Chapter 16

Conversational Agents in Language and Culture Training

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ABSTRACT

This chapter describes the design, implementation, and use of an agent architecture that has been deployed in Alelo, Inc.'s language and culture training systems, which offer practical training for foreign language skills and intercultural competence. These agents support real-time conversation in the language of interest (Dari, Pashto, Arabic, French, and others), using automatic speech recognition and immersive simulation technologies. In earlier work, we developed a number of agent-based language and culture trainers, based on the Tactical Language and Culture Training System platform. Our experience has revealed a number of desiderata for authorable, believable agents, which we have applied to the design of our newest agent architecture. In this chapter, we describe the Virtual Role-Players (VRP), an agent architecture that relies on ontological models of world knowledge, language, culture, and agent state, in order to achieve believable dialogue with learners. Authoring and user experiences are described, along with future directions for this work.

INTRODUCTION

Conversational agents have particular appeal in the educational domain of training learners in communicative competency. Experts in the language education community, such as the American Council on the Teaching of Foreign Languages (ACTFL), describe communicative proficiency as a goal that includes both declarative knowledge and procedural skill (Lampe, 2007). In a computer-based learning environment, conversational agents allow students to engage these procedural skills by speaking in real time and observing believable responses.

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Our concern is the development of conversational agents for practical training systems for foreign language skills and intercultural competence. Such agents must meet a range of challenging design constraints. They need to produce behavior that has an appropriate level of realism and cultural accuracy, so that they provide a suitable model for training. At the same time, they need to be easily authorable and configurable, by people who may not be specialists in agent modeling frameworks and formalisms. Ideally, it should be possible for trainers and educators to create their own training scenarios, populate them with conversational agents, and have the agents behave in culturally and situationally appropriate ways.

In earlier work, we developed a number of agent-based language and culture trainers, based on the Tactical Language and Culture Training System platform (Johnson & Valente, 2008), such as the Tactical Iraqi trainer for Iraqi Arabic (Johnson, 2010). These have been used widely by military service members and other individuals preparing for overseas work. The trainers include a large number of practice dialogues and scenarios, each of which includes one or more conversational agents. A typical course includes fifty or more agents, each designed to converse with learners in a particular scenario or situation. The behavior of each agent is specified in a finite state machine framework.

Although this has proven to be an effective approach for creating conversational agents in this domain, it suffers from some key limitations. One is that each agent has to be authored for the specific scenario context in which it is intended to be used. This multiplies authoring effort and limits the number of agents that can be incorporated into a given scenario. It also prevents trainers from creating new training scenarios or adapting scenarios to their own needs. Another limitation is that it is up to agent authors to make sure that the agent’s behavior is culturally appropriate, and it is difficult to validate whether they have done so. To overcome these limitations we have recognized the need to develop an agent authoring framework that supports the creation of agents that can be employed flexibly in a range of training scenarios, and which incorporate explicit, validated models of culturally appropriate behavior.

In response to these and other desiderata, this chapter introduces Alelo’s new Virtual Role-Player (VRP) architecture, a conversational agent architecture that has been employed in a number of language and culture training systems. The Virtual Role-Player (VRP) architecture is a flexible platform for combining models of conversation, facilitating model reuse and behavior validation. Models of politeness, culture, and strategy (e.g. lying for a social purpose) have all been implemented in this framework in an effort to drive more believable agent behavior. The result is a set of artificially intelligent, conversation-ready agents who can be attached to visual avatars in a variety of serious game environments. These agents are called Virtual Role-Players (VRPs). Individual VRPs have been instantiated as characters in Alelo’s Operational Language and Culture Training System (OLCTS), and in mission rehearsal applications built on the 3D platforms Virtual Battlespace 2 (VBS2) and RealWorld.

In this chapter, we connect our experience with conversational agent systems to a selection of related examples from the literature, followed by a detailed description of our newest agent architecture. In the remainder of this section, we explain the context of this work with examples from Alelo’s OLCTS language and culture training suite. This leads to a set of desiderata for agent architectures, and a discussion of related work using these desiderata as a guide. Following related work, we give a technical overview of the VRP architecture, along with additional detail on the models used for dialogue and culture. Finally, we describe user experiences of authoring and interacting with VRPs.
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