

TRAINING SUPERIORITY: RAPID DEVELOPMENT OF MISSION-ORIENTED COMMUNICATION SKILLS

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Micro Analysis & Design



Center for
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CTELL

U.S. Military Academy
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CRESST

National Center for Research on Evaluation, Standards, and Student Testing

PROJECT SUMMARY

The objectives of this project are (1) to develop computer-based training systems for rapid acquisition of mission-oriented communication skills, targeted at multiple languages and missions, and (2) to develop a toolset that permits the rapid construction of new training systems. The toolset will include (a) tools for automatically constructing natural language and speech processing functions from sample data, (b) authoring tools for creating language lessons, (c) tools for constructing and managing interactive scenarios involving communication with synthetic characters, and (d) tools for tracking learner performance and engagement.

We place heavy emphasis on the communication skills required to accomplish particular missions, to give trainees sufficient ability to understand native speakers and make themselves understood in such missions. The target communication skills will include spoken language skills and nonverbal gesture skills. They will be reinforced through interaction with animated agents that represent the local population, as well as teammates who can coach and assist if needed. Our approach emphasizes speech recognition, speech synthesis, and gesture synthesis to give learners realistic opportunities to practice face-to-face communication and to help them learn the do's and don't's of communication in the target culture. The realistic mission simulations should help engage military trainees and motivate them to devote effort to mastering the communication skills.

Evaluation and assessment will play a central role in the project, both at the macro-level and at the micro-level. At the macro-level we will evaluate the learning outcomes of the approach, so that it can be compared to alternative methods. Built-in student assessments will help instructors to monitor learner progress, even if the instructors are remotely located, and help engage learners in the metacognitive activities of planning their own learning and assessing their own progress. At the micro-level we will analyze learner performance moment-by-moment, both to spot performance difficulties and to detect possible motivational problems. Motivation is particularly important in order to help learners overcome frustration and fear of making mistakes. We propose an innovative approach that utilizes real-time analysis of the learner's speech, visual gaze, and keyboard inputs to infer learner attention, hesitation, and confusion; this together

with learner self-assessments should be effective in assessing learner motivation. Scaffolding and assistance will then be provided automatically to learners to help them overcome difficulties and maintain motivation.

Such mission-oriented language training must be easily adaptable to new missions, since we cannot anticipate the specific missions that trainees will be asked to participate in. We plan to organize the system around a reusable library of mission scenarios and models of language and nonverbal behavior as they apply to categories of cultures. The language structures and vocabulary are readily extensible.

We have assembled a strong team to tackle this problem. Five groups from the University of Southern California are participating: the Center for Advanced Research in Technology for Education (CARTE) and the Natural Language Processing Group at USC / ISI, the Speech Analysis and Interpretation Laboratory (SAIL) of USC's Integrated Media Systems Center (IMSC), the USC Laboratory for Computational and Biological Vision, and the Rossier School of Education. The UCLA Center for Research on Evaluation, Standards, and Student Testing (CRESST) will be participating, as well as two private companies, Micro Analysis and Design and Eyematic Interfaces. The US Military Academy will advise us on tool design and serve as a test site.

The proposed work, although ambitious, is feasible because it builds upon capabilities already developed by the team members. MA&D has built a language learning authoring tool, MITAS. CARTE has developed a speech and gesture synthesis engine for its STEVE virtual human architecture, as well as the VImprov tool for managing interactive pedagogical dramas. The ISI NL Group has created a suite of tools for constructing natural language processors from text corpora, and SAIL has developed robust speech recognition capabilities as part of the DARPA Babylon program. UCLA CRESST has developed models and software designed to allow the creation of high quality measures, useful for formative evaluation and for assessing overall program quality. The measures address both process and outcome performance. Eyematic and LCBV have built and commercialized face tracking technology, and CARTE is currently integrating that capability into a robust system for tracking learner focus of attention.