

AFRL/HE Modeling Program

4 May 06



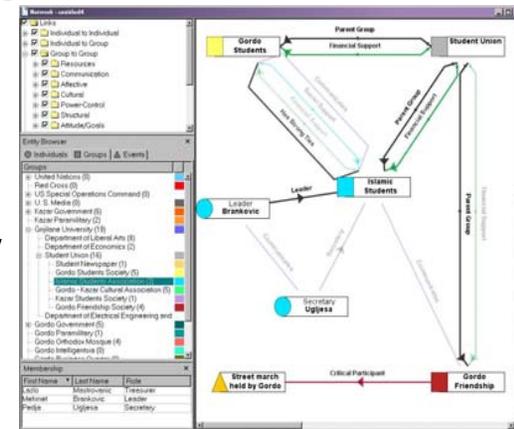
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Overview



- What AFRL/HE is not doing
- What AFRL/HE has done:
 - Agent-Based Modeling and Behavioral Representation (AMBR)
 - DMSO Human Performance Modeling Program
- What AFRL/HE is/will be doing:
 - Behavior Signatures and Models
 - Research on Culture, Personality, and Society
- Summary





Etiquette Guides: Not AFRL/HE Research Area



WHEN CULTURES COLLIDE



RICHARD D. LEWIS



Cultural Intelligence for Military Operations

DOD-2630-007-04

North Korea, South Korea, Japan



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This product is designed to help U.S. military forces understand the mindset of foreign cultures. Emphasis is placed on cultural factors with the greatest impact on military operations such as:

- Customs
- Religion
- Attitudes
- Social Structure
- Language
- Cultural History

The Cultural Field Guides are concise products covering all of the major cultural factors of a given country. The Cultural Intelligence Studies are in-depth comprehensive reports written for every significant ethnic group within a country.

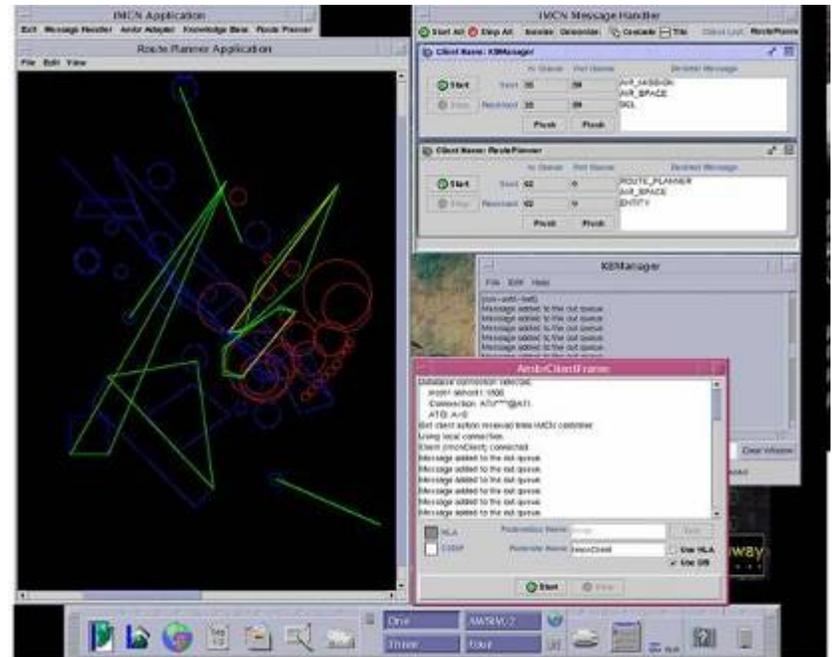


Agent-Based Modeling and Behavioral Representation (AMBR)



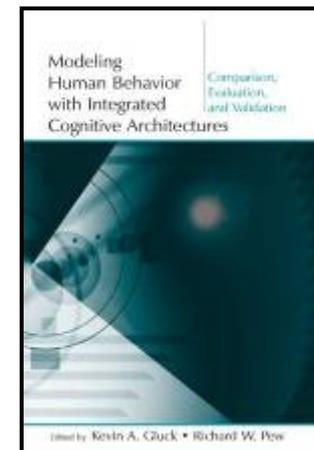
Warfighter Payoff / Impact

- Determined realistic performance boundaries for Human Performance models
- Cultivated and reported on the development of cognitive based human team models
- Increased AOC training realism and effectiveness for AF and Navy, while reducing exercise cost by 10%
- Provided means to leverage expert model controller experience for wide-use
- Developed highly sophisticated C2 model based on culture and personality differences



Product Transitions

- Intelligent Mission Controller Node transitioned to Air Force Agency for Modeling and Simulation and Office of Naval Research for incorporation into training toolkits
- Model Comparison book published
- Architecture for Behavior and Cognitive Modeling transitioned to Joint Warfare System program office





DMSO Human Performance Modeling Program



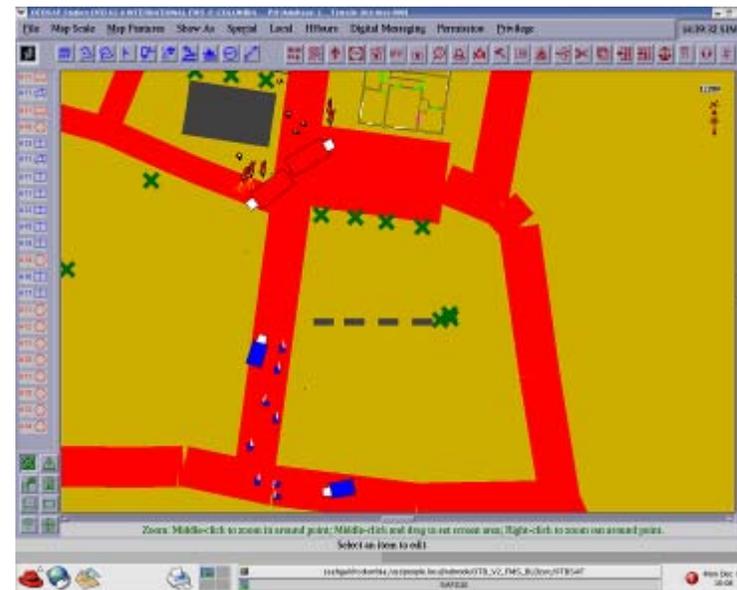
Warfighter Payoff/Impact

- Increased realism of MOUT training and exercises by creating a robust and dynamic model of crowds
- Provided responsive, realistic models operating under modifiable Rules of Engagement constraints
- Developed non-lethal weapon models for use in OneSAF and JSAF
- Created Rules of Engagement training modules for the DARWARS Ambush! trainer
- Provided cascading effects models for military operation planning exercises



Product Transitions

- Crowd Federate in transition to JFCOM's Advanced Training Technologies Lab (ATTL)
- Role-Player Controller Node: in final stages of development with transition planned to JFCOM ATTL
- Rules of Engagement and Non-lethal weapon models successfully developed and delivered to several DoD agencies
- Darwars AMBUSH! modules incorporated into deployed AMBUSH software package





Behavior Signatures and Models



OBJECTIVE

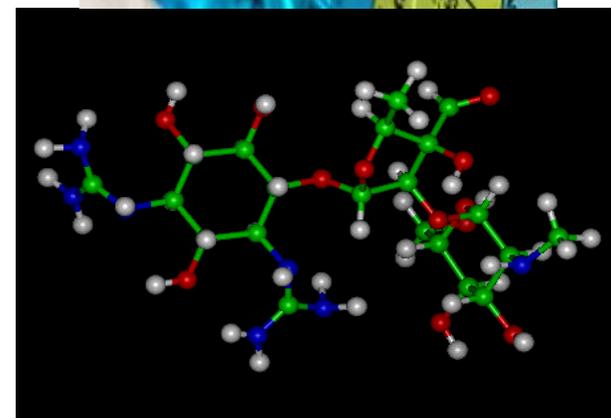
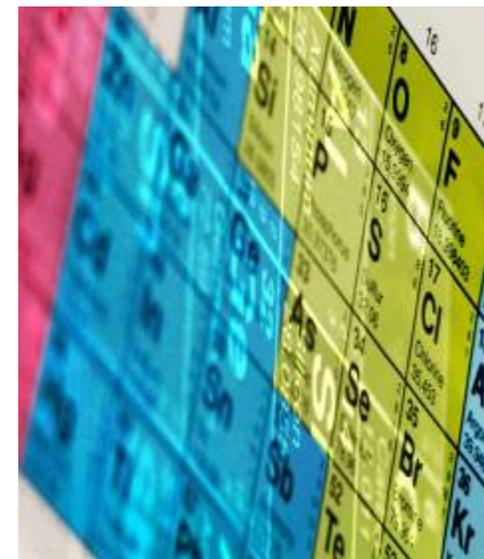
- **Provide the scientific foundation to understand and characterize behavioral proclivities based on all relevant scientific disciplines**
- **Reduce the variability you have to predict**
- **Provide precise characterization and prediction for precision effect**

**Reduce uncertainty across the strategic to tactical continuum....
Enable the decision maker to focus on the truly anomalous and
unknown**



TECHNICAL APPROACH

- Create a “periodic table” to characterize behavior on relevant dimensions
 - Apply and develop a broad foundation of science to identify the relevant dimensions
 - Identify the set(s) of conditions for which dimensions can characterize and predict
 - Identify the direct indicators of those dimensions
 - Identify direct indicators for which data will likely be scarce/non-existent
 - Identify indirect indicators to provide “assessed data” when direct data is absent
- Specify “compounds” or sets of indicators that characterize behavioral proclivities for various sets of scenarios
 - Given condition set (i.e., compound) X, Y will occur



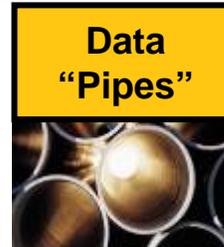


Behavior Signatures and Models



TECHNICAL APPROACH (CON'T)

- Create unified signatures based on
 - Data from multiple “pipes”
 - All physical and observable event data
 - Assessed knowledge on behavior and situational attributes, e.g.,
 - Personality
 - Culture, ethnicity, nationality
 - Religion/ideology
 - Training, education, learning behavior, experience
 - Political/economic factors
 - Specific activities/associations
 - Contextual events and timing
 - Sampling over long periods of time
 - Using agent technology to update, correlate, and alert
 - Extracting more knowledge from existing “ints” and combining it with the knowledge base



Turning Data into Actionable Knowledge

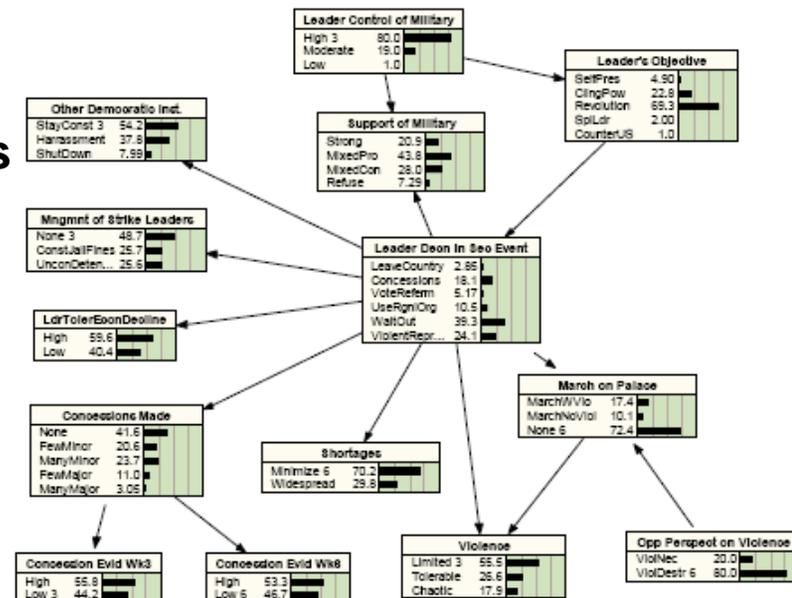


Behavior Signatures and Models



TECHNICAL APPROACH (CON'T)

- Develop models to provide exploratory structure for understanding
 - Characterization dimensions and indicators
 - Knowledge gaps
 - Inter-relationships and sensitivity analysis
 - Combining existing knowledge with new discoveries and incoming data
- Use models to
 - Explain and predict behavioral proclivities
 - Develop alternative courses of action
- Leverage other research





Behavior Signatures and Models



TECHNOLOGY CHALLENGES

- Cultural understanding in a militarily relevant context
- Systematic characterization of individuals, small groups, weak or failing states, and societies – meaningful for prediction
- Automated, dynamic characterization
- Automated learning algorithms
- Developing design patterns and visualizations to accelerate sensemaking
- Multi-int data and knowledge base correlation and reconciliation
- Rapid relevance determination and categorization of incoming data with existing characterizations

Key Challenge:
Unifying applicable principles and dimensions across all scientific disciplines



Behavior Signatures and Models



PRODUCT OUTPUTS

- **Behavior signatures: specific distinguishing sets and arrangements of the relevant dimensions to make characterizations and predictions**
- **Behavior signature libraries**
 - By event and scenario type
- **Models that characterize and predict future actions**
 - Individuals to collectives
 - Over a range of circumstances
 - With a level of certainty that enables preventative or preemptive action

A multi-source, multi-disciplinary based assessment of attributes, characteristics, and patterns that make actions uniquely identifiable in a given context



Behavior Signatures and Models



PAYOFF

- Prepositions the scientific foundation to understand and characterize behavioral proclivities
- Behavior signatures and models provide a framework to select what to analyze from the mass of data
- Brings to bear the relevant knowledge of the entire system on the decision point
- Reduces operational time to do characterization and prediction
- Reduces the variability and improves accuracy and actionability
- Enables longer-range projection and prediction
- Provides precise characterization and prediction for precision effect
- Provides understanding of cascading effects

**Attain a constant, knowing state,
sufficient to take action, anywhere, anytime...
Reduce uncertainty for the decision maker**



Research on Culture, Personality, and Society



- **Organizational Modeling: From Individuals To Societies**
 - NRC Study to Develop an edited volume on “Organizational Modeling: from Individuals to Societies”
- **Situation Authorable Behavior Research Environment (SABRE) Game-based Testbed**
 - Adapt commercial game for use as a research tool to study culture, society, and personality factors in immersive, team environment
- **Predictive Modeling & Decision Aiding Tools Programs**
 - Stress/strain tensor models to predict “fault lines” from major 2-factor sociological culture model
 - Culture as dynamic process rather than static state: prediction of coalition changes & shifting alliances

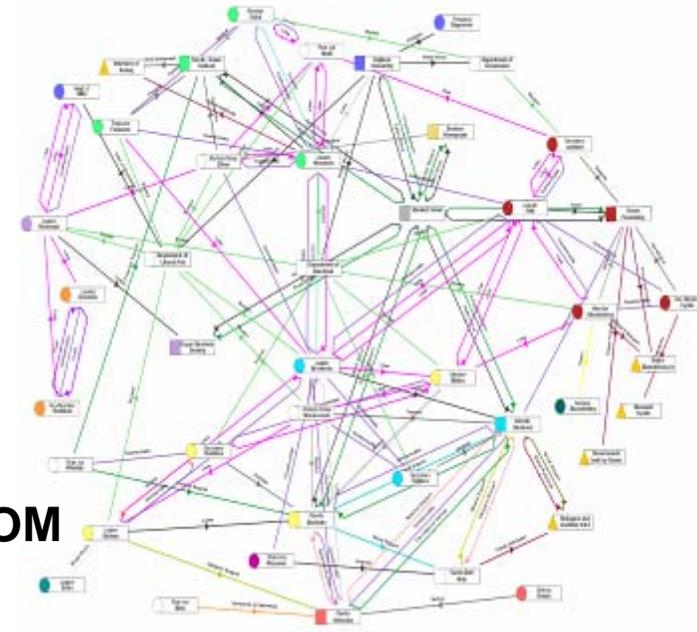




Research on Culture, Personality, and Society



- **Organizational and Cultural Criteria for Modeling**
 - Design and develop an *analyst decision aid* that incorporates organizational and cultural criteria in behavioral modeling and impact analysis
- **Cultural Overlays**
 - Develop process for incorporating culture into operational planning for STRATCOM
- **Cultural Factors in Communication Chains**
 - Determine how distortion of passed message varies with content & culture in accordance with analytic – wholistic cultural dimension
- **Rosetta Project**
 - Develop LOW-TECH paper & pencil test battery to assess cognitive styles of new and uncharted cultural groups





Summary



- **AFRL/HE has a history of successful development and transition**
- **Our programs are shifting from the development of Human Performance models for training and exercises to the development of models used in military planning, monitoring, analysis, and prediction**
- **Current and upcoming programs diverse in cultural research and behavioral modeling**
 - **Programs have a broad range of focus and customers**
 - **Program run the gamut from basic research to applied applications**