

## Modelling Non-Cooperative Dialogue: the Role of Conversational Games and Discourse Obligations

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### Abstract

We describe ongoing research towards modelling dialogue management for conversational agents that can exhibit and cope with non-cooperative behaviour. Empirical studies of conventional dialogue behaviour in the domain of political interviews and a coarse-grained notion of conversational games are used to characterise non-cooperation. We propose an agent architecture that combines conversational games and discourse obligations, and suggest an implementation.

### 1 Introduction

Consider the dialogue fragment in Figure 1<sup>1</sup>. It differs from typical political interviews, where one of the participants poses more or less impartial questions, while the other provides clear and relevant answers. This type of dialogue eludes traditional approaches to computational dialogue modelling which assume a strong notion of cooperation between the participants. Joint intentions (Cohen and Levesque, 1991) or shared plans (Grosz and Sidner, 1990), for example, successfully explain situations in which dialogue participants recognise and adopt each other's intentions and goals.

Many naturally-occurring dialogues do, however, not conform to these assumptions. Deviations from conventional behaviour –such as loaded questions, evasive answers, unsolicited comments, etc., which we refer to as non-cooperative features (Plüss, 2010)– do occur. Consequently, shedding light on

<sup>1</sup>BBC presenter Jeremy Paxman interviews MP George Galloway after the UK 2005 General Election. Video: <http://www.youtube.com/watch?v=S1E5cTcYZbs>.

<b>Paxman</b>	Are you proud of having got rid of one of the very few black women in Parliament?
<b>Galloway</b>	I'm not err... Jeremy, move on to your next question.
<b>Paxman</b>	You're not answering that one?
<b>Galloway</b>	No, because I don't believe that people get elected because of the colour of their skin. I believe people get elected because of their record and because of their policies. So move on to your next question.
<b>Paxman</b>	Are you proud...
<b>Galloway</b>	Because I've got a lot of people who want to speak to me.
<b>Paxman</b>	You...
<b>Galloway</b>	If you ask that question again, I'm going, I warn you now.
<b>Paxman</b>	Don't try and threaten me Mr Galloway, please.

Figure 1: General Election Night Interview (BBC, 2005)

the nature of non-cooperation in dialogue<sup>2</sup> promises to yield a better understanding of conversation, and may eventually be of use in applications (e.g. role-playing agents, sophisticated dialogue systems).

### 2 Conversational Games and Discourse Obligations

Conversational (or dialogue) games extend speech acts beyond the single utterance, spanning from two sequential utterances to entire conversations (Power, 1979). Following Walton and Krabbe (1995), we use a coarse-grained notion of conversational game that refers to entire dialogue situations. At this level, a game is seen as a set of rules, a contract participants subscribe to by agreeing on a specific type of interaction. An informal example for a (simplified) political interview follows:

1. Two participants: an interviewer (IR) and an interviewee (IE).
2. IR limits herself to asking questions from a pre-agreed topical agenda until the agenda is empty.

<sup>2</sup>We refer here to linguistic cooperation, as opposed to non-linguistic (or task-level) cooperation. Plüss (2010) presents a discussion on this distinction.

3. IE limits himself to providing relevant and complete answers to questions until the IR ends the conversation.
4. Grounding:
  - Adequate questions (i.e. in the topical agenda) are accepted.
  - Inadequate questions are rejected.
  - Irrelevant or incomplete replies are rejected.
  - Relevant and complete answers are accepted.
5. After accepting an answer, IR moves on to the next question.
6. Once all questions have been addressed, IR initiates closing.
7. When IR initiates closing, IE completes and the dialogue ends.

These rules capture conventional behaviour under a certain scenario, as participants are expected to act according to the game's rules. Discourse obligations resulting from such social pressure have been used for modelling dialogue management (Traum and Allen, 1994; Matheson et al., 2000). In the example above, for instance, an adequate question imposes an obligation on the interviewee to accept it.

Discourse obligations follow naturally from conversational games and are associated with cooperation. When obligations are addressed, the rules of the game are followed and the result is cooperative behaviour (Traum and Allen, 1994). Non-cooperative dialogue (e.g. the interaction in Figure 1) seems to be beyond the limits of such games. Of course, one could add further rules that capture the variations present in these conversations, but in the limit this approach would require an additional set of rules for each possible unconventional behaviour.

In our work, we use the insights from dialogue games to provide a description of expected behaviour in the form of social obligations, but allow agents to bend –or break– the rules. Our hypothesis is that non-cooperative behaviour occurs when participants favour individual goals that are in conflict with their current discourse obligations.

### 3 Agent Architecture and Prototype Implementation

We have implemented a prototype with two autonomous agents holding an interview. We followed an information state approach (Traum and Larsson, 2003), grouping update and selection rules according to the architecture shown in Figure 2. The information state has the agenda of individual goals, the dialogue history and pending obligations. The agents keep the same knowledge about the game, so as to track each other's obligations, while individual goals are private. After each move, obligations are updated and a deliberation mechanism decides

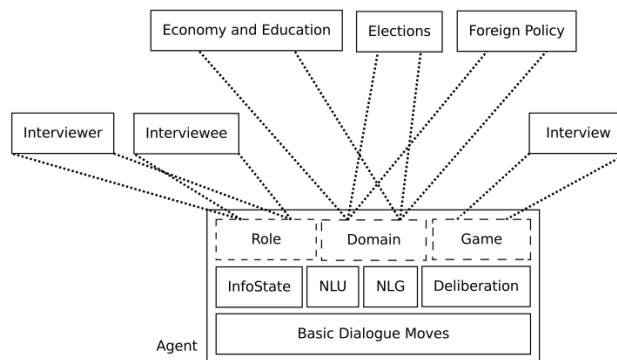


Figure 2: Agent architecture

whether to discharge an obligation or follow an individual goal, based on priority settings.

Current and future work include the development of a good topical domain for the prototype and a comprehensive evaluation.

## 4 Conclusion

Conversational games capture dialogue conventions, but say little about deviations. By focusing on how dialogue rules can be bent or broken we aim at producing and coping with a wider range of behaviours.

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