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On robot decisional abilities for human-robot joint action

Aurélie Clodic, Séverin Lemaignan, Amit Kumar Pandey, Lavindra de Silva, Mathieu Warnier, Rachid Alami
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Questions for a robot which collaborates with humans:
What, who, where, when, how ?



Integrative approach for a robot that acts in interaction with humans

Work on Collaborative / Interactive task achievement

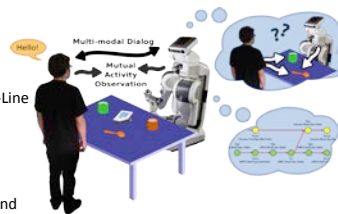
- based on a study of human-robot interaction
- inspired from Joint activity / Teamwork
- concretized as a set of robot decisional abilities

is progressively producing a coherent basis for **Joint Human-Robot Activity**

A Task Oriented Architecture

- **Task-Oriented:** How to perform a task, in presence or in interaction with humans, in the best possible way
 - Efficiency
 - Safety
 - Acceptability
 - Intentionality
- **Plan-Based:** Planning and On-Line Deliberation
 - Reasoning
 - Anticipation
 - Pro-active behaviour
- **Theory of Mind** – Predicting and reasoning about human activity and mental state

H&R Sharing Task and Space

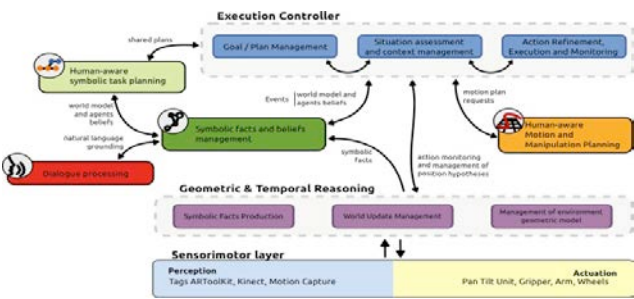


Building a « good » plan

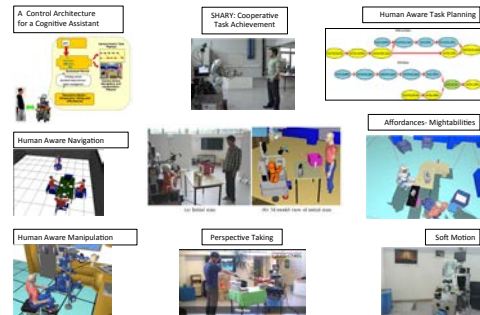
- Managing Joint task achievement
- Legibility of robot actions and intentions (intentionality)
- Acceptability of robot actions
- Compliance with "conventions"
- Coherent attitudes and behaviours

=> Constraints on robot plans

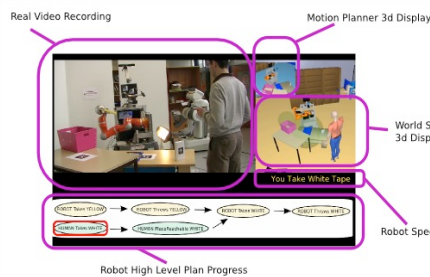
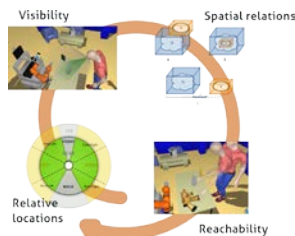
Robot Decisional Architecture



Decisional Ingredients



Perspective-taking and geometric reasoning



Facts related to objects, robot and human (from the robot perspective)

(a) Initial state		(b) 3d model view of initial state	
ROBOT	FINE_TASDBIN isReachable false	HUMAN1	FINE_TASDBIN isReachable true
WALL_TAPE	isReachable false	WALL_TAPE	isReachable true
SOFT_TAPE	isReachable true	SOFT_TAPE	isReachable false
GREY_TAPE	isReachable false	GREY_TAPE	isReachable true
WALL_TAPE	isInvisible true	WALL_TAPE	isInvisible true
SOFT_TAPE	isInvisible true	SOFT_TAPE	isInvisible true
GREY_TAPE	isInvisible true	GREY_TAPE	isInvisible true
WALL_TAPE	isOn TABLE	WALL_TAPE	isOn TABLE
SOFT_TAPE	isOn TABLE	SOFT_TAPE	isOn TABLE
GREY_TAPE	isOn TABLE	GREY_TAPE	isOn TABLE

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