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OSCAR: a framework for structuring mediated communication by speech acts

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Abstract

The work presented in this paper addresses the problem of the structuration of textual communication through Chats or Forums as a means to (1) support students involved in collective activities and (2) support the tutor in his perception of these activities. OSCAR is a framework based on the speech-acts theory. It allows defining theories composed of a set of speech-acts and precedence relations between these speech-acts and to perform synchronous and asynchronous discussions structured by these theories. OSCAR can be used both as an operational tool within a distance-learning platform and as a research tool as it proposes means to study a posteriori the discussions (e.g., analysis of the different students' attitudes in the discussion).

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1 Introduction[2]

Methods and tools that are proposed to support group communication through the Internet are not "neutral". They must be studied very carefully in order to provide the students involved in a collective activity with an effective support [11]. From another point of view, experience accumulated in distance learning highlights the importance of a close pedagogical assistance to the students all along their activities, in particular in order to cope with problems such as isolation or "getting lost" in the curriculum. However, in order to provide such a support, tutors have to perceive the students' activities. This is a key-problem for distance-learning tutors: they must construct a coherent model of each student's activity from a set of heterogeneous and often incomplete information. Therefore, constructing tools that help tutors to deal with this problem is a key feature.

The work presented in this paper addresses the particular problem of the structuration of textual communication through Chats or Forums as a means to (1) support students involved in collective activities and (2) support the tutor in his perception of these activities. OSCAR is a framework based on the speech-acts theory. It allows defining theories composed of a set of speech-acts and precedence relations (a grammar) between these speech-acts and to achieve synchronous and asynchronous discussions structured by these theories.

This research pursues different objectives. First, we want to study the impact of a speech-act structuration in collective educational activities by accumulating different experiences from different ecological contexts[3]. In particular, we want to study the impact of the theory (i.e., the speech-acts and the precedence relations) by modifying the speech-acts and/or precedence relations. Second, we want to help the tutors to perceive what happens in these discussions. As an example, analyzing how the speech-acts are used by the students allows defining interesting features from a pedagogical point of view such as the students' social behaviour [4]. OSCAR is therefore both an operational tool that can be (and is already) used within distance-learning platforms and a research tool. It has been designed by a research team mixing different competences (natural language theories, computer supported collective learning, tutoring of distance-learning curricula) and developed in a professional way (i.e., by a software engineer) in order to embed the functionalities that are required for the research aspects (easy modification of the theory, means to analyze the discussions) and respect the robustness criteria that are required to achieve multiple full-scale ecological experiences.

We will focus in this paper on the theoretical background of the work, the modelling of the discussions and OSCAR's functionalities.

2 Theoretical background

The foundations of the speech-acts theory have been defined by Austin at Harvard in the 50ths and published in 1962 in the famous book entitled "How to Do Things with Words" [1]. This work introduced a fundamentally new point of view on language that could be seen not only in terms of truth (following Aristotle's tradition: given a

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[3] This includes but is not limited to studying if such a structuration has a positive impact on the way students learn about the discussion underlying domain, see [3].

world, a statement is true or false), but in terms of actions that could change the world. Austin first dissociated performative statements (that can be successful or not) and constative statements (that can be true or false). This introduces a pragmatic point if view: the statement's functions are analysed on the basis of contextual and conventional information rather than according to its syntax. As an example, an order can be given with an imperative form ("Give me the salt."), an interrogative form ("Can you give me the salt ?") or an affirmative form ("This soup needs some salt."). More precisely, a speech act can be divided into three parts: the *locutionary act* corresponds to the act of performing words into sentences; the *illocutionary act* bounds to social conventions; the *perlocutionary act* corresponds to the effect that an utterance has on the thoughts, feelings or attitudes of the listener. The obtained results can differ from the initial intention. Following Austin, different speech-acts classifications have been proposed, the most famous being Searle's [10].

The *Geneva Model of discourse analysis* [9, 7], that is an interactionist approach to discourse organization, also takes its foundations in the speech-acts theory. This model allows denoting the structure of conversations on the basis of their illocutionary values. It allows identifying the constituents of discourse in order to establish the functional and hierarchic links between these constituents. The authors assume that the functional properties of the smallest discourse units are inherited by the larger constituents. In practical terms, this model is based on four discourse constituents: A (act), M (move), E (exchange) and D (discourse). We can represent the structural dimension of this model by the following rules:

$$D \rightarrow E + [\ E\ ^*\ ]$$
$$E \rightarrow M_{\ initiative} + M_{\ reactive} + [\ M_{\ evaluative}\ ]$$
$$M \rightarrow [\ E_{\ preliminary}\ ] + (\ A \mid M\ )_{\ central} + [\ E_{\ complementary}\ ]$$

The use of this model is based on the ability of determining the illocutionary function of the moves from their central speech-act. This can be based on a classification that identifies initiative, reactive and evaluative acts, e.g.:

Initiative acts	Reactive acts (+)	Reactive acts (-)
to say	to confirm	to invalidate
to maintain	to admit	to protest
to ask	to answer	to refuse
to propose	to accept	to decline

This kind of classification underlies the existence of conversational sequences we can describe with grammars that are not based on discourse constituents (like in the Geneva Model) but on illocutionary values. It is very difficult to write such a grammar in the case of discourse analysis, but conceivable in the perspective of computer-assisted communication between people. This is the context where this paper takes place.

One of the first works that attempted to use the speech-acts theory within mediated communication is The Coordinator [13], a mail tool that proposes menus to select speech-acts from a typology based on Searle's works. The objective was to facilitate group coordination by inciting to select speech-acts presented as *Sentence Openers*. Different other systems have been designed (using or not finite state automates) such as ICLS [6], C-CHENE [2], TecfaMOO [5], BetterBlether [8] or Splach [4]. George [4], in his analysis of these different systems, notes a disagreement within the research community concerning the use of *Sentence Openers* as means to structure communication. Some researchers define as a hypothesis or assume that clarifying their intentions conduct students to a reflection about the meaning and the objective of their messages, which can be of positive impact in an educational context. Some others oppose philosophical considerations against the pertinence of the speech-act theory itself or ethical considerations, stating that such a method imposes constraints to the students' communication and restrains their liberty [12].

3 OSCAR underlying models

OSCAR is based on *Sentence Openers* (that correspond to illocutionary acts) and precedence grammars that guide/restrain the students' possible use of these illocutionary acts. It is designed as a generic framework, highly configurable (the set of illocutionary acts and the grammar can be defined for a specific domain and/or context), that can be used to allow completely free discussion (i.e., without any structuration, no speech-acts and no grammar) to completely guided discussions (i.e., students can only select speech-acts associated with predefined texts, they cannot type free text), the basic use being (1) selecting a speech-act and then (2) typing a text. We call **theory** (in the formal system understanding) a set of illocutionary acts and of precedence relations. A discussion through OSCAR is related to a theory. We call **agora** a set of discussions administrated by a given teacher or tutor (the discussion administrator). An agora is associated with a list of participants. A structured **discussion** is composed of statements. A statement (or utterance) is defined by a sender, an illocutionary act, a date, a text and another statement to which it makes reference. Figure 1 presents the basic UML model of OSCAR.

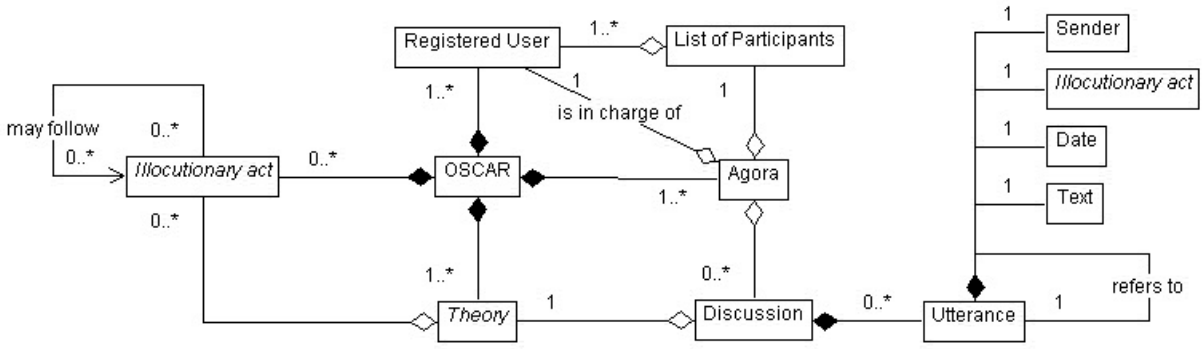

Figure 1 : *A (simplified high-level) UML model of OSCAR*

A key aspect of OSCAR's flexibility comes from the possibility to define illocutionary acts taxonomies by specializing theories. Therefore, the discussion administrator can define a discussion theory from scratch or by specializing a basic ready-to-serve theory. As a simple example, let us consider a basic theory based on the set of illocutionary acts {Greet the company, Welcome, Ask a question, Answer a question} associated to the grammar presented in Figure 2 (left). Within a discussion focusing on the curriculum structure that includes a set of distance students and the curriculum manager it can be interesting to dissociate questions related to administrative features (e.g., exams) and questions related to technical features (e.g., about the platform; other distinctions could be introduced, related to the domain, etc.). For this purpose, the basic illocutionary act "Ask a question" can be specialized into "Ask a technical question" and "Ask an administrative question". The result is a new specialized theory, whose precedence links are inherited from the basic theory (Figure 2-right).

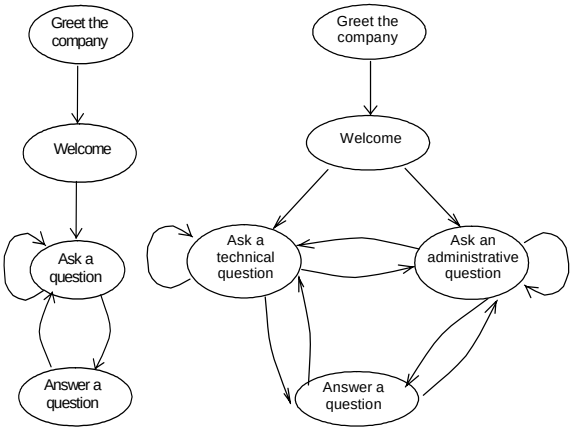

Figure 2: *A basic and a specialized inherited theory*

It should be noted that the software manipulates the theory structures but does not address the semantic coherence of these manipulations. For instance, errors can be introduced such as specializing "Answer a question " into "Answer an administrative question" and "Answer a technical question" and allowing the answer to a technical question by an administrative answer. The design of a theory is a difficult modelling task. This is why we propose predefined ready-to-use theories (inspired from the literature) and means to specialize them when necessary.

4 The OSCAR framework

Within the OSCAR framework a discussion is structured and visualized as an arborescence of statements (for simplicity and coherence with Mail and Chat usual vocabulary we will use in this section the "message" term). Every node proposes all the information associated to a message: an icon that denotes the illocutionary act that has been selected by the student, the name of the student, the date and the text written by the student (Figure 3). The children nodes correspond to the answers to the message.

When a new message is posted, it is highlighted in a manner that depends on the student's preferences (e.g., bold characters or coloured text). A configurable length of the message is visualized, if the text is longer the message must be selected (mouse left click) to be completely visualized. The messages are inserted at their place according to the message they respond to. As this can be outside the screen, indicators highlight the unread messages (in Figure 3, 2 unread messages down).

The right part of Figure 3 illustrates how a message can be answered: (1) select a message (mouse right click), (2) a contextual menu appears, that presents the list of acts that can succeed to this message according to the theory, (3) select an act, (4) edit the text to be sent (in a separated window not illustrated here). New threads can be created by selecting initiative acts.

All the data manipulated by OSCAR (students, theories, discussions, statements, etc.) is stored in a data base. This allows *a posteriori* analyses of a discussion (using SQL queries) as for instance the automatic construction of the students' social behaviour by analyzing the speech-acts they use (e.g., passive or active, tendency to ask/answer questions, etc. [4]).

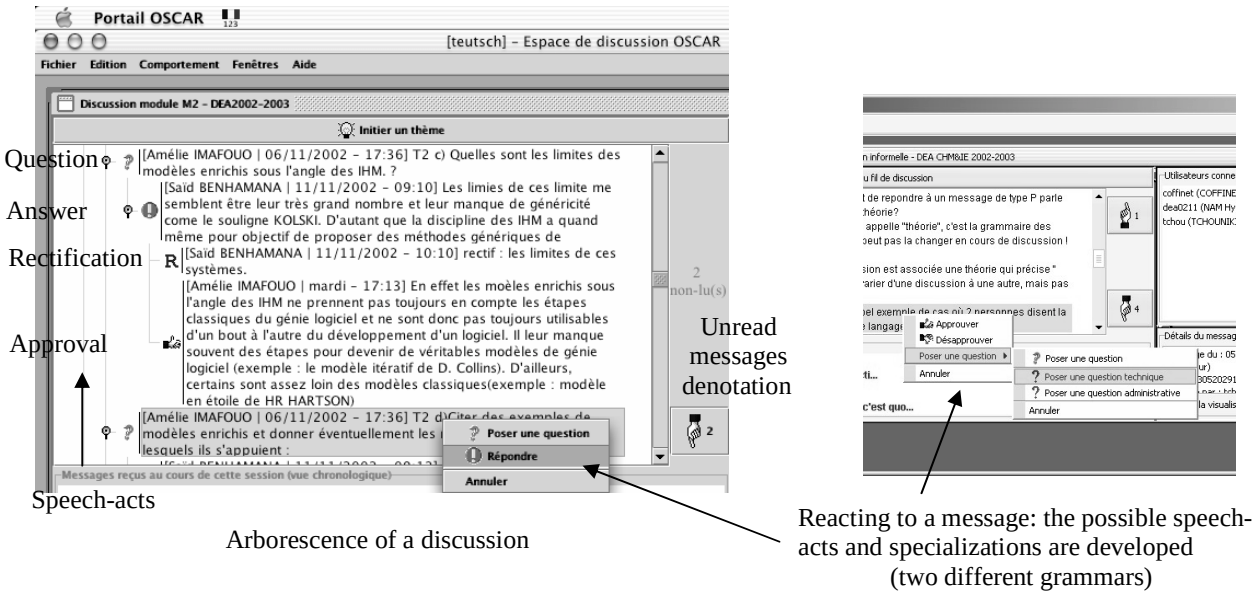

Figure 3 : *The OSCAR interface*

5 Using OSCAR: an example

The University du Maine (France) proposes a computer-science fifth year curriculum that mixes present and distance students. The curriculum proposes a set of resources and different individual and collective activities that the students must achieve. OSCAR is used in the context of different activities of which the "Human-Computer Interaction" course is a part.

The "Human-Computer Interaction" course is structured as a set of chapters associated to bibliographical references. For each of these chapters, two students are asked to manage a scientific discussion (involving all the group) on the basis of these references: prepare a set of questions to be addressed, animate the discussion and, finally, propose a synthesis of the debate. This activity has a double goal, on one side, make students work out HCI concepts, on the other, initiate them to scientific debate and argumentation.

Within this curriculum, students are dispersed geographically and in the time. The discussions are therefore asynchronous. The theory has been defined in order to incite them to debate. It is based on a small set of speech-acts and a rather reflective grammar.

As the tutor wanted to associate a discussion theme with a unique thread, the only iniative act (i.e., the only way to create a new thread) is "initiate a theme". A set of reactive acts allows proposing questions and answers to these questions, i.e. the basic structure of a scientific discussion. Students can also use evaluative acts (Approve, Disapprove) and self-reactive acts, that allow a student to Precise or Rectify his opinion. Although very simple (one must be aware that a set of speech-acts whose cardinal is too important changes the nature of interactions), this set of speech-acts and the associated grammar incite students to express their opinions and allows going thoroughly into the arguments while keeping the discussion structure explicit (and reified by the tool). As pointed out by [4], within such a context, erroneous uses of the speech-acts (i.e., texts that do not correspond to the selected speech-act) are marginal (less then 10%).

In such a pedagogical context, the students that are supposed to manage the discussion have a key role that consists in initiating the discussion, proposing a set of questions and animating the debate. For such a purpose, the visualization of the discussion structure helps in diagnosing (for example) that a question had no answer or that some disagreement subsists. As stated before, awareness-oriented tools can be associated to the framework in order to perform particular analysis such as the students' behaviour.

Note that within the OSCAR framework, different discussions can be initiated, developed or browsed at any time: in this curriculum, different thematic discussions are open in the HCI forum and different thematic forums are open in parallel (using different theories).

6 Discussion

OSCAR can be used both in a synchronous (Chat like) or asynchronous (Forum like) mode without any modification or configuration. It is therefore possible to alternate synchronous and asynchronous phases within the same discussion. This appeared spontaneously in some discussions that took place as Chats and continued asynchronously. In the other way, students can decide to connect synchronously to a discussion opened as a forum and continue live.

Such mixed modes are an interesting subject for further researches as it appears clearly that the nature of the messages are different in synchronous and asynchronous modes. In synchronous mode students have to manage the scientific discussion itself but also the intrinsic constraints of this mode: check if everybody is connected, be sure that everybody can/has expressed his opinion, deal with other aspects of such interactions (psychological aspects of synchronous discussions, "let's take this opportunity to …", etc.). For this purpose, we noticed that students create threads that are related to the organisation of the discussion itself, threads that remain persistent at the end of the meeting. As a result, the discussion then mixes two different types of threads (domain-related and organisation-related), whose proximity can appear confusing for students that will continue the discussion asynchronously. As another point, synchronous and asynchronous discussions probably require different theories (for trivial but important aspects such as allowing "Hello - Good Bye" acts in a synchronous mode or, more fundamentally, because an asynchronous mode allows students to take time before posting messages - and these messages are longer). At present, a discussion is associated with a single theory. It is an open question to decide if the problems that this mixity creates must be addressed within the discussion or at the level of the creation and organisation of the discussions, thus requiring the development of specific meta-level additional tools.

We believe that a key interest of OSCAR is to be robust enough to be usable in ecological contexts and a research tool that allows analyzing discussions (via the information stored in a structured way in the data-base) and to vary different parameters (synchronous – asynchronous – mix modes, speech-acts, precedence grammar). Analyzing its use in different contexts (scientific discussions in a distance-learning curriculum, collective activities, etc.) will allow a better understanding of how students use such a tool and, in a dialectical way, how tutors can make the best of it in order to (1) support collective activities and (2) collect information on the discussions (*a posteriori* or while they take place) in order to support the students.

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