Culture Matters:
Better Decision Making Through Increased Awareness

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ABSTRACT

We describe an ongoing effort to develop a decision aid to give military planners, from battle planners to psychological operators, a handle on the nature and behavior of populations in an unfamiliar cultural climate. The aid provides products including profiles of people relevant to psychological operations and cases of cultural interactions. The system consists of a model for the effects of culture on decision making and behavior, based on the Cultural Lens model of cultural differences in military domains, as well as a case-based reasoning engine that uses historical examples of scenarios and groups with specific cultural traits. We describe our current efforts focusing on articulation of a case base as well as the representations and artificial intelligence methods necessary to define and apply cultural aspects of behavior and decision-making. We also discuss the problem of cultural modeling in general, and the power and limitations of computational representations.

ABOUT THE AUTHORS

Alex Davis is the lead knowledge and software engineer on the cultural decision aid tool. He also led a project involving the creation of an adaptive, intelligent user interface system for antisub helicopter sensor operators, that enhances sensor employment and target classification by assessing the effective expertise of an operator, including dynamic cognitive capabilities such as situation awareness and information overload, and intelligently enhances the operator-machine interface accordingly. The system addresses the operator's training level, individual cognitive style, and particularly past performance under particular sets of operating conditions. Mr. Davis also has extensive experience in other applications of case-based reasoning and other artificial intelligence technologies to the domain of military simulation.

Dan Fu joined Stottler Henke six years ago after earning a graduate degree in computer science. He currently manages two projects: a cultural decision aid tool, and a project to create a wargaming toolset. The first project employs a case-based reasoning approach to a decision aid that factors cultural influence into the decision-making process. The system consists of a cultural model, authoring and automated analysis techniques for applying the model to specific situations. The second project, called Warcon, aims to create a wargame construction toolset for AF instructors to quickly create wargames for student use. Most important are advanced user interfaces that cater to the user's sophistication level, ranging from simulator parameter editing to complete wargame construction.

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INTRODUCTION

Culture keeps coming up. Misunderstanding cultures was critical in the crisis in Somalia in 1993, chronicled as "Black Hawk Down" (Bowden, 1999). It is also unquestionably a crucial factor in modern operations such as in the Balkans, Afghanistan, and Iraq. Part of the problem is that war isn't just war any more; modern deployments to foreign environments frequently range over a continuum from high-intensity battle to peacekeeping, situated in population centers instead of battlefields and shifting fluidly between different intensities. The tactical environment is often composed of unfamiliar cultures: people, leaders, living spaces, attitudes, and complex relationships, all affected deeply and continuously by the influence of local culture on perspectives and decision making.

Culture affects whether that local leader you're going to visit will work for your side, the other side, or neither; whether he'll tell you the truth; whether he'll fire bullets at you before you even get close enough to talk. If he does attack, culture will affect who else will attack along with him, where they'll fire from, and what will stop their assault with the minimum risk. Doctrine can tell you a lot about how best to protect your force in a firefight, but not how to judge whether that fight will happen. When such an assessment is made on the ground, it's made from experience, of one's own or from others' stories. According to von Clausewitz, experience on the ground is ultimately the sole source of the "feel of the battlefield," which is essential to mission success.

The problem applies to friendly forces as well; joint deployments interleave American defense services, and international coalitions band together smatterings of cultures in common efforts for extended periods. Chains of command, rules of engagement, and individual responsibilities can no longer be presumed to conform to the familiar.

Even worse, when replaced, units leave behind the task of reacquiring these cultural understandings, setting back the progress of the mission as a whole as institutional memory is scattered. The modern soldier must be a scholar, diplomat, negotiator, analyst, and peacemaker. This calls for new kinds of training and decision tools in the field, centered on propagating and applying the grounded experience of those who have come before.

The Difficulty of Modeling Culture

To be useful, a decision aid tool must help its user by providing relevant information that will ultimately factor into a decision. There are various ways in which a tool can help, ranging from terrain visualization to better understand a situation, to simulated course of action analysis (COAA) to better predict an outcome. When faced, however, with the prospect of taking into account culture, as it pertains to conflict and coalition activity, there are three difficulties. First, cultural data varies widely. Sources of cultural data are unstructured, nuanced, and don't easily admit generalization from the contingencies particular to them. Consider war stories; a story possessing a strong cultural component will describe some person's experience interacting with another culture. While stories can certainly play a key role in decision-making, it is unclear how their accumulated wisdom can be distilled into a useful form.

Second, there is no prescribed validation. The field of cultural behavior modeling is nascent and theoretical, with regular disagreement. As yet, several basic questions exist, such as: What are the right abstract variables to characterize a culture? How do groups share and inherit them? How can variables be derived from behavioral data? What systematic method can show that a certain culture is a factor, for any case? How can the results of simulation be trusted? No rigorous validation exists.

Third, behavior in a cultural context is *extrinsic*. It is the effect of multiple overlapping group memberships, personal and cultural histories, current events, political and social climates, geography, and so on, rather than

intrinsic, along the straightforward lines of the commonly held perception-decision-action loop in cognitive modeling and artificial intelligence. Culture is hard to pin down in traditional models. That is because culture is not a complete answer. For example, cultural considerations will constrain or expand the courses of action available to a person, but not predict which will be chosen.

Although culture is ubiquitous, it is difficult to converge on an acceptable model of cultural influence.

Designing a Cultural Decision Aid Tool

Ultimately, this work aims to provide users with cultural information that explains their situation, ranging from a validated COAA prediction to general advice on interacting with the civilian population. Our initial step has to been to gather culturally specific experiential data from available sources, often in narrative form, and provide ways to reuse the information. We follow these approaches:

Take intelligence and planning processes as they are. What would be welcomed into the field today? What would fit in to the decision making process, from the first broad smatterings of intelligence to the fine-grained simulation models employed in COAA? What tool could employ the forms of information currently in use? What would planners discover themselves wanting to use?

Consider the tactical operational level. Provide a useful tool for those who interact directly with the major actors in the area of operations, combatively or otherwise. What could have averted, or helped better inform, the operation in Somalia? What would help convoys in (possibly, partially) hostile Iraqi urban environments?

Interpret culture as a battlefield, in the military doctrinal senses that the environment of battle determines and constrains the behaviors evinced within it, and that a primary planning task is the scrutiny of all possible battlefield effects on execution. The cognitive processes involved in perception and decision feed on an extensive cultural context, and define goals in that context's terms as well.

Focus on experience. Determining the exact influence of culture on behavior is a hard problem. The derivation of cultural characteristics from particular incidents is hard too; we need human-in-the-loop modeling, in which our tool points users in the right direction and provides the right examples from past experience, but lets them discern the nuances and apply the lessons when the aid cannot.

Seek cumulative, disseminative, and pedagogical products. The institutional knowledge developed for an operational environment is often extremely localized to a particular intelligence staff, evolves rapidly, and degrades over time as personnel are rotated. Along with the opportunity to demonstrate and inculcate the principles of culture, by formalizing certain aspects of intelligence and planning, we can also help preserve and propagate data that captures an operation's cultural context.

TECHNICAL APROACH

Our approach to producing a useful decision aid tool for users such as field commanders or intelligence analysts comes out of three bodies of work: cultural IPB, narratives or “war stories”, and case-based reasoning.

Cultural IPB

Planning in any deployment, of any intensity, depends on some form of *intelligence preparation of the battlefield* (IPB): enumerating both friendly and enemy forces, and determining the constraints placed on various courses of action by the nature of the area of operations. In terms of conventional warfare, picture two tank battalions preparing to meet (or not) in the middle of a valley; you want to know your own forces, their forces, and how they'll be affected by each inch of the valley. Traditionally, IPB includes a study of how the terrain affords maneuver and communications. The landscapes of modern operations should also include the cultural, requiring a study of demographics, groups of various persuasions or ideologies, and leaders with various goals, in additional to physical features. Cultural IPB (CIPB) can turn “force structure and terrain” into “blood and territory,” a crucial tactical difference: goals, and the behaviors of their pursuit, will alter to match.

Doctrine pertaining to stability and support operations (SASO) has begun to widen the idea of battlefield preparation to include the study of such factors as populations, major actors, and cultural sites. Intelligence staff in SASO environments perform ongoing “population profiling” to keep track of this information, much like a police headquarters, to indicate possible trouble spots. The form of these profiles tends to be informal and local to a particular intelligence staff. These inventories are supplemented by the experiences of intelligence operatives

themselves, wisdom accrued in the course of task performance. We intend our system to incorporate this experiential wisdom that is so hard to disseminate and maintain.

Retrieving War Stories

The initial stage of our work focuses on the use of experience. Interviews with military personnel deployed abroad have yielded narratives of experiences which we refer to as "war stories." Ultimately, we need to feed relevant historical field experience to current practitioners. The product can range functionally from retrieval of a war story, to the specification of formal simulated behavior models for reproduction of a historical episode—that is, generation of a theory, at some abstraction, that explains the episode—as applied to a new situation. For now, our primary source of data imposes the greatest constraint: war stories (as a general term for after-action reports, intelligence SPOT reports calling in from the field, lessons learned, history books, newswires, and so on) are almost exclusively unstructured textual accounts. As one might suspect, by and large, war stories vary dramatically, ranging in practice from a dispute as to whether a shredding machine situated on a Saudi airbase actually works, to a dilemma where an American intelligence officer, during a planning session, must decide whether he should drink alcohol with coalition partners and violate policy, or decline and insult the partners.

One functional goal of our tool is to provide stories such as these that will lend the benefit of experience to a given situation. The particular approach we use is inspired by *case-based reasoning* (CBR), which is the use of past experience to inform the present situation. A CBR system retrieves a similar case to the situation description, and then adapts the retrieved case to the problem, thereby prescribing a solution.

From the gathering of stories in our research, we expect our experiential base to be disparate in domain and dissimilar at first glance even when relevant. Retrieval of stories based on simple features, such as by a keyword search for names, roles, and events, is an obvious first step (and the current operational state of the art), but cannot sufficiently constrain the breadth of results or detect many resemblances on the level where culture manifests. As an example, consider the following real story:

A shredding machine for important and sensitive papers, provided by the Saudi Air Force, was not working to the specifications that the US desired. The machine belonged to the Royal Saudi Air Force, and the Americans had no jurisdiction over another military's equipment. The US Air Force questioned the quality of the machine. Wanting to solve the problem, the US Air Force brought it up to the Saudis. To the Americans, the machine simply didn't work; the US military on site couldn't get the machine to shred the way the US wanted. The paper would still be whole at the bottom of the machine. The Saudis kept saying the machine was fine. This caused a problem for the US Air Force with the level of security and was unacceptable to their operations. The Saudis responding to the request didn't know how to repair the machine and didn't have anyone handy who could do it for them. As hosts to the US forces, they didn't want to "lose face" by admitting imperfection in some part of the facilities and capabilities lent to the Americans.

An interesting aspect of some Mid-Eastern cultures is that they are verbal cultures, at least in comparison to the United States. For example, poetry is far more prevalent and accessible an art form. They take greater stock in what one says, and how it's said. The phrasing of an answer may be very sensitive to the context of its reception, and to the whole relationship between speaker and listener, than an answer that aims only for a stark representation of fact. Because of this, the Saudis kept saying that the machine was fine and didn't need fixing. This also approaches the "saving face" issue that is prevalent in many societies and cultures. One Saudi Lt. said if it "was really broken, we'd get a new one." The cultural difference of the Saudis manifested as a different view of what "broken" meant. "We're not going to fix it unless it's 'really broken,'" another Saudi military official said. The American military, not insensitive itself, did not want to "insult the equipment" of the host country. Saying that their equipment was not sufficient enough would be considered worse than just rude. It would also be saying their capabilities were inadequate: a derogatory social judgment. There was fear that in some indirect way this could cause an incident of international misunderstanding and could escalate on some social level to be a real problem. After all, one of the Saudi princes was involved in the operation too. The difference of culture had brought both parties to an impasse, with each trying to avoid damaging its relationship with the other.

The final course of action was as follows. If the Saudis appeared not to consider it really broken, then the problem was, is it broken or not in their host's view? What would it take to make it really broken so that getting it fixed was out of the question? Saudis said

they would be happy to replace it if they could find anything wrong with it. The best course of action was to break the machine "by accident." The US officers could apologize profusely, then the deed would be done and the Americans could rectify the situation by offering to provide a new shredding machine. An enlisted man went to the machine and "accidentally" dropped a quarter into the cutter blades. The machine was then "really broken." The Saudis, being good hosts, decided it was their responsibility to provide a new machine for their guests. They purchased one and it came immediately the next day. The new machine was well within the standards the Americans needed. The Saudi's were actually happy when it was so obviously now "broken" in everyone's eyes. The Saudis were delighted to bring in a new one and grateful for the opportunity. From their point of view, the Saudis had solved the problem for everyone.

This story contains a problem description—US and Saudi personnel in an apparent disagreement on whether a machine is broken—and consequences of a particular course of action. While we can easily imagine ways in which the story could be useful—say US and Afghan ground forces in a disagreement on a transport vehicle's "broken" transmission not going into the highest gear—it is unclear how simple keywords could ever retrieve such a story.

Though it is desirable to automatically extract the "meaning" of a story through natural language processing, it is beyond the current state of the art. As with a librarian in a vast library, however, a valuable system does not necessarily need to understand all of its content to be of service; it need only point its user to the right content. The immediate questions are:

- What indexing method would be sufficient to retrieve the right stories?
- How do we generate indexes?
- How do we prefer one story over another when compared to the user's situation?

To answer these questions, let us first define a process for Cultural IPB. Here, we construe the "battlefield" broadly to include operations in interaction with members of a separate culture, who may be adversarial or friendly. In this process, the tool produces a structured representation of the current situation, or derives structure from an existing story in order to contribute to the experiential reservoir. The experiential reservoir can contain cases of all granularities and comprehensiveness, the encoding of which will employ the relevant parts of the comprehensive IPB process.

The Cultural IPB Process

Cultural IPB, a continuous process, is the expression of the mission, the actors involved, actor relationships, and events pertinent to any of the above. It is designed as an augmentation of the conventional IPB process, superadding cultural qualifications to gathered intelligence, and guiding the collection process. This approach minimally perturbs the existing protocol for intelligence gathering and analysis. Each of the IPB phases below supports a more complex cultural characterization, and each is an explicit dimension along which the similarity of other cases can be determined.

1. **Operation**: a description of a situation and objectives including type of operation, scale, location, and other parameters. The geographical area of operations alone suggests the start of a cultural profile. Specific features such as culturally important routes and sites can also be included.

2. **Actors**: groups and leaders (including civilian populations), types of organizations, and their own areas of operation. At the coarsest scale, we can attribute to actors the political, ethnic, and religious cultures known for those groups and areas. With this information, actors can be compared to historical counterparts based on a set of behavioral traits. At the most abstract level these traits are described in the Cultural Lens (Klein and Klein, 2000), which includes such dimensions as Power Distance, indicating the distribution of decision authority within a hierarchy. Each dimension can indicate tendencies toward behaviors (as Power Distance affects the autonomy of individual units within a chain of command). Figure 1 shows various group memberships for the Somali warlord Aideed and his clan, Habr Gedir, along with the traits inherited from those groups. Figure 2 shows part of a cultural profile (for Arab culture) that relates dimensions to more specific aspects of conventional warfare. In general, more abstract cultural traits can be linked to specific behavioral characteristics by way of influence networks.

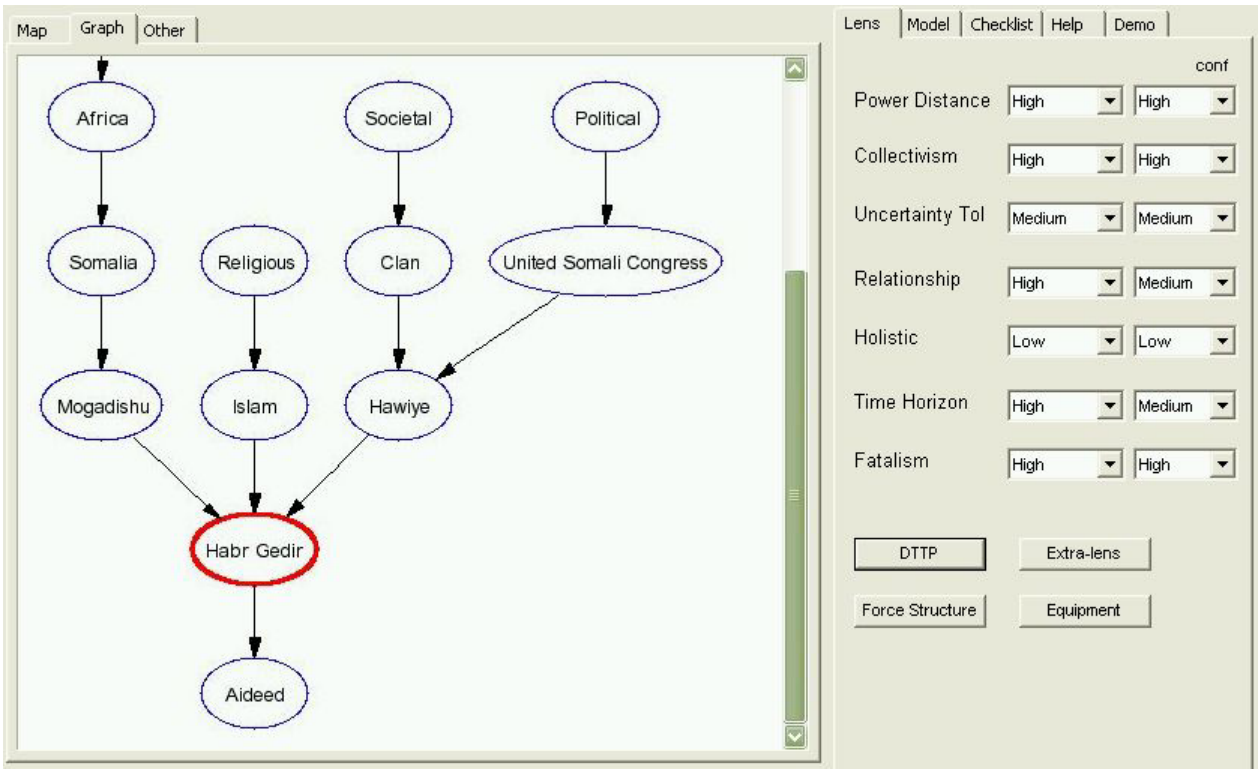

Figure 1. Actor in a Cultural Environment

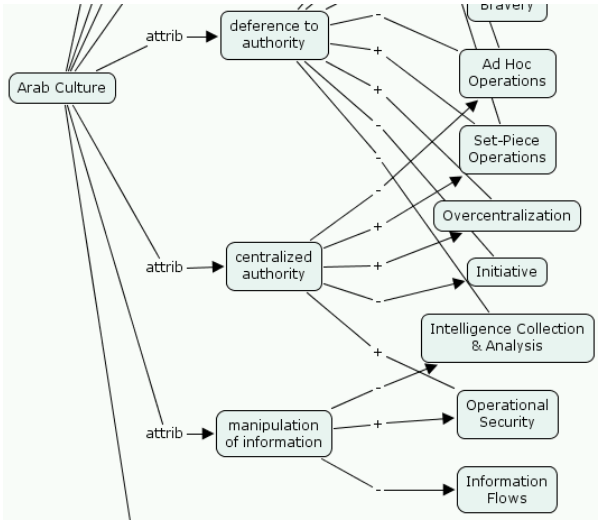

Figure 2. Cultural Traits in Conventional Warfare

3. **Relationships**: memberships of actors within groups, and specific associations between individuals. This is the start of establishing more complex cultural identities, as well as the beginnings of a story. Here, our tool mimics existing intelligence analysis representations, such as association matrices, activities matrices, and link diagrams associating various actors. Relationships such as a local leader serving as go-between for friendly and enemy factions, or a confederation of insurgent militias, can be compared to other such cases. Here we can begin to apply the conception of culture as the emphasis of certain relationships, such as the dominion of a tribal leader over the actions of tribe members. While some cultural factors pertain to the way decisions are made, some can determine whether a decision is made at all, rather than simply left to another.

4. **Events**: maneuvers and attacks, meetings, demonstrations, negotiations, speeches, etc. Here, conventional IPB representations are ill-specified, usually formed ad hoc by intelligence staffs, with varying degrees of content types and detail. With a formalized representation, culture can be conceived fully as patterns of behavior—ways of doing things—that can be compared across experience.

Any new information during the process can affect the whole system; observation of a rendezvous, for example, yields an event that can introduce a new actor and new relationship. In CIPB, the story can be directed as it unfolds; evidence gaps serve as intelligence collection requirements. A historical case, on the other hand, might be an isolated incident within

an operation. In both cases, the source data (often a textual narrative) is maintained in its original form, associated with the formal representation.

Toward a Decision Aid Tool

Now that we have described the CIPB process, let us revisit the earlier questions about story indexing and retrieval; namely, what are suitable indexes, and how do we judge a story's suitability?

Our answer to the question of indexing is to use the products authored through the Cultural IPB process. That is, a standard analysis tool such as a link diagram provides a structured representation of a situation. The example of the shredding machine could be represented as a peacekeeping operation involving two groups, Americans and Saudis, the pertinent individuals, and events describing the situation such as the machine breaking, disagreement on its status, etc. For indexing, the situation description and events leading up to a resolution are more important than the resolution; in fact, the resolution will not likely come into play as an index. Should some future user of the system be in a similar situation, the resolution serves as the "meat" of the story in that it's telling the user what happened as a consequence of decisions made in the face of a similar problem.

We believe this method of indexing has great promise as it minimally perturbs current intelligence analysis techniques, while at the same time provides a way for current users to add their own stories as they evolve; that is, users needing help with their own problems are actually assembling the index for their own unfolding stories.

So far we have established indexes as consisting of the operation, people, their relationships, and events. We now consider the question of judging a story's suitability. In CBR technology, a "similarity metric" quantitatively prescribes a degree of closeness between a problem description, and a story's index. The closer the match between the two, the better. For example, suppose a year later after the shredding machine incident, the shredding machine breaks again. Certainly we would want the system, upon receiving almost the same problem description, to retrieve the earlier incident. Here, the two groups and events overlap greatly. We might expect a nearly identical story taking place at an Afghan airbase to match as well, but not as well as at a Saudi airbase. A taxonomy of cultural groups, such as those shown in Figure 1, is a useful starting point for measuring story similarity; the Saudi case would compare favorably to other Saudi cases, less so to other Arab and/or Muslim cases, and far less to coalition operations with Australians. Using this type of semantic network to relate peoples, religions, nationalities, etc. provides a way to quantify a level of "closeness" for similarity measurement. To be sure, other types of "standard" similarity exist, such as that between a shredding machine and a transmission. Other bodies of knowledge representation, such as Cyc, can be employed.

More sophisticated metric power can be derived from cultural models of similarity such as those we are currently developing for our tool, shown in Figure 2 and Figure 3, the latter showing a theory of the influence of dimensions in the Cultural Lens (at the bottom) over intermediate behavioral traits. Moreover, retrieval based on these models can let the user can see *why* a historical culture pertains—that is, *what behavioral factors apply*—and in doing so learn something about the culture.

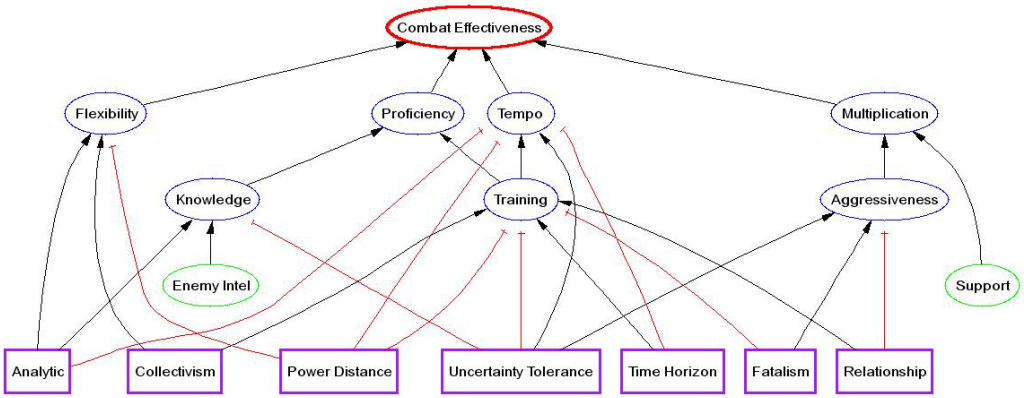

Figure 3. Cultural Dimensions and Behavior Moderators

In simulation itself, the applications of our work are varied. If the simulation corresponds to the indexing terms of our cases, with equivalent agent interactions, actions on the world, and world outcomes, then our system can apply directly through case-based reasoning, retrieving and adapting the closest historical case to the current simulation scenario. The system's validity and predictive power would depend only on the breadth and density of the case base. The cases we have collected so far would apply well to a cross-cultural interaction game, where players depend on interactions with other players to perform tasks. For broader application of our work, such as adversarial SAF scenarios, we would extract a broader and more general cultural behavior model, which could then inform decision making in the office as well as on the battlefield. This would require a comprehensive collection of cases across a wide array of tasks, and a detailed indexing scheme, which would itself give rise to the model. Validation might well be the harder part of such an effort. We believe, however, that the bottom-up, case-based approach, giving rise to indexing schemes that are partially valid in virtue of their derivation from historical fact, in concert with more abstract cultural theory informing the categorization and interrelation of indexing attributes, is a sound approach.

We have designed our effort to apply to an integral cycle of intelligence, planning, and execution, as well as to the wider concerns of dissemination between operations and units, and awareness of the influence of cultural factors in general. Our maintenance of a paper trail—linking cultural models, based on the indexes derived from historical cases, to maintain association with the cases themselves. This contributes to the explanatory power of the system, its transparency, and the user's trust in its products. It may be that the primary product of our system will be its pedagogical value: its provision of historical examples pertaining to scenario, and thereby illustration of the cultural factors at hand.

RELATED WORK

There are three bodies of work related to our effort: cultural modeling, decision aid tools, and CBR technology.

A cultural modeling project sponsored by the US Air Force is currently underway by Klein Associates. The objective of this project is to adapt the Cultural Lens model for use in psychological operations (PSYOP). The cultural lens is based on research conducted over the last 25 years in psychology, anthropology, sociology, and economics regarding cognitive aspects of culture. Cultural dimensions that address differences in cognition or thinking style are articulated as part of the cultural lens. Klein is also currently applying the Cultural Lens to Middle Eastern cultures.

Work in the broader area of individual differences in behavior modeling, including physiological and psychological factors, is being carried out by a number of researchers. A prominent example is the Methodology for Analysis and Modeling of Individual Differences (MAMID). It expands the conventional cognitive type of model, which represents entities in simulations homogeneously as purely rational and goal-driven thinkers, to include cognitive styles, psychological differences such as emotion and stress effects, and physiological parameters (Hudlicka and Pfautz, 2002). This results in robust, realistic behavior. So far this sort of work has oriented on individual mentalities, and has not been applied to culturally specific aspects of behavior, or to such tactical behavior and decision making as is spoken of here. However, aspects of the MAMID model can be reflected in our knowledge base, and the work will inform our design, allowing for future inclusion of individual psychological factors.

Recent decision aid tool work, as part of COAA, has been performed in modeling and simulation of behaviors that are sensitive to cultural factors. Raybourn and Forsythe (2001) studied the effects of culture, among other factors, in a sensor-shooter simulation scenario inspired by an event in the Gulf War of 1991, in which participants were required to make a quick decision about opening fire on Iraqi girls who may have posed a security threat. Work has also been done at the strategic level, modeling belief systems and game-theoretic behaviors of various state powers in confrontation (Howard, 2001). More recent work has shown increasing interest in cultural factors in military and civil defense scenarios. Mui, LaVine, Bagnall, Sargent, Goodin, and Ramos (2003) incorporate select aspects of the cultural lens into cultural templates as parameters and macros that can affect the execution of Integrated Air Defense in simulations. They identify three dimensions as relating directly to combat effectiveness: Distribution of Power (like Power Distance), Willingness to Take Risk (like Uncertainty Avoidance), and Familiarity with the Enemy. We share some of their findings and applications, and seek to model cultural effects at a level of detail that can explain and add further illustration, such as the mechanisms of power distribution in various organizational structures, and the explicit manifestation of uncertainty avoidance as

part of an OODA loop. Bloom (2003) applies gaming techniques to the low-level psychological phenomena that lead to asymmetric adversarial behavior, some of which derive from cultural influences, focusing on an airline terrorism scenario. Wagenhals and Levis (2002) use an influence net approach to model inhibitory and enhancing effects of various factors, some of which are cultural, to assign probabilities to different attitudes and behaviors. This is similar to parts of our approach, but in their study focuses on larger level, strategic policy decisions. All of this work shares some similarity to ours, and we continue to follow it, but our direction differs in the focus on the knowledge-based approach that eschews starting from a theoretical standpoint (as much as possible) in favor of historical precedent and usability.

Though CBR is a mature technology, little has been done involving cultural factors. However, there has been work extracting representations from text (Lenz and Ashley, 1998). Weber and Aha (2001) have derived case structure through text analysis, and conversational CBR in which the system elicits and structures a case interactively with the user. In addition, the work concerns military lessons learned, which are a subset of the sources relevant here.

CONCLUSION

We have described our effort to develop a decision aid to give its user an understanding of the nature and behavior of culturally unfamiliar people. As a first step, we are gathering and structuring "war stories" and forming indexes that can connect this experiential data to the theoretical cultural models we have studied.

We introduced the notion of a culture-based IPB process that shapes the content used for a situation description, and perhaps subsequently for a story index. We feel this process is largely compatible with current intelligence analysis, only requiring that the user specify a minimum of cultural knowledge. We intend to build upon the case library of stories, eventually reaching an adequate number that will enable the tool to impart its collective wisdom as efficiently as possible.

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