

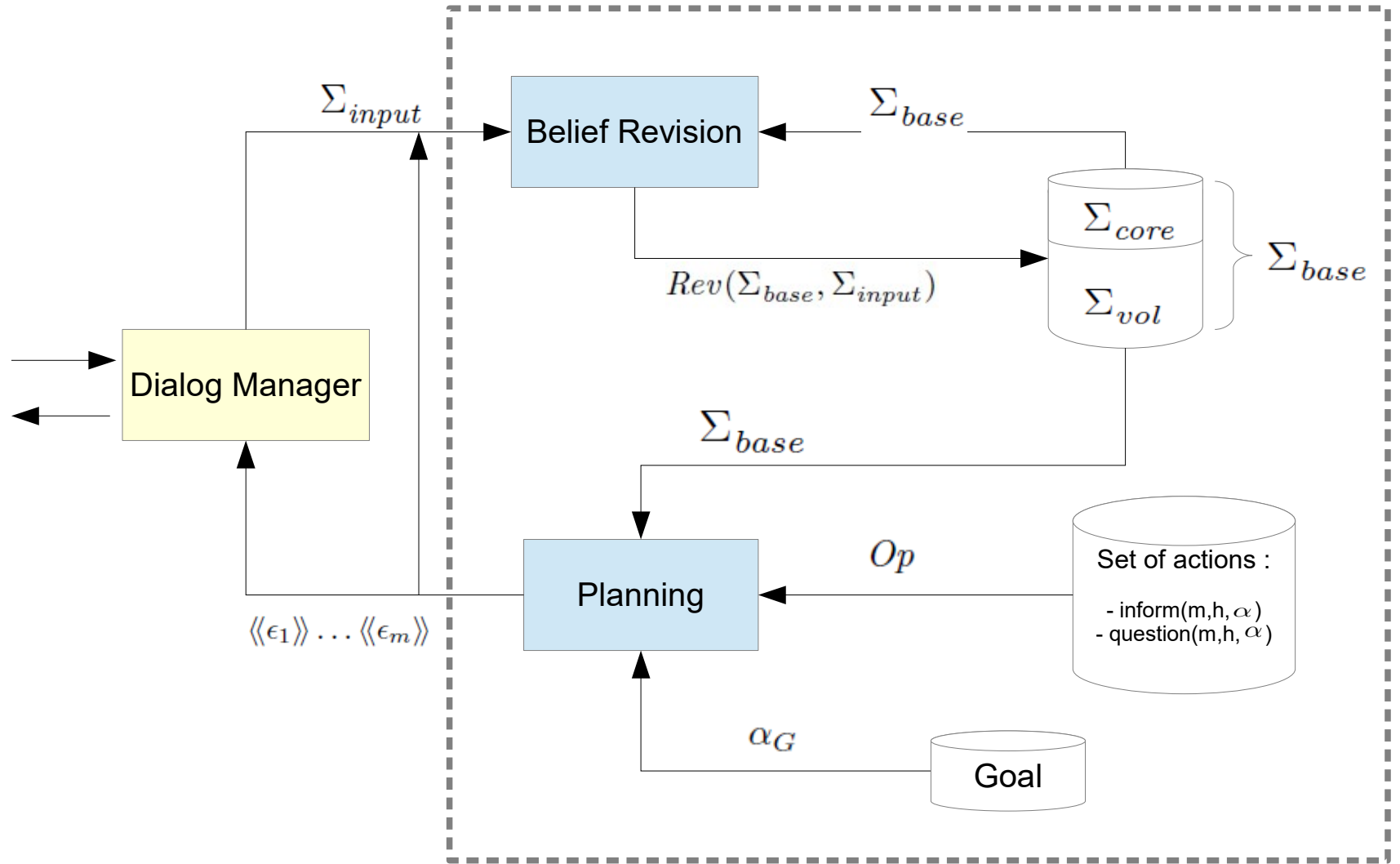
# COGNITIVE PLANNING FOR PERSUASION

Jorge Fernandez Davila

Supervisor : Emiliano Lorini  
Co-supervisor : Frédéric Maris

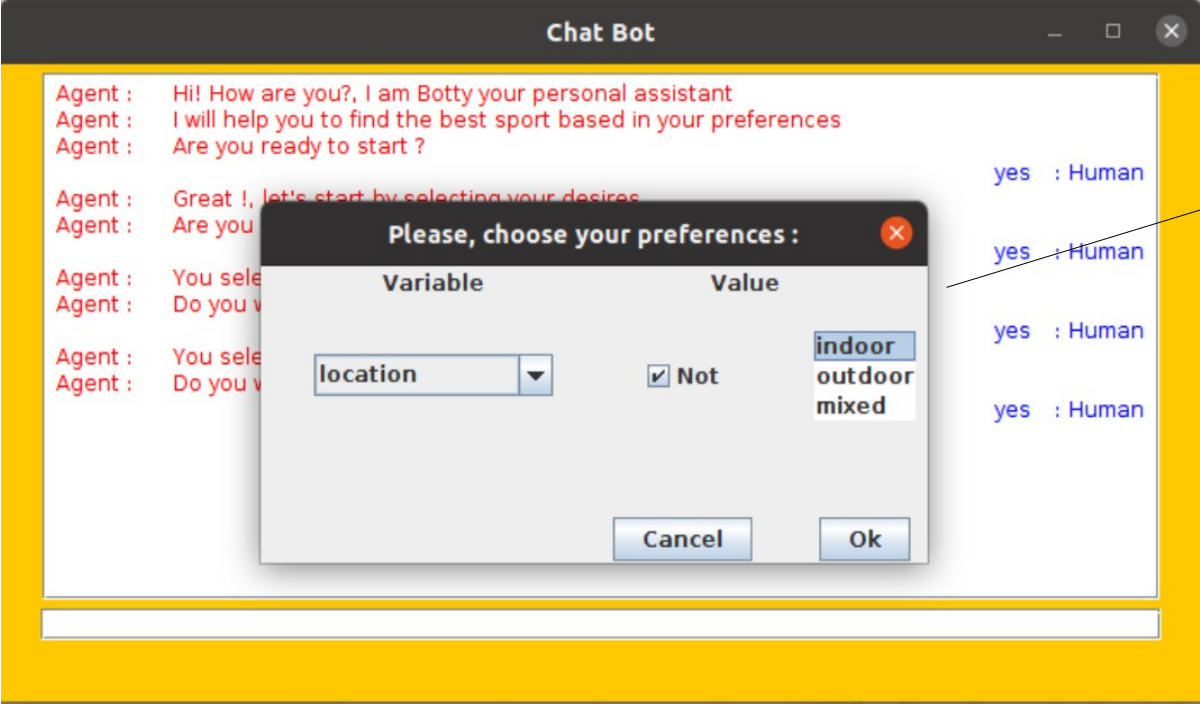
CoPains meeting, 05<sup>th</sup> July 2021

# SYSTEM ARCHITECTURE (Artificial Assistance)



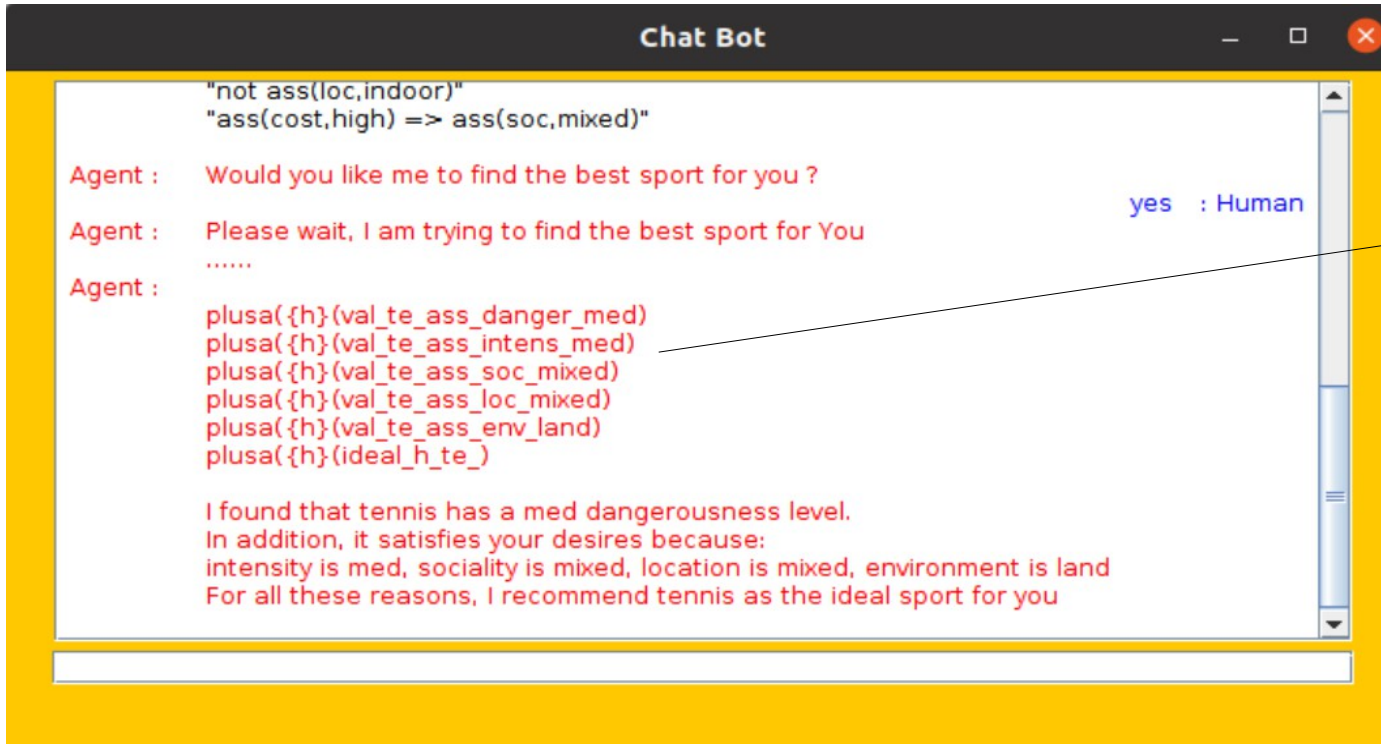
Artificial Agent

# Artificial Assistance (demo)



Artificial agent captures the human's preferences through an interactive process.

## Artificial Assistance (demo)



```
"not ass(loc,indoor)"
"ass(cost,high) => ass(soc,mixed)"

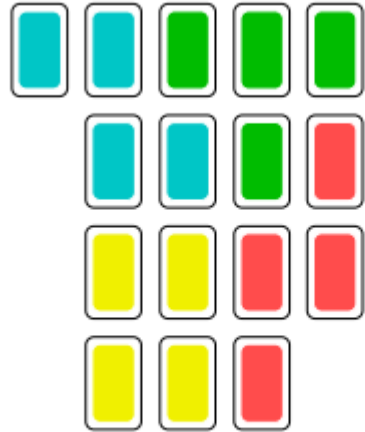
Agent : Would you like me to find the best sport for you ?
Agent : Please wait, I am trying to find the best sport for You
.....
Agent :
plusa({h})(val_te_ass_danger_med)
plusa({h})(val_te_ass_intens_med)
plusa({h})(val_te_ass_soc_mixed)
plusa({h})(val_te_ass_loc_mixed)
plusa({h})(val_te_ass_env_land)
plusa({h})(ideal_h_te_)

I found that tennis has a med dangerousness level.
In addition, it satisfies your desires because:
intensity is med, sociality is mixed, location is mixed, environment is land
For all these reasons, I recommend tennis as the ideal sport for you
```

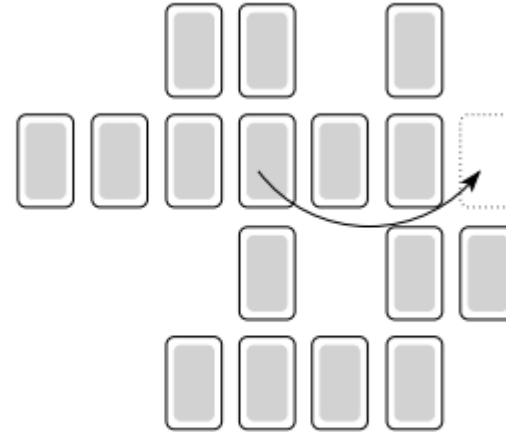
The artificial agent performs the cognitive planning process and generates an abstract plan.

The interface reads the plan, translates it into natural language and shows it to the human.

# Yokai Board Game



(a) Winning configuration



(b) Illegal move

1. to look at two cards privately (2 actions),
2. to move one card from its current position to a new position adjacent to another card (that is, linked to the latter by one of its sides) and without separating the cards into two disjointed groups,
3. either to activate a hint from the set of available hints (see next paragraph) or to disclose an information by marking one card with an active hint.

# Yokai Board Game

We first define the language  $\mathcal{L}_0(ATM)$  by the following grammar in BNF:

$$\alpha ::= p^t \mid \Delta_{\mathfrak{h}}^t \alpha \mid now^{\geq t} \mid \neg \alpha \mid \alpha_1 \wedge \alpha_2 \mid \Delta_{\mathfrak{m}} \alpha,$$

$$\begin{aligned} \mathcal{L}_0^T(ATM) = & \{p^t : p \in ATM \text{ and } t \in \mathbb{N}\} \cup \\ & \{\Delta_{\mathfrak{h}}^t \alpha : \alpha \in \mathcal{L}_0(ATM) \text{ and } t \in \mathbb{N}\} \cup \\ & \{now^{\geq t} : t \in \mathbb{N}\}. \end{aligned}$$

The language  $\mathcal{L}(ATM)$  extends the language  $\mathcal{L}_0(ATM)$  by a modal operator of implicit belief for agent  $\mathfrak{m}$  and is defined by the following grammar:

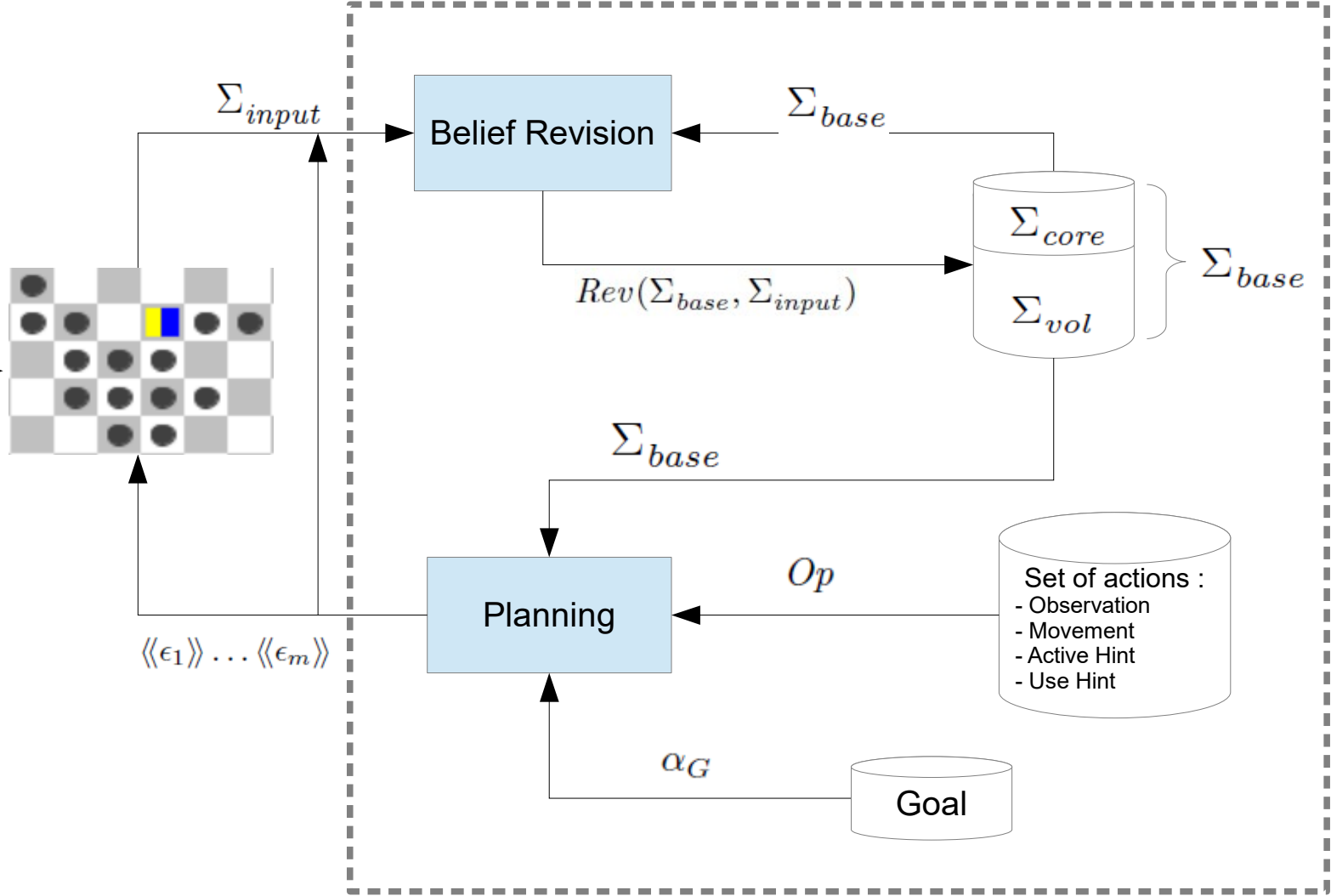
$$\varphi ::= \alpha \mid \neg \varphi \mid \varphi_1 \wedge \varphi_2 \mid \Box_{\mathfrak{m}} \alpha,$$

$$\varphi ::= \alpha \mid \neg \varphi \mid \varphi_1 \wedge \varphi_2 \mid \Box_{\mathfrak{m}} \alpha \mid [+_{\mathfrak{m}}^t \alpha] \varphi$$

$\mathfrak{m}$  = the machine  
 $\mathfrak{h}$  = the human agent



# SYSTEM ARCHITECTURE (YOKAI)



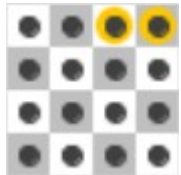
Artificial Agent



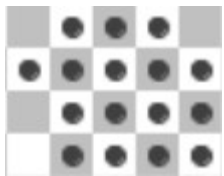
# Yokai Board Game (demo)

Machine round

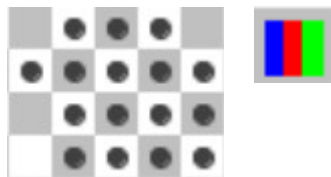
t1



t2

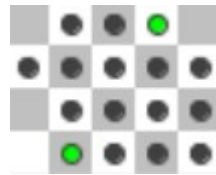


t3

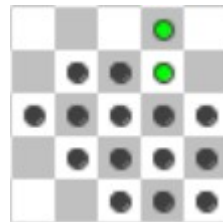


Human round

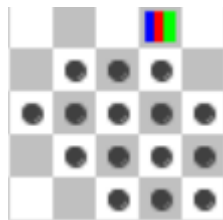
t4



t5

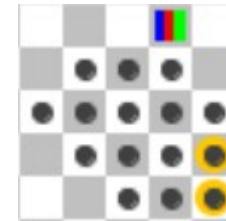


t6

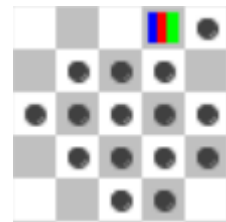


Machine round

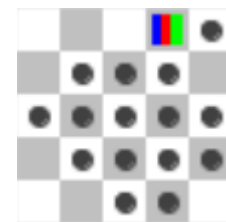
t7



t8



t9

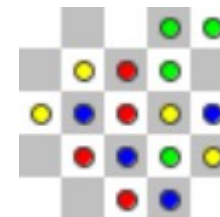
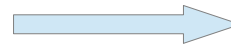


Player observes two cards privately

Player moves a card

Player uses or activates a hint

Current state of the game at time t9



# Yokai Board Game

## Requirements.

a player must have beliefs about:

- the other player's actual beliefs (*ToM reasoning*);
- the current positions of the cards and the executable card movements, given the current spatial configuration of the game (*spatial reasoning*);
- the color of the cards she/it observed in the past as well as the other player's past observations (*temporal reasoning*).