



# Modeling a collaborative task with social commitments

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# Context

## Task

**Document retrieval** on a thematic search engine

## Requirement

Expert **assistance** to carry out the task

# Context

## Goal

Design a **collaborative** agent for a document retrieval task.

## Approach

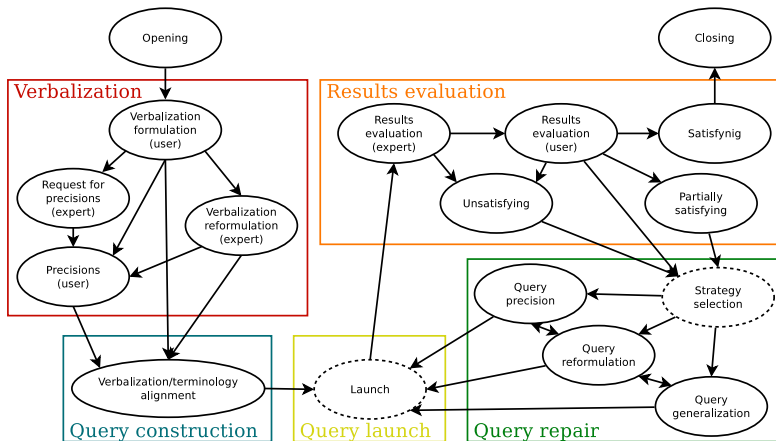
Use **dialogic interactions** for collaborative document retrieval.

## Challenges

- **Formalize** the interactions with the user
- **Model** the task using the formalism of the interactions
- **Deliberate** to take initiative to carry out the task

# 1. Scenario of the collaborative document retrieval task

# Collaborative document retrieval task



How to switch from one step to another?

## 2. Formal model of the interaction to describe a collaborative document retrieval task

# Social commitments and conversational gameboard

## Social commitments<sup>1</sup>

Social commitments are commitments that bind a speaker to his interlocutors. “ $x$  is committed on the proposition  $p$ ” is in state

$$s: C(x, p, s)$$

## Conversational gameboard

$T_i$  describes the state of the dialogue at time  $i$

$$T_i \text{ contains } c: T_i \models c$$

$T_i$  fulfills the conditions to emit the predicate  $E$ :  $T_i \vdash E$

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<sup>1</sup>Munindar P. Singh. “Social and psychological commitments in multiagent systems”. *AAAI Fall Symposium on Knowledge and Action at Social and Organizational Levels*. 1991.

# Dialogue games<sup>2</sup>

## Dialogue game

Bounded joint activity between an **initiator** and a **partner** defined with expected dialogic moves and social commitments

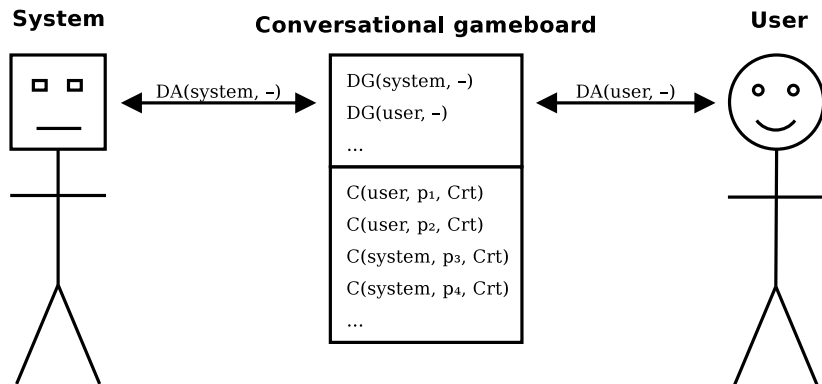
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<sup>2</sup>Nicolas Maudet. “Modéliser l’aspect conventionnel des interactions langagières: la contribution des jeux de dialogue”. *Thèse de doctorat en informatique*. 2001.



└ Formal model of the interaction to describe a collaborative document retrieval task

# Human-machine interaction



└ Formal model of the interaction to describe a collaborative document retrieval task

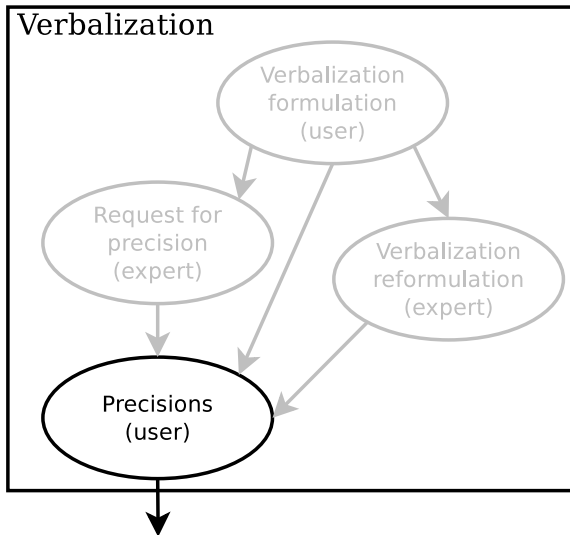
## Step tables

<b>⟨Name of the step⟩</b>	
<b>Access</b>	$\wedge \left  \begin{array}{l} T_i \models C(z, p, s_1) \\ T_i \vdash E \end{array} \right.$
<b>Expected game</b>	$DG_1(z, p_1)$
<b>Trigger</b>	$T_i \vdash E_1$
<b>Output</b>	$T_{i+1} \models C(z, p_1, s)$
<b>Expected game</b>	$DG_2(z, p_2)$
<b>Trigger</b>	$T_i \vdash E_2$
<b>Output</b>	$T_{i+1} \models C(z, p_2, s)$

Generic step table

### 3. Formalization of the scenario with the model

# Verbalization precision



## Example of step table from the scenario

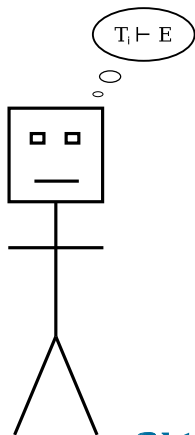
Verbalization precision	
<b>Access</b>	$T_i \models C(\text{user}, \text{preciseVerbalization}, \mathbf{Crt})$
<b>Expected game</b>	$\text{inform}(\text{user}, \text{verbalizationExpression}(\text{expr}))$
<b>Output</b>	$\wedge \begin{cases} T_j \models C(\text{user}, \text{verbalizationExpression}(\text{expr}), \mathbf{Crt}) \\ T_j \models C(\text{user}, \text{preciseVerbalization}, \mathbf{Ful}) \end{cases}$
<b>Expected game</b>	$\text{inform}(\text{user}, \text{verbalizationComplete})$
<b>Output</b>	$T_j \models C(\text{user}, \text{verbalizationComplete}, \mathbf{Crt})$

Verbalization precision step,  $i < j$

# Triggers

Triggers correspond to predicates deduced in  $T_i$ .

They define the “reasoning process” of the system.



### Query precision

<b>Access</b>	∧	$T_i \models C(\text{user}, \neg \text{queryResultsSatisfying}(q), \mathbf{Crt})$ $T_i \vdash \text{lastQueryLaunched}(q)$ $T_i \vdash \text{queryTooGeneral}(q)$
<b>Expected game</b>		$\text{inform}(\text{user}, \text{queryKeyWord}(kw))^{[s]}$
<b>Output</b>		$T_j \models C(\text{user}, \text{queryKeyWord}(kw), \mathbf{Crt})^{[s]}$
<b>Expected game</b>		$\text{request}(\text{user}, \text{launchQuery}(q))$
<b>Output</b>		$\text{acceptRequest}(\text{system}, \text{launchQuery}(q)) \Rightarrow T_j \models C(\text{system}, \text{launchQuery}(q), \mathbf{Crt})$
<b>Expected game</b>		$\text{offer}(\text{system}, \text{addKeyWord}(kw))^{[s]}$
<b>Trigger</b>		$T_i \vdash \text{relevantForPrecision}(kw)$
<b>Output</b>	∨	$\text{acceptOffer}(\text{user}, \text{addKeyWord}(kw)) \Rightarrow T_j \models C(\text{system}, \text{queryKeyWord}(kw), \mathbf{Crt})^{[s]}$ $\text{declineOffer}(\text{user}, \text{addKeyWord}(kw)) \Rightarrow T_j \models C(\text{system}, \text{addKeyWord}(kw), \mathbf{Fal})^{[s]}$
<b>Expected game</b>		$\text{offer}(\text{system}, \text{specifyKeyWord}(kw, skw))^{[s]}$
<b>Trigger</b>		$T_i \models C(z, \text{queryKeyWord}(kw), \mathbf{Crt}) \wedge T_i \vdash \text{specification}(kw, skw)$
<b>Output</b>	∨	$\text{acceptOffer}(\text{user}, \text{specifyKeyWord}(kw, skw)) \Rightarrow \wedge \begin{cases} T_j \models C(\text{system}, \text{queryKeyWord}(skw), \mathbf{Crt})^{[s]} \\ T_j \models C(\text{system}, \text{queryKeyWord}(kw), \mathbf{Ina})^{[s]} \end{cases}$ $\text{declineOffer}(\text{user}, \text{specifyKeyWord}(kw, skw)) \Rightarrow T_j \models C(\text{system}, \text{specifyKeyWord}(kw, skw), \mathbf{Fal})^{[s]}$
<b>Expected game</b>		$\text{offer}(\text{system}, \text{specifyKeyWord}(kw, skw))$
<b>Trigger</b>		$\downarrow \text{inform}(\text{system}, \text{isSpecification}(kw, skw))$
<b>Output</b>		$\emptyset$
<b>Output</b>		$T_j \models C(\text{system}, \text{isSpecification}(kw, s), \mathbf{Crt})$
<b>Expected game</b>		$\text{offer}(\text{system}, \text{launchQuery}(q))^{[s]}$
<b>Trigger</b>		$T_j \not\models C(\text{system}, \text{launchQuery}(q), \mathbf{Fal}) \wedge T_i \vdash \text{queryPreciseEnough}(q)$
<b>Output</b>	∨	$\text{acceptOffer}(\text{user}, \text{launchQuery}(q)) \Rightarrow T_j \models C(\text{system}, \text{launchQuery}(q), \mathbf{Crt})$ $\text{declineOffer}(\text{user}, \text{launchQuery}(q)) \Rightarrow T_j \models C(\text{system}, \text{launchQuery}(q), \mathbf{Fal})^{[s]}$

## Relevant for precision

relevantForPrecision( $kw$ ):

$$\begin{aligned} &\exists q, \text{currentQuery}(q), \text{queryResultsNb}(q) > \text{queryResultsNb}(q + kw), \\ &\nexists j, T_j \models C(-, \text{queryKeyWord}(kw), \mathbf{Crt}), \\ &\nexists k, T_k \models C(\text{user}, \text{addKeyWord}(kw), \mathbf{Fal}) \end{aligned}$$

$\Rightarrow$  trigger = deliberative process of the agent



## 4. Conclusion

# Conclusion

## Contributions

- Explicit definition of the expected behaviours in each step
- Explicit definition of the transition conditions between steps
- Separation between interaction and decision with triggers

## Perspectives

- Describe the entire scenario with step tables
- Follow the user during his search

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