

A Layered Service Architecture (LSA) for Human Behavior and Cultural Modeling



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The Problem

Actionable intelligence analysis and threat assessments require incorporating estimates of the intentions, decision-making, and most likely behaviors of different groups and individuals. Understanding the behavioral aspects of target individuals and groups, estimating future social dynamics for specific segments of the population, and incorporating different cultural traits into intelligence assessments is fundamental to determining appropriate courses of action. These complex information needs cannot be satisfied without extensive knowledge of the geo-political, socio-cultural, economic, infrastructure and preparedness context. The amount and heterogeneity of models and data playing a role in decision-making require effective methods to design hypotheses, ingest data, run models and present results that take into account variables at many levels (macro-, micro-, and meso levels) of analysis. Models capable spotting indicators of events, anticipating developments of strategic concerns, identifying opportunities and vulnerabilities, and creating timely opportunities and vulnerabilities are of interest.

LSA Service-Oriented Architecture

A service encapsulates each function and is instantiated by a service request. Services are described by service description documents (may be in written in WSDL). In our architecture, each model is instantiated as a service and described by a service document.

The LSA contains a dashboard where a user can view summary briefs of theoretical concepts, available models, and access input data. Service discovery for models is available. Model execution is run from the dashboard according to the service description document.

Models can also be composed and executed in a pipeline fashion built by users. The resulting data is stored with metadata that contains information about each model, the composition process, data sources, and degree of confidence in each source and/or model.



The Cultural And Media Influences on Opinion (CAMIO) Model of Group Behavior

The Cultural And Media Influences on Opinion (CAMIO) simulation of group behavior is an agent-based computational model that can be used to examine the opinions, issue stances, political allegiances or other judgments held by members of a particular group within a society and examine how these opinions change or can be influenced to change over time. Of particular interest is changes caused by an external organization such as the international or internal media. CAMIO is a model of how small groups of acquaintances form from larger populations and change over time; how opinions spread throughout the groups; how an outside entity, such as the media, can influence the spread of such opinion; and how this population of small groups may become polarized or unified around a particular issue.

1. R. R. Brooks, J. Schwiart, and C. Griffin, "Behavior Detection using Confidence Intervals of Hidden Markov Models," *IEEE Transactions on SMC Part B*, accepted for Publication, Feb. 2009.



Cultural and Political Knowledge

The LSA contains current and historical information about cultures and politics in a repository, including country, policy, and geo-referencing information. This enables the characterization of how certain ethno-political groups interpret their circumstances and put forward their agenda.



Data ingestion built upon ORCAT²



ORCAT ingests open source intelligence from the Web (ORCAT I) and vetted data from the Open Source Center (ORCAT II) with its metadata. With the use of RDF triples, the exploitation of relationships among concepts and entities produces concise yet relevant results to complex queries.

ORCAT enables Intelligence Analysts to:

- restrict and refine the information space,
- disambiguate the person from the place,
- formalize the connection between entities linked by third parties (hidden networks), and highlight the mutual connection.

Which cities outside the US and Egypt did al-Sharif visit last year?

2. L.C. Pouchard, J.M. Dobson, J.P. Trien "A Framework for the Systematic Collection of Open Source Intelligence," *Techno-Social Predictive Analysis Workshop, AAAI Spring Symposium*, Stanford, CA: March 2009.

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