Decalog 2007: Proceedings of the 11th Workshop on the Semantics and Pragmatics of Dialogue, pages 169–170.
Trento, Italy, 30 May – 1 June 2007. Edited by Ron Artstein and Laure Vieu.

A Platform for Designing Multimodal Dialogic and Presentation Strategies

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Interactive and dialogue systems are daily used in various contexts and with different devices. This diversity guarantees the current and upcoming success of multimodal services. Although several multimodal dialogue systems have been built, their design, their implementation and their testing remain a difficult task. We address this problem by focusing, in this paper, on a software component dedicated to the implementation and testing of dialogic and presentation strategies. We characterize data manipulated by this component, using results from experimental studies on impact of presentation strategies.

1 Our approach and our platform

For the generation of outputs in multimodal dialogue systems, two concepts are essential: a modality and a presentation task. Adopting a system-oriented perspective, we consider a *modality* (input or output) as the coupling [*d,L*] of a physical device *d* with an interaction language *L* (Nigay & Coutaz, 1995). A *presentation task* refers to the presentation of a coherent piece of information. This piece can be either elementary or composed. The granularity of elementary presentation tasks is at the discretion of the designers. Each answer of the system is composed of at least one presentation task.

The generation process generally consists of three choices: (1) the content of the answer of the system; (2) the modalities to use in order to present this answer; (3) the distribution of the answer on these modalities. Within this process, we distinguish the dialogic strategy (DS) selection from the presentation strategy (PS) selection. DS is generally determined during step (1) and PS is shared out among steps (2) and (3).

The DS selection involves the selection of the answer. We identify three initial DS in cooperative multimodal dialogue information systems:

- DS1, "relaxation": the system suggests alternative solutions or alternative search criteria;
- DS2, "statement": the system provides found solutions;
- DS3, "restriction": the system suggests possible criteria to restrict the solution set.

The PS selection refers to the selection of the modalities for each piece of information. The PS influences the user's processing and the user's behaviour (cf. Section 2). In addition, presentation constraints and available modalities must influence the selection of a particular DS. That is why we think that DS and PS are inter-related and as such they must be decided in parallel at each step. This leads us to propose a platform for implementing and testing output strategies in multimodal dialogue systems that includes a component dedicated to select both DS and PS.

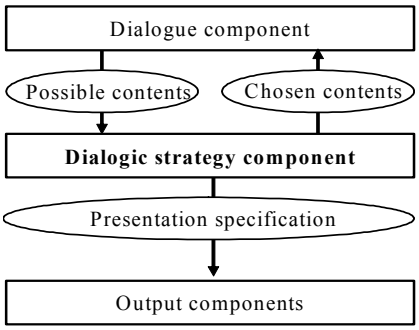

Figure 1. The platform for exploring dialogic and presentation strategies

Figure 1 shows our platform based on the ARCH meta-model architecture (UIMS, 1992). It includes a Dialogic Strategy Component (DSC) which acts as an intermediary between the classical dialogue component and the output (i.e. presentation and interaction toolkit) components. Instead of the dialogue component selecting a DS for each dialogue turn, it sends to the DSC all the possible contents (i.e. all the possible DS). The DSC then selects simultaneously the DS and the PS and it defines the presentation specification of the multimodal answer: a presentation specification is a composition of at least two presentation tasks using the CARE (Complemen-

tarity, Assignment, Redundancy, Equivalence) properties (Nigay & Coutaz, 1997). In addition, the DSC conveys the chosen contents to the dialogue component in order to maintain an accurate dialogic history. So the DSC manages the complete generation process. For further details, see (Horchani et al., 2007).

To improve our platform, we need to specify concepts which are manipulated by the DSC.

2 Contribution of a study on impacts of presentation strategies

The aim of the experiment is to study the users' reaction (verbal behaviour, cognitive load, and memorization) according to the multimodal answer of the system. We need to characterize output information in order to identify links between modalities and types of information and to test these links during the experiment.

We identify a dual task analysis of interactive and dialogue systems. On the one hand, three main types of information communicable to the user are suggested in order to structure the design of dialogue outputs for any kind of systems (Nievergelt & Weydert, 1980): trails refer to past actions, sites correspond to the current action or information to give and modes are about possible actions to come. In the context of human-computer dialogue, trails are generally called *feedback* ("You want an appointment Friday"), sites are called responses ("There are *x* available appointments") and modes are called *openings* ("What is your choice?"). On the other hand, users often carry out more than a single task when communicating with dialogue systems: we distinguish the field task – which is reached thank to the responses – and the interaction task – which includes feedbacks and openings.

For our experiment, information which reaches one task was allocated to one modality. Using a complementary combination of auditory outputs (A = [loudspeakers, natural language]) and visual outputs (V = [screen, hypertext]), we tested four PS {AAA, AVA, VAV, VVV}: the first letter refers to the feedback modality, the second one to the response modality and the last one to the opening modality. During the experiment, the participants conversed with a Wizard of Oz simulating a system dedicated to fix medical appointments. Four groups (one for each PS) of 20 participants (10 males and 70 females, 17-26 years old students (M=19)) took part in the experiment. The results showed the relevancy of considered dual task analysis and it underlines that modalities are not equivalent with regard to the type of information: the PS, as the DS, has an impact on the dialogue. For further details, see (Fréard et al., 2007).

These conclusions are used to improve our platform. Using the three types of information, we characterize presentation tasks into three types in our platform: feedback presentation tasks, response presentation tasks and opening presentation tasks. This better characterization of the presentation tasks increases the set of possibilities for multimodal outputs: given a set of possible contents, the answer of the system results from the selection of the DS (i.e. the content to convey) and of the PS (i.e. the types of presentation tasks and their modality allocation).

Conclusion

We have presented a platform including a component dedicated to the intertwined management of dialogic and presentation strategies. Using conclusions from an experimental study on the impact of presentation strategies on the user's reaction, we detail information manipulated by our component: indeed, a presentation task can be a feedback presentation task, a response presentation task or an opening presentation task. The answer of the system is a combination of these tasks. In future work, we will use our platform and to perform experimental studies on links between quantity of information and selected strategies.

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