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The International Technology Alliance in Network and Information Sciences

Alun Preece, University of Aberdeen

Winston R. Sieck, Klein Associates

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Editor: Alun Preece
University of Aberdeen
apreece@csd.abdn.ac.uk

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In May 2006, the US Army Research Laboratory and UK Ministry of Defense created the International Technology Alliance (www.usukita.org). The consortium of 26 partners—including the ARL and MoD—offers an open

research environment in which leading US and UK companies and universities can collaborate (see table 1). It will also fuse the best aspects of the US Army's Collaborative Technology Alliances and UK MoD's Defense Technology Centers on an international scale. The ITA aims to develop flexible, distributed, and secure decision-making procedures to improve networked coalition operations.

Network science is a young discipline—we have limited information models and network theories to describe the behavior and scaling of large, complex mobile ad hoc networks.¹ Moreover, you can't understand a coalition network's performance without understanding its cognitive and sociocultural aspects and physical characteristics. A key ITA goal is to perform basic research in network-centric coalition decision making across four technical areas: network theory, security across a system of systems, sensor information processing and delivery, and distributed coalition planning and decision making.² We focus on the last area because this is where intelligent systems will play the biggest role.

Coalitions

Coalition operations are now the standard model for military intervention. In the last 20 years, the US and UK have conducted the vast majority of their military operations in coalition partnerships. Multinational coalitions form in response to a common interest existing between nations—including economic, political, or military interests—but they can be organizationally complex. Typically, they involve various branches of native and foreign military as well as nongovernmental and private voluntary organizations.

The key challenge in operating a coalition is to gain maximum benefit from blending the partners' distinctive capabilities and knowledge without losing effectiveness owing to the various cultural, doctrinal, and technological differences. The ITA technical area on distributed coal-

ition planning and decision making includes three interlinking projects that address this challenge.

Mission-adaptive collaborations

The first project aims to improve coordination among coalition members through basic research in agile, adaptive collaboration among teams comprising human and software agent members. It will model organizations, including their information flow in social networks, and analyze mechanisms for collaboration in fast-changing situations.

A key issue is the commander's role in guiding how the organization adapts to changes in the mission, environment, and available resources. We're researching the most effective roles for software agents in mixed human-agent teams, conducting experiments with human subjects, and analyzing communication patterns in social networks. These patterns include complex interactions such as negotiation over scarce resources and dialogues requiring some degree of information hiding.

This project's partners are Boeing (project lead), the University of Aberdeen, Carnegie Mellon University, the City University of New York, Honeywell, IBM, the Defense Science and Technology Laboratory, and the ARL.

Cultural analysis

The next project aims to develop methods for

- advancing the state of the art of cultural analysis in operational contexts and
- improving our understanding of the key cultural issues that arise in coalition planning and decision making.

The challenge is to devise approaches that are sensitive enough to detect and represent subtle differences between culturally similar national partners engaging in collaborative decision making.³

The scientific agenda includes developing rigorous approaches for representing a coalition culture's cognitive concepts, social norms, informational channels, and physical constraints (see figure 1). The *cultural network analysis* methodology that we're developing is helping us create

cultural models of US and UK planning concepts. The CNA extracts and represents culturally shared, complex mental representations that drive decisions. We're also developing methods and frameworks for analyzing culturally dependent communication patterns and discourse in distributed multi-cultural collaborations.

The project partners are Klein Associates (project lead), Boeing, Columbia University, Cranfield University, the City University of New York, the ARL, and the Defense Science and Technology Laboratory.

Shared situation awareness

The final project will research tools and methods for understanding situations unfolding in a distributed environment. The effort to enhance situation awareness will also integrate a range of planning and decision-making services. Military planners and commanders need planning and support tools to understand and analyze situations quickly to make timely, effective decisions. Without such tools, they can become overwhelmed by the amount of information in a networked battle space.

The project's proposed Semantic Battle-Space Infosphere extends the conventional Joint Battle-Space Infosphere, which integrates and interprets information with respect to rich, common semantic frames of reference. Using SBI, planners will better understand team interaction and will have command models and an information management framework in place to help them build tools and methods for enhanced distributed-coalition decision making.

The project team comprises the University of Southampton (project lead), Boeing, the City University of New York, IBM, the University of Maryland, the Defense Science and Technology Laboratory, and the ARL.

To be effective in future operations, distributed coalition teams need enriched and adaptive information environments and planning-support tools. The ITA consortium can improve distributed-coalition decision making by

- creating hybrid human-agent teams,
- developing decision-making processes that can adapt to cultural differences, and
- semantically enriching information spaces

Table 1. Members of the International Technology Alliance.

	US Partners	UK Partners
Industry	IBM (lead)	IBM UK (lead)
	BBNT Solutions	LogicaCMG
	Boeing	Roke Manor Research
	Honeywell	SEA Group
	Klein Associates Division, Applied Research Associated	
Academic	Carnegie Mellon University	Cambridge University
	City University of New York	Cranfield University
	Columbia University	Imperial College
	Pennsylvania State University	Royal Holloway, University of London
	Rensselaer Polytechnic Institute	University of Aberdeen
	University of California, Los Angeles	University of Southampton
	University of Maryland	York University
	University of Massachusetts	
Government	Army Research Laboratory	Ministry of Defense, the Defense Science and Technology Laboratory

to facilitate a shared understanding and greater human-system cooperation.

Intelligent systems technology and methodology—from software agents and organization modeling to models of cultural and social networks, to ontologies and semantic data models—play key roles in the ITA research agenda. The ultimate ITA goal is to build the scientific foundations for the next generation of military information management and information utilization capabilities. ■

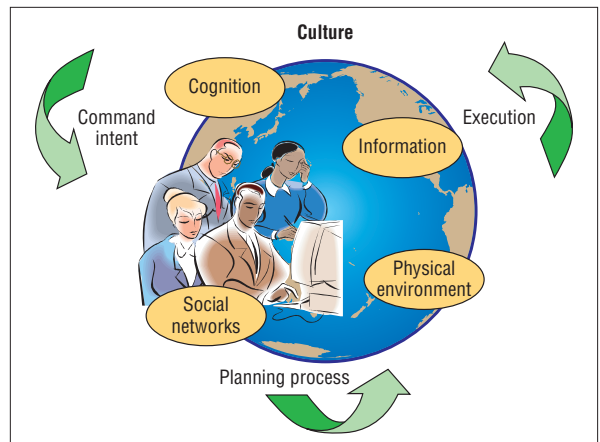


Figure 1. Cultural and contextual variations in operations.

Alun Preece is a principal investigator in the International Technology Alliance at the University of Aberdeen. Contact him at apreece@csd.abdn.ac.uk.



Winston R. Sieck is the cultural-analysis project champion in the International Technology Alliance at Klein Associates. Contact him at wsieck@ara.com.

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