Authoring By Cultural Demonstration

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ABSTRACT

Modern military missions require soldiers to communicate effectively and at a personal level with people whose cultures, languages, lifestyles, and beliefs are very different from their own. Constructing suitable, game-based, culturally relevant scenarios to prepare soldiers for effective communication is difficult, time-consuming, and expensive. This chapter describes a method to simplify the creation of cross-cultural scenarios, Authoring By Cultural Demonstration (ABCD). ABCD allows authors to construct discrete cultural vignettes to represent key points in the story. It then guides the author to generalize those vignettes using an approach similar to Lakoff’s (1987) radial categories applied to gesture, facial expression, language, and other cultural abstractions. ABCD connects the generalized vignettes into a cultural envelope that constitutes the scenario. Trainees’ actions during scenario execution are then monitored to ensure that they stay within the envelope, so that they will encounter the cultural training opportunity that the author intended.

Keywords: Cultural training, cross-cultural scenarios, game-based training, scenario authoring, scenario engineering, radial categories

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INTRODUCTION

This is a game of wits and will. You've got to be learning and adapting constantly to survive.

--General Peter J. Schoomaker, USA, 2004, quoted in Army FM 3-24, Counterinsurgency

Increasingly, military personnel require a sound and current understanding of the culture in which they are embedded. Such understanding eases local transactions, enables the US military to work with, rather than against, civilian communities, and ultimately multiplies operational effectiveness dramatically. Because both the local culture and our understanding of it are constantly evolving, learning about and adapting to culture are crucial.

Warfighters need to be able to interact with host-nation persons who are likely to recognize them as outsiders, but will appreciate their efforts to understand a culture that is different from their own; they need to avoid giving offense and demonstrate acceptance and respect for the culture’s beliefs, customs, and way of life. Computer-based training using games has the potential to help military personnel and others prepare to work with persons from different cultures, and can provide cost-effective solutions to meet many needs (Keeney et al., 2009).

Unfortunately, constructing suitable game-based scenarios is difficult, time-consuming, and expensive.

For one thing, specialized personnel are required to create synthetic assets including terrain, buildings, roads, vehicles, and characters; cultural subject matter makes the creation of human avatars especially difficult if they are to provide realistic nuances such as gesture, facial expression and speech. Different specialized personnel are then required to create the scripts that will execute the scenario. Their work gets especially onerous as the number of potential logic branches—each representing a different scenario choice—explodes. Further, it is rare that personnel with special skills in digital asset creation, or in script programming, will deeply understand the content of the cultural lessons, and this leads to an inevitable disconnect between the intended and the actual content in the scenario. As if all this weren’t enough, going through the production cycle for a game can take many months; by the time the cultural training is available, it may be stale.

There is a need to improve and accelerate the creation of culturally aware models of human entities for socio-cultural training simulations and games. More specifically, what is needed is a means by which deployed personnel with no special training in game development can easily create scenarios that express what they have learned in interactions with persons from the host nation – to generate their scenarios in a form that can be used in a gaming environment to teach others. Marines returning from patrol, for example, might take half an hour to express what they have learned from the day’s interactions with the local sheik. Doing this, though, requires a major advance in scenario authoring.

We are addressing these challenges by developing Authoring By Cultural Demonstration (ABCD). ABCD extends existing scenario generation technology to
accommodate cultural concepts, runs scenarios in a COTS environment called Game Distributed Interactive Simulation (GDIS), available from Research Networks, Inc., and is intended for use by deployed personnel.

ABC STRATEGY

When warfighters come back to base having had a meaningful cross-cultural experience, the memory trace of that specific experience is fresh in their minds. By recounting that memory trace to others, whether by telling a story or by creating a replay of the incident in a virtual environment, they can effectively convey what happened, stopping and commenting at critical points. This can be a valuable learning experience for the listeners and viewers.

The trouble is that, by its nature, this is passive learning: the audience can only watch and listen. Modern learning theory posits that both active and passive learning is required for maximum effect (Schwartz & Bransford, 1998; Schwartz, 2008), but this requires both the passive approaches and a means to provide the active experience. Leveraging the memory trace to create a scenario that has some degree of freedom for the trainee—that allows the trainee to take actions and make decisions in the scenario—gives the trainee the opportunity to actively participate and, therefore, an effective multiplier of training effectiveness.

To accomplish this, ABCD adapts technology from an ongoing project at Aptima called CROSSTAFF. CROSSTAFF is a tool suite that uses Flight Data Recorder (FDR) data and events defined by Military Flight Operations Quality Assurance (MFOQA) to create flyable simulator scenarios. A particular focus of CROSSTAFF is to use the flight logs of safety mishap data to create scenarios that will train pilots to avoid the mishap in future flights.

CROSSTAFF FUNDAMENTALS

Figure 1 shows the steps involved in the creation of a mishap-related scenario with CROSSTAFF. The original flight path (a) is provided from FDR data and MFOQA events, either from the actual aircraft or from a re-creation in a simulator. The FDR data and MFOQA events describe the exact state of the aircraft, its instruments, and its controls during the ill-fated flight.

On the flight path, the author identifies key events of two kinds (1) events that were out of the pilot’s control that led up to the incident (in blue in Figure 1b), and (2) pilot decision points that were key to causing or avoiding the incident (in red.)
The next step is an important one: to generalize the key events and decision points, shown in Figure 1(c) by metaphorically turning discrete 3D points into larger 3D spheres. The generalization step is an acknowledgement that a safety incident will never happen exactly the same way twice—the location, altitude, speed, or other aspects of the situation may be different from the original mishap, but it will still be the same kind of mishap. For each event and decision point, CROSSTAFF lets the scenario author specify what is important for recreating the mishap and what is not.

Suppose, for example, that the aircraft was at an altitude of 22,937 feet for the second (blue) key event. To recreate the mishap, it may only have been necessary that the altitude be greater than 15,000 feet in order for the incident to occur. This is a generalization. Identifying factors that had no effect on this particular mishap—say, weather or terrain—is another form of generalization. If some particular aspect of the flight must be exactly the same to recreate the mishap—if it can’t really be generalized—the author notes that as well. Other space-and-time-related specifics can also be generalized, as might specific states of instruments, controls, and other aircraft in the scenario. In effect, generalization turns specific events and decision points in the MFOQA log into 4D regions in space-time.

The final step, Figure 1(d), connects those 4D regions into a continuous envelope. This constitutes the scenario. As long as pilots stay within this envelope during the training mission, they will encounter the key set of circumstances involved in the mishap, and they will arrive at the mishap’s critical decision points. They will be actively flying in a scenario based on, but not exactly the same as, the original mishap. They will have an opportunity to experience the mishap’s
circumstances and to take action accordingly. A beneficial side effect is that every use of the scenario will potentially be different. As a result, with repeated runs through the scenario, pilots will encounter a variety of conditions under which the mishap might occur, giving them a broader experience base.

**GENERALIZING CROSS CULTURAL VIGNETTES**

ABCD adapts the CROSSTAFF approach to help warfighters create cross-cultural lessons learned. Starting with a memory trace, the author identifies (and creates) discrete vignettes representing key cultural events and decision points. This is accomplished by using the GDIS level editor and digital asset library to choose terrain and avatars, position and animate them appropriately, and by adding dialog when necessary. We call this a vignette, and it corresponds to CROSSTAFF’s events and decision points. The author then generalizes the vignettes and connects them to create a scenario envelope.

A major challenge in doing this is the generalization step. Generalizing culturally salient information is a more complex task than generalizing CROSTAFF’s spatiotemporal information. While the latter is easily expressed on numerical scales, there is no obvious corresponding set of numbers for the former. ABCD needs to generalize over many dimensions such as gesture, facial expression, language, and other cultural abstractions. What is needed is a mechanism that can organize cultural information, whether it is linguistic or non-linguistic.

To address this problem, we use radial categories (Lakoff, 1987) as a framework for generalization, as shown in Figure 2.

Cognitive scientists have known for some time that a key aspect of human perception is the categorical knowledge people bring to the task of filtering and interpreting the physical stimuli that impinge on their senses (Biederman, 1981; Biederman, Rabinowitz, Glass, & Stacy, 1974; Barsalou, 2004). Hence, it is natural to approach the problem of organizing cultural phenomena by leveraging recent findings in human categorization.

Lakoff’s (1987) theory of radial categories has successfully accounted for many categorization phenomena, both in the laboratory and in existing natural languages. The term was inspired by empirical work on the human conceptual system (Rosch & Mervis, 1975, and many others; see Murphy, 2004 for an excellent, thorough review.) This body of empirical research has established rather conclusively that the human conceptual system is not definitional; that is, that human categories exhibit properties that cannot be explained by a taxonomic system, where each concept is a node represented by a simple necessary-and-sufficient definition.
One of the most important phenomena that cannot be explained with a definitional system is that category members show strong typicality effects: some instances are better members of a category than others. A common example is that a robin is considered by most people to be more typical of birds than is an ostrich. This typicality shows up in many ways in the psychology laboratory, as well as in linguistic research across cultures (e.g., Jurafsky, 1996; Archard & Niemeier, 2004; Narayan, 2008.) For example, the problem of categorizing hot and cold entities across cultures has proved particularly difficult, but Narayan (2008) was able to automatically construct culture-specific radial categories for hot and cold foods with impressive accuracy across multiple cultures (including English, Tamil, Javanese, Chinese, Hindi, and Persian.)

The categories are deemed radial because a category starts off with a central concept, and as a person encounters more ambiguous and difficult-to-classify instances, variants of the central concept are added, sometimes to the central concept, sometimes to other variants. For example, the category mother includes not only the prototype—a married woman who conceived, gave birth to, and is raising a child—but also many variants, such as stepmother, birth mother, adoptive mother, surrogate mother, and others too complicated to have a name, such as female legal guardians who don't personally care for the child. In this way, the variants of the category radiate outward from the central concept.

The same logic can be applied to other cultural, but non-linguistic, phenomena. There are prototypical bows and there are less common bows; there are prototypical

FIGURE 2. The Structure of Lakoff's Radial Categories.
smiles and there are less common smiles; and there are prototypical tones of voice that are assertive, and others that, while still assertive, are less so.

It is interesting to note that categories, structured this way, are considerably more robust to new knowledge and experience than definition-based categories. As new meanings of mother are encountered, it is a simple matter to create a new variant within the category. It is quite another to modify the definition to encompass all previously encountered instances, or to create new categories and to try to decide where existing instances belong. In ABCD, the ideal is to have native members of the culture provide the radial structure that they use to understand to categorize gestures, facial expressions, and other semantic information. But even if it is the warfighters returning from patrol that provide the categorizations, the categories will need restructuring far less often in the face of new experience, when organized by radial categories.

**THE ABCD APPROACH**

Extending the CROSSTAFF approach with radial categories results in the ABCD approach shown in Figure 3. Because humans tend to encode and remember the things that were most meaningful to them, the author’s memory trace is not a high-fidelity sequential log of the events they encountered; it is not directly analogous to CROSSTAFF’s FDR data or MFOQA events. For this reason, in ABCD we start by capturing key events and decision points, shown in Figure 3(b). Key events are more complex than in CROSSTAFF, so we have labeled

![Figure 3. ABCD Approach to Scenario Generation.](image)
them vignettes. The author uses a simple game level editor to select terrain, buildings, vehicles, avatars, and other assets out of a prebuilt library, and then positions them and indicates any key gestures or facial expressions (also using the library). If language and speech play a role, users also indicate that.

The next step is for the author to generalize the key vignettes using radial categories, as in Figure 3(c). Radial categories structure the libraries. If the author chooses a prototypical smile for a certain vignette, the library will present other facial expressions that have some level of membership in the category “smile,” and the author will select those that work in the scenario. This is true for gestures and for semantic textual dimensions, and perhaps for other cultural pragmatics such as tone of voice.

To assist with the generalization, we are developing a formal representation for radial categories that will be used to structure culturally relevant gestures, facial expressions, and other culturally relevant phenomena. We are also designing a mechanism that leverages the radial categories to assist users in generalizing the vignettes. Authors can choose a central concept when constructing the original “plot point” vignette; then, during generalization, ABCD presents other members of the category radially and asks which members fit the vignette and which don’t. Authors are able to do this for all aspects of the vignette that they feel are generalizable. The union of these judgments provides a “cultural enlargement” of the vignette that, as described above, will be used to create the cultural envelope that is the scenario.

Finally, ABCD connects the generalized vignettes into a cultural envelope, as shown in Figure 3(d), that constitutes the scenario, and the trainee’s actions are monitored as the scenario runs to ensure that the trainee stays within the envelope and encounters the cross-cultural training opportunity.

**IMPLEMENTING ABCD**

Figure 4 shows the architecture for ABCD. There are two major sets of components. The first set is used at authoring time, to define cultural behaviors and interactions with native populations. The second set of components is used during the cultural training session to ensure that trainees stay within the cultural envelope and therefore actively encounter the situation the author had in mind.

The ABCD Authoring component combines the vignette editing capabilities of the GDIS game editor with the library of cultural artifacts, which include gestures, tone of voice, facial expressions, and other pre-built cultural phenomena. Authors create discrete vignettes describing their experience, and then generalize their experience using radial categories as well as more conventional spatio-temporal means (such as those used in CROSSTAFF). ABCD then connects the discrete generalized vignettes to create a cultural envelope, forming the basis for the cultural lessons learned scenario.
Because of the generalization, every trainee's path through the scenario is potentially different, but the methodology guarantees that scenario conditions will steer the trainee into the circumstances the author had in mind. When the game is played—that is, when the scenario is executed—ABCD monitors conditions to determine if the trainee is within the scenario envelope. If not, ABCD advises the instructor of the situation, recommends actions to be taken, and provides the instructor with a means to put those actions into effect in the game. In future versions of ABCD, we intend to provide an optional mechanism to take those actions automatically, either because the instructor prefers that the system operate this way or because no instructor is available.

CONCLUSION

ABCD meets a real need—training cross-cultural lessons in game-based environments in a way that is guaranteed to be fresh and current, because those lessons will be authored by warfighters as they themselves experienced the situations and learned the lessons. ABCD enables authoring by people who are not game engine or computer programming specialists. Because it enables lesson authors to generalize their experience, it allows them to directly and meaningfully expand the circumstances under which that lesson applies, while at the same time providing experiential variation if trainees choose to experience the lesson more than once. We believe that ABCD has the potential to be an important component of the learning and adapting that Gen. Schoomaker highlighted as so important for the warfighter.
REFERENCES