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Dialogues as Social Practices for Serious Games

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Abstract. The paper describes an architecture for a social conversational agent. The aim is to use the agent in a serious game to improve the social and communicative skills of the players, showing the social effects of conversational choices on the emotions and behavioural changes of the interlocutors.

1 Introduction

A growing body of research considers the possession of adequate interpersonal, social and communicative competences as necessary for ensuring social, psychological and occupational well-being [1]. Through "role playing" it is possible to practice the desired behaviours in a controlled setting [1]. However, this approach can be difficult and expensive; often actors are used to train students, who can only practice a limited number of times.

Serious games can be exploited as an innovative and valid approach by means of simulation of interactions with virtual characters. Virtual agents can be used to bring social elements of interactions into simulations [2] [3][4]. The players can interact with the agents to experience the social effects of a conversation [5]. In order to bound the amount of social and dialogue information that has to be encoded and to bundle social interactions into standard packages we propose the use of *social practices* [7]. A social practice refers to a routinized type of behaviour typically and habitually performed in a society. Social practices are used by people as well to direct and limit the interactions and set expectations. In [8], the theory is analyzed considering an individual perspective in order to formalize it into an agent architecture. In this paper we will show how social practices can be used to implement a serious game to support the learning of social and communicative skills by medical students.

2 A social practice model

The social practice model proposed in [8] allows for the implementation of cognitive agents able to use the social practice as a first-class construct in their deliberation processes. According to this model a social practice is characterized by a *Physical Context* that describes physical objects and individuals with a meaningful role in the practice, a *Social Context* that describes the social interpretation of the environment, the *Activities* that an agent could perform, the *Plan Patterns* that the agent can use to construct a plan to reach a specific goal, a *Meaning* of the agent's activities and plans within the social practice, and finally the *Competences* that an agent should have to perform the activities of the social practice. Table 1 summarizes the components of a specific social practice.

Table 1. An example of social practice formalization: Consultation with a doctor

Abstract Social Practice	**Doctor Patient Dialogue**
Physical Context	
Resources	current time,medical instruments
Places	hospital,office
Actors	user, agent
Social Context	
Social interpretation	consulting room, consulting time
Roles	doctor, patient
Norms	patient is cooperative (gives truthful and complete answers), doctor is polite
Activities	welcome, presentation, data gathering, symptom description, speech acts
Plan patterns	Welcome, Presentation, Data Gathering, Symptom Description, Therapy
Meaning	support the patient, create trust, eliciting patient's problems and concerns,empathic response
Competences	listening effectively, being empathic, use effective explanatory skills, adapt conversation

3 A Social Agent Architecture for serious games

The proposed architecture (fig. 1), is composed of three main modules; a complete description of the *Social Practice Selection* module module can be found in [9], while in this work we focus on the formalization of the agent's *Identity* and its *Deliberation Engine*.

3.1 Identity

The identity of the agent formalizes his beliefs, the information related to the possible social practices, the state of the dialogue the rules for the generation of plans, the analysis of norm violations and state variables updating. A formalization based on the concept of social practice allows the agent to interpret the context from a social point of view and to perform the more suitable plan pattern contextualizing the dialogue. The identity of the agents includes also the linguistic knowledge required to manage the conversation: a set of question-answers modules (called categories) described according to S-AIML. It is an extension of the AIML language, that allows to bind the categories to specific practices and their activities. Specific tags have been introduced to contextualize the dialogue inside a social practice (*social practice* tag), according to a specific activity (*activity* tag), when specific preconditions are satisfied (*precondition* tag) and to have more freedom in the effect management. The enhancement of the AIML language was required because the AIML dia-

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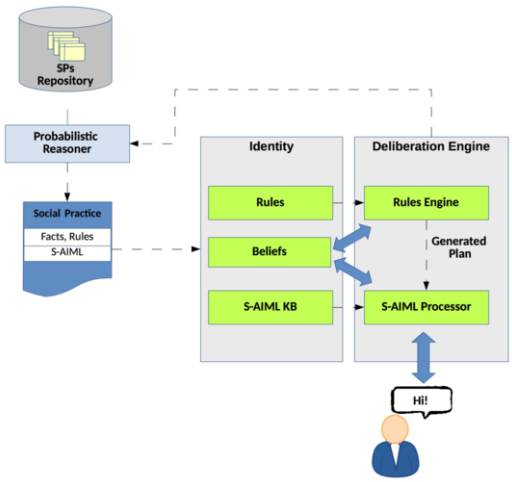

Figure 1. Social Chatbot Architecture

logue designer cannot use only the variables/parameters to control the evolution of the dialogue.

3.2 Deliberation Engine

This module allows the agent to deliberate according to the recognized social practice. It is composed of two main components. The first is a reasoner that exploits facts and rules to understand the proper action to execute(i.e. the updating of a fact, the execution of a plan or a specific activity). The other is the S-AIML processor that processes the S-AIML KB. These modules allow for a dynamic activation of a set of S-AIML categories related to the current social context with a consequent reduction of the number of categories that can match the user sentences and a simplification of the agent deliberation. Without a social practice oriented approach at every step of the dialogue all dialogue variables values and all the rules should be checked. Let us suppose that the player tells to the agent "You should make a computerized axial tomography". Several conditions must be considered, as highlighted in the following category (for shortness only few conditions have been considered).

```
<category>
  <pattern>You should make a computerized axial tomography
  </pattern>
  <template>
    <condition name="interlocutor" >
     <li value="familiar">Who gave you the medical degree?
       <think><set name="emotion">annoyed</set></think>
     </li>
     <li value="doctor">
       <condition name="doctor_type" >
        <li value="faimily_doctor">Tel me doctor, could i have
              something of serious?
        <think> <set name="emotion">fear </set> </think>
          </li>
        </condition>
       </condition>
    </li>
  </template>
</category>
```

Is the other speaker a doctor or is he a family member or another patient? And if he is a doctor and the agent does not know him, was the appointment scheduled or is it unexpected? The same recommendation to make a CAT examination, triggers different behaviours. Instead, using a social practice approach, when the social practice is correctly identified the dialogue is managed according to the rules bound to the practice that are satisfied, as highlighted in the following category.

```
<social practice name="unknown_doctor_consultation">
  <category>
    <precondition> <el>trust>low</el> </precondition>
    <pattern>You must make a computerized axial tomography</pattern
        >
    <template>
      Why should i make this examination?
      <think>
        <el>emotion=fear</el>
        <el>trusting=trusting−3</el>
      </think>
    </template>
  </category>
</social practice>
```

The activation of a social practice determines meaningful changes also on the entire dialogue path. From time to time, new information is acquired and the agent can re-plan according to the new situation. Moreover, it continuously monitors possible violations of social practice norms. In case of a violation the agent will act in a proper manner, stopping the execution of that practice if necessary.

4 Conclusion

The proposed architecture puts social practice at the heart of the deliberative process of a conversational agent. We presented a few examples based on the case study of medical consultations. We discussed some preliminary steps in the formalization of the agent's knowledge and the introduction of the new S-AIML language. Future work will regard a more developed implementation and the validation of the assumption by means of an experimental evaluation following a proper learning design approach.

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