

Mapping the Human Factor



GIF 2011 Volume: 9 Issue: 2 (March)



Geospatial technology is playing a vital role as the U.S. military works to develop greater understanding of the social, cultural and behavioral aspects of the populations in which it operates, now and in the future.

The effort to fill the gap in the military's sociocultural understanding is being led by the Human, Social, Cultural and Behavioral (HSCB) Modeling Program within the Office of the Secretary of Defense. The initiative is being executed through the Army Geospatial Center (AGC) and Office of Naval Research.

The importance of social/ cultural knowledge is obvious for the conflict in Afghanistan, where insight into ethnic, tribal and language identities is vital for military operations such as the fight against IEDs, as well as larger efforts to foster political stability. In addition, the growing importance of worldwide humanitarian and peacekeeping missions in the military portfolio only underscores the need to understand patterns of human behavior.

Such developments boost the importance of "cultural intelligence," said Swen Johnson, who until recently was president and chief executive officer of SCIA, a firm that specializes in sociocultural intelligence analysis for the military and intelligence community. "Counter-terrorism, counter-proliferation and counter-narcotics can best be accomplished by successful non-lethal operations. Cultural intelligence is an essential first step in building the foundation for both non-lethal and the more traditional military operations," he said.

At the same time, cultural intelligence can't do entire job. Once military personnel gain some level of cultural knowledge, they need a way to efficiently share and act on the information they've collected and analyzed. "We get a lot of information from different sources, like sensors, mobile phones and even Facebook. There are not enough analysts to review it all," said Peggy Agouris, chair of the department of geography and geo-information science at George Mason University.

One way to efficiently make sense of and distribute the information is by representing it geographically, said Robert Tomes, director of strategy and policy, global analysis with BAE Systems. That way, the military can quickly gain insight into where both its adversaries and supporters are, and where they're likely to move. "Visualization of data can help with decision-

making and understanding problems," Tomes said.

In fact, visualization technology already has enabled military decision-makers to create databases with spatial and temporal components so that they can better understand societies, Tomes said. As an example, he pointed to the way humanitarian aid and medical support was staged in the Balkans prior to the Serbian ethnic cleansing operation that led in 1999 to U.S. military action.

Recognizing that the Serbs were burning select houses, and possessing knowledge of the migration routes refugees would use to find safe passage, food and water were staged before the onset of the crisis. This was an early example of how human geography data was used in decision-making. In this case, it was a preventive stabilization operation to reduce starvation, infant mortality, water shortages and infectious disease outbreaks.

Shift in Thinking

The military's recognition of the importance of cultural understanding has been growing for some time, Tomes said. By about 2003, the experiences of soldiers on the ground in Iraq and Afghanistan were reshaping opinion and attitudes. For starters, the proliferation of IEDs required an approach that expanded upon traditional military action. Instead, it called for a better understanding the civilian population, which in some cases may be participating or acquiescing in the planting of the insidious munitions. An important and often overlooked relationship makes the capability-development and fielding activities of the HSCB and the Joint IED Defeat Organization (JIEDDO) complementary at both the strategic and tactical levels.

Where JIEDDO is focused on defeating IEDs, attacking enemy IED networks, and training personnel to identify and defeat IEDs, the HSCB community is focused on understanding the populations that IED networks operate within. The HSCB focuses on helping coalition forces improve governance and build civil society, and the JIEDDO focuses on defeating those that wish to prevent the emergence of a stable Iraqi or Afghan government through fear, violence and intimidation, Tomes said.

Further evidence of the military's growing appreciation for the changing nature of combat can be seen in a 2005 DoD directive stating that "stability operations are a core U.S. military mission," and "shall be given priority comparable to combat operations."

In other words, "this put security and stability missions on an equal footing with combat," Tomes said, adding that past peacekeeping operations may have been seen by some as less critical to U.S. security than traditional combat operations. Falling within the umbrella of peacekeeping operations are such activities as helping local civilians with security, developing governmental institutions and restoring basic services.

To that end, one of the responsibilities assigned to the under secretary of defense for personnel and readiness was to develop opportunities for DoD personnel to contribute to stability operations by "learning languages and studying foreign cultures." In addition, the combatant commanders were instructed to conduct intelligence campaign plans that included gaining "information on key ethnic, cultural, religious, tribal, economic and political relationships."

As the directive also noted, engaging the military to help civilian populations establish or maintain order "can help secure a lasting peace and facilitate the timely withdrawal of U.S. and foreign forces." This was a significant shift in thinking, Tomes added, as the focus had moved from weaponry and battle tactics to social and cultural intelligence.

In addition, a 2005 president directive called for promoting U.S. security through "improved coordination, planning, and implementation for reconstruction and stabilization assistance for foreign states and regions at risk of, in, or in transition from conflict or civil strife."

In order to move toward these goals, the military needed to create a community of research and technology focused on cultural knowledge, Tomes said. That required pulling together individuals with skills and expertise in areas ranging from database development to statistics to anthropology and linguistics.

HSBC Program

The HSBC program is one solution to this need. While it isn't the only like this, it is a flagship program, said Captain Dylan Schmorrow, HSCB program director and assistant director for human systems in the office of the deputy undersecretary of defense for science and technology. The HSBC first received funding from Congress in 2008, with the funds arriving at the OSD and the program forming in 2009.

The goal of the program, Schmorrow said at the time, is to develop "tools and systems that would provide enhanced or new capability for a range of decision makers, including those working at the strategic, operational and tactical levels."

The goals of the HSCB program include advancing "the understanding of the influence of sociocultural factors on behavior as it applies to military-relevant contexts," and providing analysis methods, computational models and software to assist war fighters in considering sociocultural behavior in their planning and operations," said Barry Costa, director of MITRE Corp.'s initiative in smart power.

In 2009, the HSCB program expanded its direction somewhat, Costa explained. While the primary focus remains on conducting research and transitioning relevant and targeted parts of the research to DoD acquisition programs, DoD leaders also want to challenge the program to see what technologies might be ready in the near term to support operations in the field. As a result, the HSCB program engaged with users in meetings and now has multiple projects that support deployed forces.

Initial results from the research under way began emerging last year, and are expected to continue into 2011. In 2012 and beyond, the HSCB should be an established program with traction, Schmorrow added.

The HSCB program is based upon four pillars, according to Schmorrow. They are modeling, or developing "generalizable" models of social and cultural behavior; data collection, use and storage; training; and visualization, or using software and other tools to map the geospatial aspect of the models.

"Geospatial information is important because culture is very tied to geography," said Ajay Divakaran, technical manager with SRI International Sarnoff, a provider of solutions that allow clients to see, understand and control complex environments. From the mundane—for example, the "ice-breakers" people in different cultures use to start conversations— to the more serious, such as the lengths to which an individual might go to maintain his or her honor, conventions and attitudes can vary significantly from one country to another, Divakaran said.

"The buildings, geography, imagery and topography are important to understand and solve questions. It creates the seed where the activity is taking place," Agouris said. "Without the seed, you can't solve the question."

It's been within the last two to three years that it's become clear how geospatial capabilities can be brought more effectively and efficiently to users in the field, Tomes said. In part, this has been due to the explosion of technologies, such as Google Earth, available in the civilian world. Warfighters who get to Iraq want the same geospatial information that they can get when they're planning their vacation, Tomes noted. What's more, these capabilities will become more sophisticated as the network, enterprise and standards are brought together.

In fact, the geospatial technical revolution of the 1990s allowed for intricate maps that began approaching reality, SCIA's Johnson said. "Previously, the kind of static, monochromatic, single-layered maps could only represent the geographical location of important social groups as blobs or some kind of unrealistic geometric shape. Now, we can show the evolution of groups in space and time."

Geoprocessing techniques used within the HSCB program include geostatistics, spatial agent-based modeling and geographically weighted regression, said Joe Watts, special programs manager with the AGC.

The AGC has been a leader in the human dynamics arena since 2006. Among the technical functions the AGC has been performing for the HSCB program are carrying out and testing HSCB technologies and capabilities; developing a sociocultural data model; and establishing a cultural web-mapping portal.

With the technology currently available, users can do things like extract positional information from motion imagery feeds and analyze it in order to monitor the behavior of individuals or groups, Agouris said. By analyzing patterns of behavior and formalizing relevant rules, analysts can automate certain video surveillance and analysis tasks, which in turn raises the level of objectivity and reduces the potential for analyst-related bias, she added.

Charles River Analytics' Organizational and Cultural Criteria for Adversary Modeling project is a software-based decision aid that incorporates organizational and cultural influences on individual and group behavior. All entities and relationships can be geotagged and then visualized geospatially, said Jonathan Pfautz, vice president of the firm.

If person X is tagged with pieces of geoinformation, such as his or her home town, for example, these are presented across the different types of views within the application, such as geospatially and temporally. This helps connect the dots between information that is presented geospatially—person X was last seen at location Y—and other information, such as the fact that person X is the spiritual leader of a specific group, Pfautz noted.

Developing Rules

Typically, the rules-developer will look at behavioral patterns to develop rules. Agouris provides a rudimentary, hypothetical example of such a rule: If the geo-intelligence shows a group of people moving in a certain direction through a specified neighborhood to a building with a specific shape near the local river, it's likely that they're going to a shed that's functioning as a nuclear storage facility.

To be sure, developing ways to represent human activity across space and time is a challenging undertaking. "Models of sociocultural space are highly complex across various dimensions," Watts said. One tool used to manage the complexity is hybrid modeling, or integrating different types of modeling approaches, such as agent-based, system dynamics and spatial analysis, across several layers of granularity, he added.

Limitations remain, Johnson noted. For instance, most models define relatively large areas, such as ZIP codes in the United States, to represent the boundaries of human social behavior. Future advances will allow "the technology to represent human geo-social behavior as it actually is," he said.

What's more, while many GEOINT tools, such as those that analyze topography, have been available for some time, the technology needed to turn cultural norms into rules hasn't advanced as much, Agouris said. Social scientists can provide the information, but physical scientists who can develop tools to use the information still are needed, she added. "It's a new direction that brings together these two communities and philosophies."

After all, any rules developed need to take into account cultural norms. That way, the applications are more likely to accurately assess, for instance, whether a gathering of 100 people means that a wedding ceremony is under way, or that insurgents have come together to plot an attack.

The magnitude of the challenges involved in trying to create rules and predict human behavior becomes clearer when one considers that humans have been modeling weather for thousands of years, and yet still have much that could be improved upon, Schmorrow observed.

Similarly, economists and other academics have been trying for hundreds of years to understand how humans make financial and economic decisions, yet still find their efforts coming up short. Progress in this area is slow, given that it's necessary to incorporate human behavior, which can be fickle, inconsistent and driven by attitudes, values and experiences, rather than logic. "When you consider the goal of modeling human behavior, you need to recognize that the challenges are great," Schmorrow said.

What's more, the most powerful method for gathering intelligence on human behavior and actions currently is via "boots on the ground," said Divakaran. That's a slow, laborintensive process.

At the same time, there currently is so much geographical data available that technology is needed to manage it. "The geo-data is much more voluminous than it used to be," said Divakaran. "If you begin to associate rich data such as video with it, then the combined data grows to a non-humanly-manageable size quickly." Handling it requires everincreasing computational capabilities.

With both social and physical scientists working together, the result should be maps that are more visual and immersive. Eventually, the goal is "a cultural atlas of the world where you have location and richness with respect to cultural understanding," Agouris said. Given limited resources, however, it's necessary to start with areas that are problematic, she added.

Some in the social science community have expressed concerns that the information they provide may be used to betray trust of the communities they're studying. But the efforts under way have been used (and will continue to be used) to help the military learn how to have constructive, effective interaction with civilians, Divakaran said, adding, "For constructive exchanges to occur, the military needs some understanding of social science.

"At a macro level, I think that in general, understanding is better than not. If you are able to understand a community, you've taken a big step toward having a positive, friendly interaction with them," Divakaran said. "There will be more constructive interaction, and more effective resolution of conflicts." ♦

[Back to Top](#)

NGA Forms Human Geography Standards Working Group

The National Geospatial-Intelligence Agency chief information officer's National Center for Geospatial Intelligence Standards recently partnered with the NGA Source Operations and Management Directorate to establish the Human Geography Working Group (HGWG) as a component of the Geospatial Intelligence Standards Working Group (GWG).

The GWG serves as a DoD, intelligence community, federal civil and allied partner community-based forum to advocate for

IT standards related to GEOINT. In this capacity, the GWG supports the NGA director to carry out GEOINT functional manager responsibilities.

The HGWG is defining a standards-based dictionary and catalog for exchanging human geography data, and is developing data entities, attributes, a common vocabulary and lexicon. The group is chaired by the Department of State and the Office of the Under Secretary of Defense for Intelligence. Participation is open to DoD, intelligence community organizations, federal civil agencies, allied coalition partners, international organizations and commercial organizations. For more information, contact nccgis-mail@nga.mil or asfechair@nga.mil. ♦

[Back to Top](#)