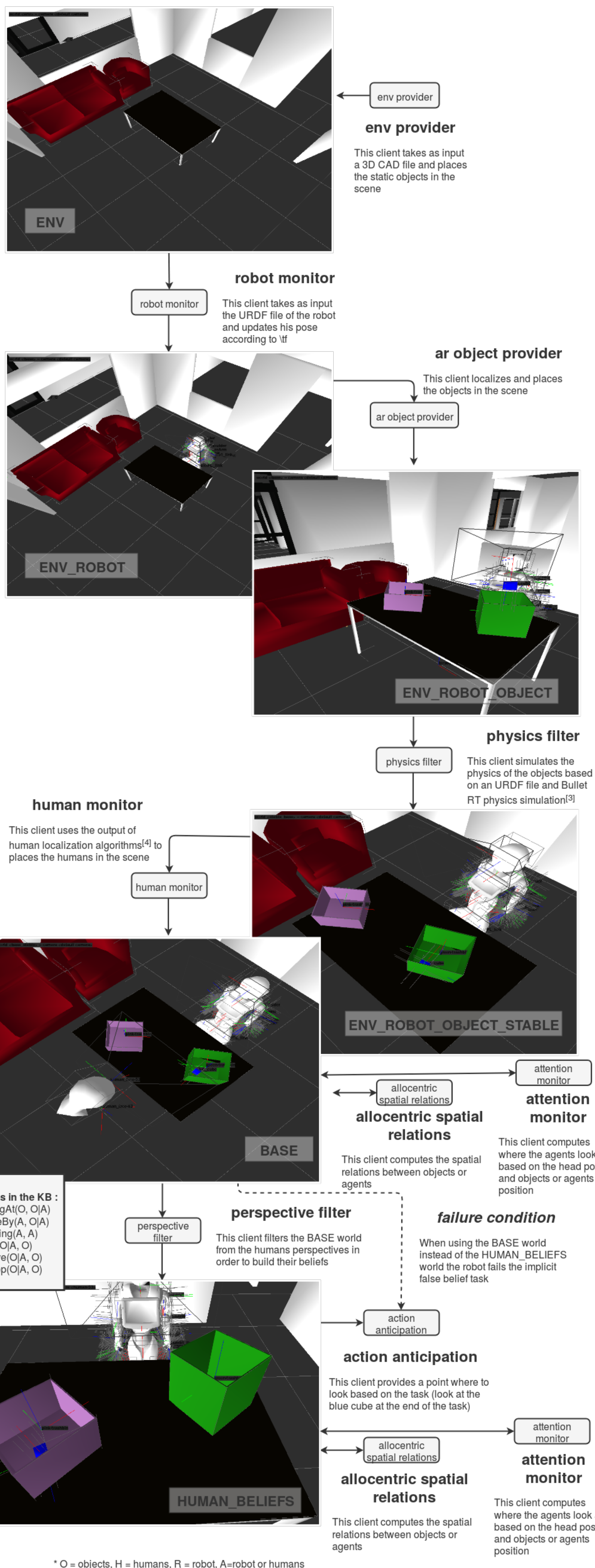
UNDERWORLDS, is a novel lightweight framework for cascading spatio-temporal situation assessment in robotics. UNDERWORLDS allows programmers to represent the robot's environment as real-time distributed data structures, containing both scene graphs (for representation of 3D geometries) and timelines (for representation of temporal events). UNDERWORLDS supports cascading representations: the environment is viewed as a set of worlds that can each have different spatial and temporal granularities, and may inherit from each other. UNDERWORLDS also provides a set of high-level client libraries and tools to introspect and manipulate the environment models.



Let's play together !

How could you simply compute the common ground between the actor and the robot from the task at right ?

By only using the clients presented at right, how could you implement a higher order Theory of Mind task ?



* O = objects, H = humans, R = robot, A=robot or humans



(a) The experimenter puts the cube in the box



(b) The actor leaves the room



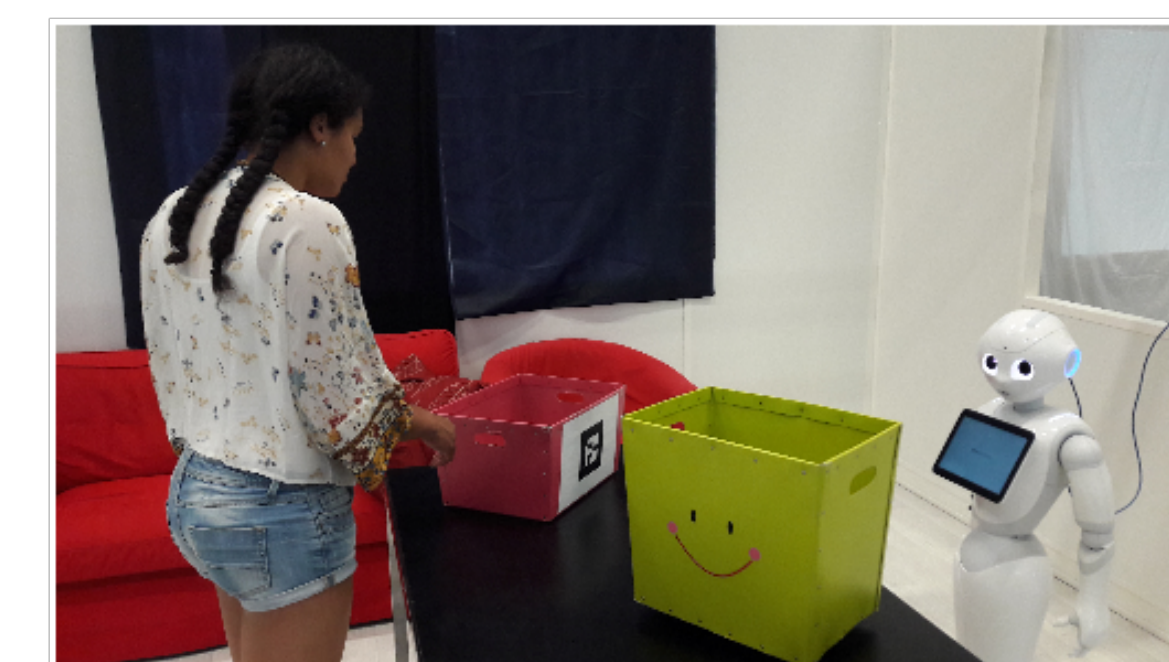
(c) The experimenter changes the cube location



(b) The actor reaches the box



Success : The robot looks where the actor last saw the cube



Failure : The robot looks at the actual position of the cube

Contact

Yoan Sallami
yoan.sallami@laas.fr
+33 561336348

LAAS CNRS - 7, avenue du Colonel Roche BP 54200
Toulouse 31031 cedex 4, FR



<https://github.com/underworlds-robot>

[1] V. Southgate, A. Senju, and G. Csibra. "Action anticipation through attribution of false belief by 2-year-olds." Psychological Science, vol. 18, no. 7, pp. 587-592, 2007.

[2] S. Lemaignan, Y. Sallami, C. Wallbridge, A. Clodic and R. Alami, "UNDERWORLDS : Cascading situation assessment for robots" under review IROS. 2018.

[3] E. Coumans. "Bullet physics engine." Open Source Software: <http://bulletphysics.org>, 2010.

[4] V. Khalidov and J.-M. Odobez, "Real-time multiple head tracking using texture and colour cues," Idiap, Idiap-RR Idiap-RR-02-2017, 2 2017.



This research is funded by the
EU H2020 project MuMMER (grant 688147)