

# Serious Game Environments for Language and Culture Education

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## Abstract

In this demonstration we will present technologies that enable learners to engage in spoken conversations in foreign languages, integrating intelligent tutoring and serious game capabilities into a package that helps learners quickly acquire communication skills. Conversational AI technologies based on the SAIBA framework for dialog modeling are realized in this 3-D game environment. Participants will be introduced to tools for authoring dialogs in this framework, and will have an opportunity to experience learning with Alelo products, including the Operational Language and Culture Training System (OLCTS).

## 1 Introduction

Alelo's language and culture education environments, including The Tactical Language and Culture Training System (TLCTS) and the Operational Language and Culture Training System (OLCTS), are AI-enhanced learning platforms that help learners quickly acquire communication skills in foreign languages and cultures. They have been developed by Alelo, Inc. based on a prototype developed at the University of Southern California (USC).

These environments utilize an integrated combination of intelligent tutoring system and serious game technologies. Trainees work through a series of interactive lessons and exercises, called the Skill

Builder, focusing on mission-oriented communication skills. The lessons make extensive use of automated speech recognition focused on learner language, and provide learners with feedback on their performance. Cultural notes describing customs and nonverbal gestures are integrated into the Skill Builder lessons. Trainees apply their skills in an interactive Arcade Game, where they use spoken commands in the target language to navigate a town grid, and in a Mission Game, where they participate in real-time dialog with simulated local people in order to accomplish their mission.

## 2 Systems that Impact Learners

Five TLCTS/OLCTS training courses have been developed so far: Tactical Iraqi<sup>TM</sup>, focusing on Iraqi Arabic, Tactical Pashto<sup>TM</sup> and Tactical Dari<sup>TM</sup> focusing on the predominant dialects spoken in Afghanistan, Tactical French<sup>TM</sup> for Sahel Africa, and Operational Indonesian<sup>TM</sup>. TLCTS courses are complete training courses, providing all of the training materials needed to conduct basic training in foreign language and culture. For example, Tactical Iraqi<sup>TM</sup> includes eighteen Mission Game scenes, ten Arcade Game levels, and sixty-three Skill Builder scenes comprising over 2000 lesson pages. Additional scenes and lessons are under development.

While the platform imposes no limit on content size, the material developed so far or these systems typically covers 80-120 hours of training. In-game reference materials, including glossaries, summaries of lesson content, and grammar notes, are

available both as part of the training package and as is a support Web site. Manuals, comprising tutorials and training guidelines, help with initial orientation, training management, and troubleshooting. The OLCTS versions of these courses include supplementary exercises delivered on handheld devices and on the web, giving trainees a range of platforms for "train-anywhere" access.

TLCTS rapidly transitioned into widespread use. Computer labs for training with TLCTS courses have been established in numerous locations in the USA and around the world. An estimated twenty-five thousand US military users have trained with the system, and consistently rate it highly. It has also been made available to service members in allied military forces.

Although the Tactical Language and Culture concept was originally developed under military funding, the approach can be applied quite generally to language and culture learning. The key is that the courses are task-oriented: the learner has a task to carry out, the Skill Builder helps the learner to acquire the skills necessary to carry out the task, and the Mission Game gives the learner an opportunity to practice the task in compelling simulated settings.

### 3 Conversational Agent Technologies

Simulated dialogs are executed by the virtual human architecture described in (Johnson & Valente, 2008). The architecture adopts a variant of the SAIBA framework (Vilhjalmsson & Marsella, 2005), which separates intent planning (the choice of what to communicate) from production of believable behavior (how to realize the communication). An overview of the social simulation process is given in Figure 1.

#### 3.1 Rule-Driven Behavior

Virtual human behavior is generated by a series of components that include explicit models of speech and language (for natural language understanding and generation) as well as behavior-mapping rules that implicitly reflect the subject-matter expertise of the rule authors. These rules generally occur at the level of communicative acts (Traum & Hinkelmann, 1992). A simple example of such a rule, expressed in natural language, is shown below:

*IF* the learner says that your home is beautiful,  
*THEN* reply that it is quite plain (1)

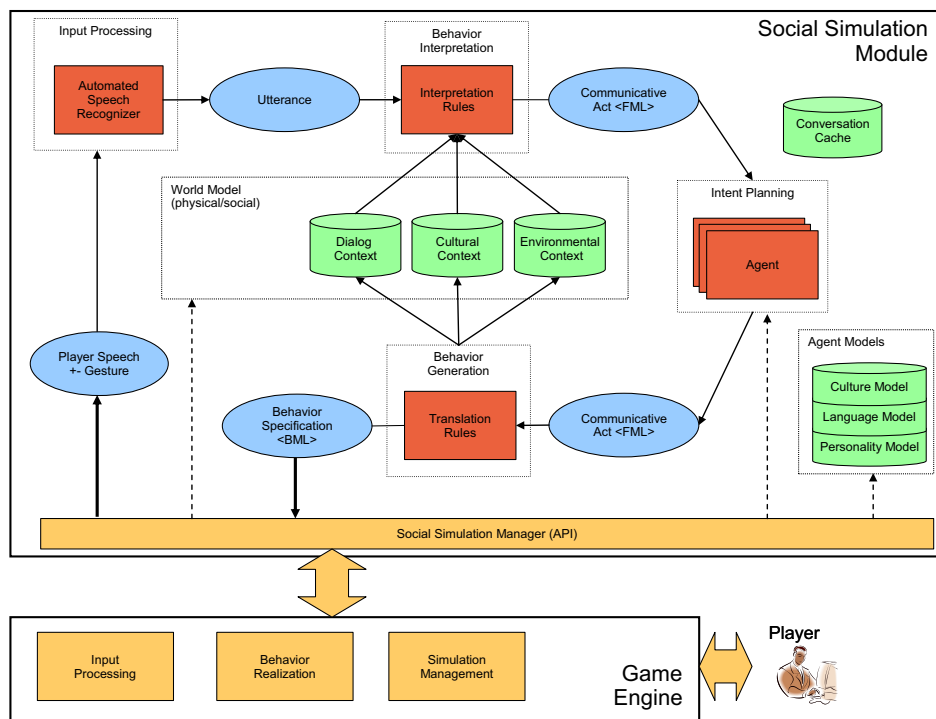


Figure 1. Dialog simulation architecture in Alelo language and culture training systems



Figure 2. Screen shot of a Mission Game dialog in Operational Dari™

### 3.2 Collaborative Authoring

Rules like (1) are created by a content development team with expertise in linguistics and cultural anthropology. This work is supported by a set of web-based collaborative authoring tools, called Kona and TIDE. Kona is used to create lesson content for the Skill Builder, while TIDE is a graphical editor used to encode dialog rules as transitions in a Finite State Machine.

Kona gives authors access to a database of lesson content, specified in XML format. The authors can selectively lock and edit lessons in the database, and view and edit different fields in the specification of each page in the lesson. The author can edit the written descriptions of the image on the page, the cultural notes, and the enabling learning objectives (ELOs) covered in the page. In other views, authors can link in images and sound recordings, and make notes and comments for other authors to review. The lesson specifications are then automatically translated into the internal data format used in OLCTS, so that authors can review

the lessons as they appear in the training application.

## 4 The Demonstration

The demonstration will give participants an opportunity to use OLCTS, and other Alelo interactive language and culture training products, and learn about their supporting authoring tools. It is intended for people who are interested in gaining an in-depth understanding of AIED (artificial intelligence in education) technology for serious games, and the development tools used to create them. The demo will be conducted by a presenter, who will give live demonstrations of the software, and an assistant presenter who will coach the participants in the use of the game and supporting authoring tools.

### 4.1 Overview

First, the participants will get a hands-on introduction to one of the Operational Language and Culture courses. Under supervision of a presenter,

the participants will learn to say a few phrases in the Skill Builder and use the phrases that they have learned in the Mission Game. This portion can be tailored on the fly to the interests of participants, and can take from 5 to 30 minutes to complete.

Depending on time and interest, participants may also have an opportunity to work with an OLCTS course in more depth. They can be called upon to learn some basic communication skills in Dari and apply them in the Mission Game. This will give participants a firsthand understanding of how each component of OLCTS supports learning, how the components support each other, and how artificial intelligence technology is applied in the learning experience.

Finally, the presenter will demo some of the authoring tools used to create OLCTS content. The participants will propose modifications or extensions to an existing OLCTS course. The presenter will use the authoring tools in real time to make the modifications, following the recommendations of the participants.

#### 4.2 Example: Engaging in a Dialog in Operational Dari™

For a video summary of the demonstration, please visit [http://www.alelo.com/movie\\_tlt-6min.html](http://www.alelo.com/movie_tlt-6min.html). The user experience in the Mission Game is one engaging component of this demonstration. An example script for a Mission Game interaction in Alelo's Operational Dari™ course is given in the following sections.

A sample of a Mission Game screen is shown in Figure 2. The player controls the figure in the center-left. At this point in the demonstration, the player has received a briefing that describes a communication task that he or she should accomplish in this exercise. To complete the task, the player must engage the virtual human, or non-player character (NPC) shown on the right.

Organizing rebuilding operations is one example of such a task. The NPC is a host-national character in Afghanistan. The player should check on the status of their shared plan for rebuilding and give constructive feedback. This type of communication task can require finesse and delicacy on the part of the player in order to be culturally appropriate. It draws on the learner's understanding and skill with face-saving, a prominent feature of many cultures worldwide.

The learner must initiate the conversation by speaking into a headset-mounted microphone. He or she clicks on the microphone icon, shown in Figure 3, speaks, then clicks on the icon again to indicate the end of the turn.



Figure 2. Push the microphone button to speak during a dialog, push again to stop.

Recognized player speech is posted to a dialog history window that appears near the top of the virtual scene, as shown in Figure 1. The NPC responds using spoken output, creating a realistic and engaging practice environment. During the dialog, the player may view hints that display key phrases in Dari. Once the player has discussed all of the host national's training mistakes, the dialog ends in success.

#### References

- H. Vilhjalmsson and S. Marsella. "Social Performance Framework", in *Proceedings of the AAAI Workshop on Modular Construction of Human-Like Intelligence*. 2005.
- W. L. Johnson and A. Valente. "Tactical Language and Culture Training Systems: Using Artificial Intelligence to Teach Foreign Languages and Cultures", in *Proceedings of IAAI 2008*. March 2008.
- David R. Traum and Elizabeth A. Hinkelman. "Conversation Acts in Task-Oriented Spoken Dialogue", in *Computational Intelligence*, 8(3):575--599, 1992.