Pilot Scenario Design for Evaluating a Metacognitive Skills Learning Dialogue System

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Abstract. This work describes the experimentation on the application of evaluation methodologies for creating metrics that evaluate the experience of the users of the Metalogue system as they learn and using them to validate the effective ability of the system to assess them. Pilot scenarios were formulated in order to effectively train the system to train the users on metacognitive skills learning. Usability design common approaches, such as focus groups and user experience needfinding sessions were used to collect the data.

Keywords: TEL; multimodal interaction; usability evaluation

1 Introduction

Metacognition has been studied and presented as strongly linked to learning approaches for several targets in learning [1]. Metacognitive strategies have been examined and evaluated on key aspects, such as in language learning and predicting leadership potential [2, 3]. The Metalogue[1] project approach is working towards creating a multimodal dialogue system that utilizes meta-cognitive abilities in a qualitative manner so that it can reason and explore dialogue behavior as well as adapt and predict behavioral patterns in conversations. The main objective is to use multimodal dialogue to interact with human participants during specific tasks during instructional scaffolding.

The selection of appropriate interaction scenarios is critical to the success of this experimentation. The system-human interaction should produce concrete results so that the system becomes more natural, with better understanding of the human behaviour. Additionally, the system should eventually come to exhibit sufficient metacognitive skills so that it may:

[1] Metalogue – Multiperspective Multimodal Dialogue: Dialogue System with Metacognitive Abilities, www.metalogue.eu

adfa, p. 1, 2011.

- enable adaptation of the dialogue behaviour over time according to the dialogue partners' knowledge, attitude and confidence, and
- predict other dialogue partners' intentions and show proactive dialogue behaviour.

The following paragraphs present the use cases and requirements for this task and the rationale behind the interaction scenarios that were designed to create the environment for the experimentation.

2 Use Case 1: Call Centre Agents

The Metalogue dialogue system will be used by Call Centre agents in the UK to learn negotiation skills in dealing with customers / callers. Due to the nature of their work, Call Centre agents have got a really high attrition rate. Call Centres spend thousands of pounds a year to train new employees, only to lose them a couple of months later due to constant exposure to high stress situations over the phone. The Metalogue system will automate some of the training process and make it cost-effective, efficient, reusable, adaptable and extensible.

The system is designed to deliver a realistic training experience and to make it possible to give quantitative evaluations of how well a given call went. Initially, the user will select a given training exercise, whereupon the standard dialogue system (the one without metacognitive abilities) will simulate a service call, itself impersonating a "customer / caller" character with a given issue and the user will try to resolve the issue. The system keeps track of variables such as number of interactions, type of interaction (question, statement, acknowledgement, refusal, etc.), misunderstandings and conflict, and task-specific requirements, such as degree of politeness and formality degree of self-control, degree of firmness, argument clarity, product cross- and up-selling, etc.

If the interaction does not go well, a second participant, the "coach" system interrupts and gives tips to the trainee. In an initial pilot, the system may just react with a "negative" beep and / or display a red flag / light, which does not involve an interruption or intervention of the interaction. In later pilots, the system will be more "disruptive", in that it will actually interrupt the conversation and more or less actively intervene with pointers to what went wrong and with alternatives for better self-monitoring, self-control, and goal fulfillment. Hence the system feedback / intervention will be both online and real-time in future stages of its development. Since the system is modular, new scenarios can be added incrementally, as well as new features, such as support for additional sub-dialogue extensions adding new standard situations.

The system can also simulate different meta-cognitive skills, such as "aggressive" (the call centre agent remains stubborn about relinquishing a free service / product) or "defensive" (the call centre agent is flexible and gives in to the customer request for free service / product), depending on the corresponding business rules defined by the end user organisation. The system will be able to switch its learning / simulation strategy between the two modes and dynamically adapt its associated behaviour

(communication style: turn wording, voice tone and speed, etc.). Again, this crude classification of meta-cognitive skills will be both based on existing established meta-cognitive research and on a "translation" of the research into concrete call centre terms relevant to business goals and business logic rules and agent training.

The system focus is more on modelling and simulating / exhibiting realistic behaviour based on real-world (logical from the call centre perspective) goals, and less on simulating the behaviour of irate and frustrated (and hence "illogical") customers / callers. Nevertheless, the simulated training scenarios will involve both frustrated but cooperative and irate and illogical customers to a certain degree. This is in order to model different types of communication situations and different meta-cognitive goals and skills.

3 Use Case 2: Youth Parliament and Debate

For this use case, the Metalogue system will be used to train young parliamentarians in Greece. It will observe and improve the metacognitive abilities of the trainees, creating societal abilities and skills of the new generation, introducing them into the modern world issues, such as rules, obligations, rights, social behaviour and responsibility. The setting is the Hellenic Youth Parliament that has an annual session where 300 students (ages 15-17) discuss several current affair issues, simulating the environment of the Hellenic Parliament's plenary sessions. To date, more than 4.000 participants have been part of this interesting simulation community.

After identifying a suitable public policy framework, two selected students will debate on it, in the presence of their tutor. The students will have a face-to-face debate on the selected policy presenting different opinions with justified arguments. It must be noted that, contrary to the previous use case where spoken dialogue was the main mode of interaction, in this case all the modalities are available, such as speech (verbal analysis, tone and intensity of voice), facial expression, gestures, body language. The minimum number of participants would be three, two students and one tutor.

There are several user-specific requirements such as the formal language, the need for additional training of students and tutors on the new technological environment of Metalogue pilots, the system adaptability to legal and policy language, and the participants' ability to debate in scripted and unscripted scenarios and vice versa. Finally the impact on system functionality is largely defined by the clarity of speech and the simultaneous speaking by the users.

4 Pilot Scenario Design

The domains of application are the Hellenic Youth Parliament for training youngsters in democratic debate and training of call centre agents in dealing with customer complaints and in up- / cross-selling additional products and services. There are two types of scenario for both domains:

- Scenario Type 1: Solve issue / disagreement (and try to sell something in case of call centre scenario). The goal is to win the argument (aggressive)
- Scenario Type 2: Empathize, appease, give in (give something for free in case of call centre scenario). The goal is to achieve consensus (passive)

The system should be able to pick its strategy on the fly, or adapt its strategy depending on the business / organisation rules and the meta-cognitive learning goals being illustrated.

Learning design starts with telephone conversations (call centre domain) between the two interlocutors (caller and agent) who are monitoring themselves and the conversation. Then come the face-to-face debates (youth parliament domain) between the two interlocutors who are also monitoring themselves and the conversation. Additionally, for both domains, two or more observers (tutor and trainee) can join. They are monitoring the two interlocutors and also discuss among themselves the intentions, plans, strategies and dialogue behaviour of the interlocutors, as well as how they adapt to the current situation and the changes in the other interlocutor's behaviour. The original two interlocutors can act as the control group. The interaction is always between 2-4 participants each time, that is the two interlocutors as a minimum, plus one or more observers, tutor and trainee.

The system itself can be the Experiencer and the Observer, with dynamic feedback on self and interlocutor and later adaptive behaviour as a result. It may also be the Tutor with dynamic feedback and later intervention in interaction, plus meta-cognition analysis to the trainee.

5 Conclusion

This work reported on the considerations for creating interaction scenarios between a multimodal dialogue system with metacognitive abilities and human participants. Two cases were presented and analysed from the dialogue perspective as well as on the learning design. Through those scenarios, this experimentation aims to design, develop and test a real time interactive multimodal system that will be able to exhibit certain metacognitive skills while used to engage in interaction with human actors in order to train them. The training itself is an issue that is still under investigation. The metacognitive skills and the way to train students has been a focus in research. Critical thinking [4], decision making [5] and problem solving [6] are but a few metacognitive skill related abilities that could be of interest to this study. A critical factor will be the evaluation of the level of success of the dialogue system in such endeavor.

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