



## Laboratory for Computational Cultural Dynamics: Using Technology to Understand Culture



**Can Internet search algorithms predict political violence? Can computer modeling accurately replicate culturally influenced patterns of behavior? How can we make virtual cultural training more realistic for our diplomats and soldiers?**

**These and other questions are under investigation at the University of Maryland's Laboratory for Computational Cultural Dynamics (LCCD). Researchers at LCCD develop computer-based tools that improve our**

**understanding of different cultural contexts and help identify patterns in the behaviors of specific groups. With applications ranging from new ways to measure public opinion to advanced simulations of intercultural exchange, the lab's work has important implications for policy makers in business and government.**

V.S. Subrahmanian is co-director of LCCD and director of the University of Maryland Institute for Advanced Computer Studies (UMIACS). At LCCD, Subrahmanian develops computer programs that model complex situations, such as public health crises, drug trafficking, and terror plots. He also develops sophisticated multimedia programs to simulate intercultural interaction.

Jonathan Wilkenfeld heads the university's Center for International Development and Conflict Management (CIDCM). He collaborates with the LCCD to develop tools for monitoring politically active groups. This partnership provides new approaches for understanding the cultural roots of terrorism. **Laboratory for Computational Cultural Dynamics** [www.umiacs.umd.edu/research/LCCD](http://www.umiacs.umd.edu/research/LCCD)

### *Applying Cultural Reasoning Architecture to Predict Behavior*

V.S. Subrahmanian applies a computer-science methodology called cultural reasoning architecture (CRA) to investigate complex cultural problems. CRA uses sophisticated algorithms to analyze information from many sources to construct accurate models of how people in specific cultural contexts are likely to behave. Subrahmanian has used this technique to model how outside incentives might reduce the cultivation of opium in rural Afghanistan and how health care organizations could reduce the spread of disease in Kenya. He is currently using CRA to understand the cultural dynamics of terrorism.

In a large and growing project involving collaboration with behavioral scientists at UMD, Subrahmanian and the LCCD team use information-processing programs to predict when marginalized groups who feel politically threatened might cross the line from political action to violence.

To keep up with the daily deluge of information in multiple languages and formats, LCCD is developing several software tools, including a program called STORY. STORY scours the Internet (or other large archives) for information on individuals or groups. After extracting the data, STORY identifies relationships and patterns and compiles relevant details into succinct narratives that address the specific information needs of the user. For example, the LCCD used STORY to provide the Army's 10<sup>th</sup> Mountain Division with the most recent information about the history, politics, and culture of the tribal groups they encounter in Afghanistan.

### ***Algorithms to Determine Public Opinion***

The LCCD's Opinion Analysis System (OASYS) sifts through vast digital archives of online newspapers, blogs, and news groups to gauge collective opinions on specific subjects. The 2006 winner of *Computerworld Magazine's* award for "Innovative Emerging Software," OASYS can answer questions about the direction, intensity, and history of public opinion on an issue. In other words, OASYS can determine if public opinion is positive or negative, how strong the feeling is, and if it has changed over time.

OASYS is not limited to a particular purpose or field. Politicians might find it useful to analyze the popularity of new proposals or the overall public reaction to specific events. Companies could use OASYS to measure consumer attitudes towards a product. Military or foreign policy experts could gauge opinions on a sensitive topic before moving forward with a plan. Historians and social anthropologists could track how views on an issue have changed over time or how opinions vary from region to region.

### ***Customized Simulations of Intercultural Encounters***

Imagine stepping into a room with vivid images of a landscape projected on walls all around you. As you move, computer-generated images also move. Characters appear. They ask questions, offer food, smile, or scowl. How should you respond? More importantly from a computer science perspective, how should the characters respond to your actions to simulate a real cultural exchange?

LCCD is developing games like the one described above to train soldiers and operatives about expected cultural norms for unfamiliar situations, such as entering an Afghan village. With funding from the Department of Defense, Subrahmanian and his team are refining the separate components—the game room and the rules guiding virtual characters' behaviors—to make these simulations as realistic as possible.

So far, LCCD has developed two game scenarios. The first scenario models the drug trade in Afghanistan, specifically the involvement of the Afridi tribe. The second scenario focuses on the cultural norms of the Afghan village. LCCD simulations have already made a difference by raising the cultural awareness of soldiers in the U.S. Army's 10<sup>th</sup> Mountain Division. They have learned how to behave appropriately when entering an Afghan village, how to gauge the hostility levels, and how to show respect to village elders. As a result, these soldiers have become more effective in gaining local support.

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### ***Anticipating Terrorism with Technology***

As head of the Center for International Development and Conflict Management (CIDCM), Jonathan Wilkenfeld studies terrorism and responses to terrorism. The center uses computational tools to monitor and analyze the behavior of groups facing political or religious discrimination. These tools could help identify and diffuse tense situations that might otherwise result in terrorist acts.

The CIDCM maintains the Minorities at Risk (MAR) database, a database that archives details on almost 300 minority groups around the world. Patterns in this data could help identify previously unrecognized factors that motivate marginalized groups to act violently. The main purpose of this research is to test theories about why certain organizations choose political violence as a strategy and why some targets are chosen over others. For example, under what conditions would an organization target civilians instead of security personnel? There are approximately 150 variables in the database, allowing researchers to address a host of research questions.

In the past, Wilkenfeld and his colleagues have relied heavily on human coders to find and process source material on culturally specific responses to discrimination. Now, CIDCM is working with LCCD to automate the information retrieval and compilation processes with the STORY program (described above). CIDCM and LCCD are also using this information to develop computer models that simulate the behavior of active terrorist agents.

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