

The DoD Ontology Gap - Applications of Agent Technology in the Military

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ABSTRACT

This position paper describes ontology issues important to the fielding of military agent-based systems.

General Terms

Management, Design, Standardization, Languages, Verification.

Keywords

Ontology, Military, Information Systems, Intelligent Agents.

1. POSITION

The vision for future military information systems often includes the integration of a vast number of existing heterogeneously developed information sources to obtain a "big picture" view of global events. The desire is to have a system of systems which is dynamic in its configuration and owned by players from distinct political, geographic and service-specific units.

The reality of today is that many military information systems are often stood up in conjunction with a particular mission or theatre of operations and involve the forced integration of "legacy" and "stovepiped" systems. Traditional software integration methods are used to stitch together existing (legacy) systems either on a one-to-one basis or via common, often overconstraining, data/interface standards. Heavyweight, often long in development and outdated upon delivery, have become a *de facto* result. Operators of these systems continue to look to technology to make those systems more responsive, less costly, more automated (autonomous) and requiring of less staffing

Future command and control (C2) systems are often described as containing hundreds or thousands of active, autonomous information components working with an even larger number of operational or engaged "fighting" units. The attainment of this goal is usually predicated on the development of a new class of information system - clearly heterogeneous, often loosely coupled - by policy or necessity, and most likely distributed - the same robust qualities promised by autonomous agents.

On going work in the area of agent infrastructure, e.g., DARPA Control of Agent Based Systems (CoABS), and other programs

are addressing many of the basic architecture and integration issues, but have only scratched the surface of the semantic aspects of these systems. The DARPA Agent Markup Language (DAML) program has made a good start in this direction; but new information systems, presumably agent-based, being proposed must be ontologically aware and compatible from the beginning.

The DoD has made a strong push in some quarters for increased emphasis on the use of XML and the related tagging of data. This has not always been accompanied by a clear understanding that there is more to the task than simply tagging everything in sight. Properly tagged data is seen as the key to efficient information and knowledge retrieval across multiple, and often dynamic, data and knowledge sources. Tagging must go beyond text to imagery and other media as well as more exotic data types such as recorded waveforms and other scientific data sets. Real-time automated tagging, and retrieval, is also desired.

However, there are many unresolved issues relating to this use of semantically aware agent technology in larger military systems:

1. How to bring ontological awareness to specifiers and developers of military systems?
2. How ontologically heterogeneous can new systems be, and still be integrated into larger systems-of-systems? How scalable is the incorporation of additional ontologies?
3. How to efficiently incorporate legacy systems, including the tagging of legacy data, into newer systems, and systems of systems, which are ontologically friendly?
4. How to move the processes of ontology definition and data markup from an art to a science via rigorous methodologies? And thence to common practice via a robust, established software engineering/programming paradigm?
5. Will ontologies be defined/managed by programmers or operators? And what will be their tools of choice?
6. How to quantify the amount of resources, e.g., labor hours, calendar time, level of expertise, etc.; needed to create ontologies and to mark up data sources (including validation)?
