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Modeling a collaborative task with social commitments

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Abstract

Our goal is to design software agents able to collaborate with a user on a document retrieval task. To this end, we studied a corpus of human-human collaborative document retrieval task involving a user and an expert. Starting with a scenario built from the analysis of this corpus, we adapt it for a human-machine collaborative task. We propose a model based on social commitments to link the task itself (collaborative document retrieval) and the interaction with the user that our assistant agent has to manage. Then, we specify some steps of the scenario with our model. The notion of triggers in our model implements the deliberative process of the assistant agent.

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1. Introduction

Document retrieval (DR), which takes place in a closed database indexing pre-selected documents from reliable information resources, is a complex task for non expert users. To find relevant documents, interfaces allowing formulating more specific queries are hardly used because an expertise about the domain terminology is needed. It may require an external assistance to carry out this task according to the users information need. Thus, we propose to design software agents able to collaborate with a user on a document retrieval task.

To this end, we adopt a cognitive approach by studying a corpus of human-human (h-h) collaborative document retrieval task in the quality-controlled health portal CISMef (www.cismef.org)¹, which involves a user and an expert. In previous work^{2,3}, extraction of dialogue patterns from the corpus has been done with their formalization into dialogue games⁴, which can be fruitfully exploited during the dialogue management process³. This formalization uses the notion of *social commitments* introduced by Singh⁵.

In this article, we are interested in linking the task itself (collaborative DR) and the interaction with the user that our assistant agent has to manage. We show that the formalism³ used to model the dialogue games through social

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commitments can be enhanced to describe the task. Our model makes the link between a high level structure (the task) and low level interaction (dialogue games). Starting with a scenario built from the analysis of the corpus of h-h interaction, we adapt it for a human-machine (h-m) interaction. Then, we specify each step of this scenario in terms of social commitments.

This article consists of 5 parts: Section 2 gives a short state of the art on dialogue models. Section 3 describes the model we used to specify a collaborative task. Section 4 presents the scenario modeling the h-h collaborative document retrieval process and a discussion on its transposition in a h-m context. In Section 5, some steps of this scenario are detailed in terms of commitments. Finally, Section 6 gives some conclusions and future work.

2. Related work on reactive/deliberative dialogue model

To model dialogue, plan-based approaches and conventional approaches are often viewed as opposite, although some researchers argue that they are complementary^{6,7,3}: Communication processes are joint actions between participants that require coordination. Nevertheless, coordination must stand on conventions reflected by interaction patterns. Thus, dialogue can be considered as a shared and dynamic activity that requires both high-level deliberative reasoning processes and low-level reactive responses.

Dubuisson Duplessis³ proposes to use a hybrid reactive/deliberative architecture where a theory of joint actions can be a “semantics” to the interaction patterns described as dialogue games. These dialogue games are modeled through the notions of social commitment and commitment store described below.

2.1. Social Commitments

Social commitments are commitments that bind a speaker to a community⁵. They are public (unlike mental states such as belief, desire, intention), and are stored in a commitment store. Our formalization classically distinguishes a propositional commitment from an action commitment.

Propositional commitment. A propositional commitment involves that an emitter (x) commits itself at the present on a proposition towards a receiver (y). Such a commitment is written $C(x, y, p, s)$, meaning “ x is committed towards y on the proposition p ” is in state s . We only consider propositions describing present, which leads us to consider only two states for a propositional commitment: a propositional commitment is initially inactive (**Ina**). After its creation, it enters the state created (**Crt**). A created commitment can be canceled by its emitter. In this case it goes back in an inactive state.

Action commitment. An action commitment involves that an emitter (x) commits itself at the present on the happening of an action in the future, towards a receiver (y). Such a commitment is written $C(x, y, \alpha, s)$, meaning “ x is committed towards y on the happening of the action α ” is in state s . An action commitment is initially inactive (**Ina**). In this state, it can be created. The creation attempt can fail (**Fal**) or succeed (**Crt**). An action commitment in **Crt** state is active. An active commitment can be violated, leading it to the **Vio** state. It corresponds to a situation in which the satisfaction conditions of the content of the commitment can not be fulfilled anymore. An active commitment can be fulfilled, leading it to the **Ful** state. An action commitment is satisfied if its content has been completed.

In order to simplify the writing of the commitments, as in our case the interaction is between two interlocutors, we omit the receiver of the commitments. Consequently, a propositional commitment will be written $C(x, p, s)$ and an action commitment will be written $C(x, \alpha, s)$.

2.2. Conversational gameboard

The *conversational gameboard* describes the state of the dialogue between the interlocutors at a given time. The conversational gameboard describes the public part of the dialogic context supposed *strictly shared*. T_i stands for the conversational gameboard at a time i (the current time). In the framework of this article, we use a simple theory of instants where “ $<$ ” is the relationship of precedence. The occurrence of an *external event* increments the time and makes the table evolve. An *external event* can be dialogic (e.g. an event of enunciation of a dialog act) or extra-dialogic (e.g. an event like `light_on` showing the occurrence of the action of turning the light on).

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