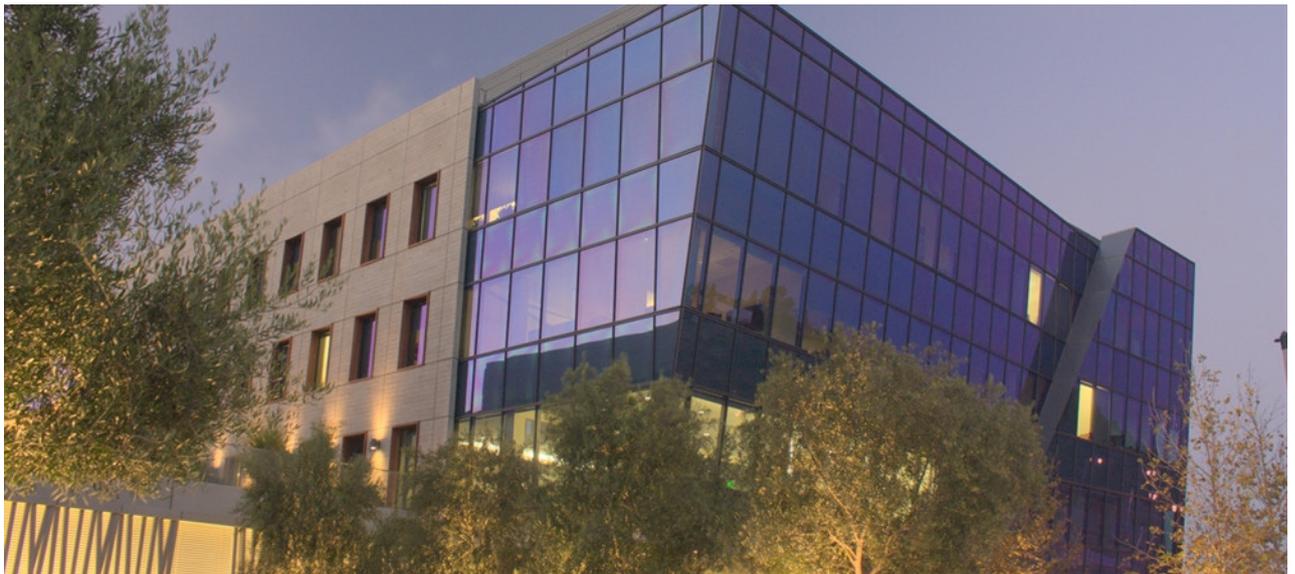# KSCO

Proceedings of the Ninth International Conference on Knowledge Systems for Coalition Operations 2017

6th to 8th November 2017 in Los Angeles, California, USA

Co-located with the 22nd International Command and Control Research and Technology Symposium (ICCRTS 2017)

Army Research Laboratory West and USC Institute for Creative Technologies
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These proceedings are also available via the KSCO-2017 and ICCRTS-2017 web sites

http://ksco.info/ksco-2017.html
http://internationalc2institute.org/proceedings/

Editor: Austin Tate, University of Edinburgh

Knowledge Systems for Coalition Operations 2017 Proceedings

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The Ninth Knowledge Systems for Coalition Operations Conference (KSCO-2017) was incorporated into the 22nd International Command and Control Research and Technology Symposium (ICCRTS 2017)

Introduction

KSCO - Knowledge Systems for Coalition Operations is an international working group exploring research in Knowledge-based Systems and Information Management, with a focus on the challenges of Coalition Operations. KSCO regularly organizes a technical conference where practitioners and key decision makers in coalition operations management meet and discuss with researchers from areas of knowledge-based systems, information management, planning, and multi-agent systems, exchange experience and ideas, share inspiration, and suggest novel concepts. It can also lead to joint project proposals.

After successful events in Edinburgh UK, Toulouse France, Prague Czech Republic, Waltham MA USA, Southampton UK, Vancouver BC Canada, Pensacola Florida USA, and London UK, the ninth KSCO conference in 2017 was held in Los Angeles California USA in conjunction with the 22nd International Command and Control Research and Technology Symposium (ICCRTS).

Topics of Interest

KSCO-2017 is a forum to publish original research, application and project description papers related to intelligent and knowledge systems for coalition operations management. A coalition includes, but not limited to, military, inter-agency and cross organization alliances engaged in a cooperative endeavour and joining capabilities together for a common cause. Topics may be related to knowledge systems requirements and knowledge systems potential or actual use for coalition and inter-agency operations (i.e., multi-national and multi-agency, civil authorities, home land safety and security, expeditionary or domestic operations).

KSCO 2017 areas include:

- Intelligent Command and Control (C2)
- Coalition and Team Information Sharing
- Coalition and Team User Interfaces
- Planning and Scheduling
- Coordination and Collaboration
- Data to Decision Support

- Humanitarian Assistance & Disaster Recovery
- Cultural Influences
- Human-Machine Teams
- Virtual Coalition Organizations
- KSCO related Research Programmes & Projects
- Deployed Systems & Case Studies

Organizing Committee

- ICCRTS-2017 Conference Chair: Dr. David Alberts, IC2I, USA
- ICCRTS-2017 Programme Chair: Dr. Micheline Bélanger, DRDC, Canada
- ICCRTS-2017/KSCO-2017 Local Arrangements Chair: Dr. Niranjan Suri, IHMC, Florida, USA
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- KSCO-2017 Programme Chair & Publications Chair: Prof. Austin Tate, AIAI, Edinburgh, UK
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  - Dr. Tim Grant, R-BAR, Netherlands
  - Mr. Rick Metzger, AFRL, USA
  - Prof. Michal Pěchouček, Czech Technical University, Prague, Czech Republic

3: Austin Tate (UK, University of Edinburgh) and Jeffrey Hansberger (USA, Army Research Laboratory)

Virtual Operations Centres for Coalition Operations and Distributed Team Collaboration

Abstract:

On-line multi-user virtual worlds have been used to create collaboration environments and shared virtual spaces to allow distributed teams to train, exercise or work together. Platforms such as Linden Lab's Second Life or the open source community's OpenSimulator have been used to provide easily accessed facilities in which users are represented by avatars in a space designed to support their collaboration and sharing of resources. The creation of a suitable virtual space allows users wherever they are located to be brought together into a shared visualisation of an "operations centre". This may be joined with real operations centre(s) to integrate a distributed team to allow them to more effectively address the task or operations they are engaged in. Such environments are particularly well suited to training and exercises, but can also be used for real events when distributed teams are involved.

The paper describes the "Open Virtual Collaborative Environment" (OpenVCE) and its facilities, and how the resources have been made widely available as a basis for creating customised environments and used for multi-national and multi-agency team collaboration facilities especially where teams are geographically distributed.

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72: Wen Zhou (China, National University of Defense Technology), Weidong Bao (China, National University of Defense Technology), Xiaomin Zhu (Chine, National University of Defense Technology), Chao Chen (China, National University of Defense Technology), Zhu Wu (China, Naval Command College) and Changfei Wu (Air Force Early Warning Academy)

A Semantic-Based Information Integration Framework of Agile Command and Control

Abstract:

Human society is in the period of accelerated development of the information revolution. It not only affects people's life extensively, but also constantly updates our understanding and understanding of the mode of operation in the information age. The ability to carry out effective information integration and provide intelligent information services, has become a joint combat process to obtain the command and control of the agile advantage of the support base. Based on this, this paper proposes a semantic-based information integration framework of agile command and control, which includes two parts: basic module and semantic analysis engine. The basic idea is to change the semantic relation from the pursuit of comprehensive information reasoning to the attention data, the idea of information retrieval into knowledge retrieval, relying on the information integration framework to tap the command information

system implied in a variety of rich semantic relations, in order to carry out a higher level of information integration and provide more intelligent knowledge retrieval, and thus agile Command and control.

76: Jitu Patel (UK, Dstl) and Peter Houghton (UK, Dstl)

Where are the Knowledge Systems? - Understanding Obstacles to Technology Adoption

Abstract:

Command and Control (C2) aspects of military operations, though very complex, knowledge intensive and usually time bounded, tend to be carried out with limited use of command and decision support tools. While there have been isolated successes such as the Dynamic Analysis and Replanning Tool used during operation Desert Shield, routine adoption of knowledge systems have remained low. The problem is not with the availability of technology, as defence (both Governments and Industries) have invested significant effort in tool development over the years. The Aim of this paper is to discuss findings from an earlier study, which investigated factors that may be contributing to the lack of exploitation of the intended utility of knowledge systems, and also to present insights from recent experience working in a standing joint force headquarters. The paper will conclude with an agenda for future research that contributes to our understanding of how best to improve technology adoption.

111: David Mott (UK, Emerging Technology Services, IBM UK), Yunfeng Zhang (USA, Human Agent Collaboration Group, IBM T.J. Watson Research Center), Soheil Eshghi (USA: Department of Electrical Engineering and Institute for Network Science, Yale University), Cheryl Giammanco (USA, Army Research Laboratory) and Troy Kelley (USA, Human Research and Engineering Directorate, Army Research Laboratory)

A Framework for Modelling the Effect of Emotion on Uncritical Reasoning

Abstract:

We describe research on understanding group mutability in the behaviour of external groups, and how interventions by coalition forces may affect the behaviour in terms of controlling hostile groups and encouraging friendly groups. We explore how emotion may influence the behaviour of individuals by affecting the type of reasoning that they undertake, encouraging "uncritical" rather than "critical" thinking. We describe a computational framework holding a cognitive model of an individual operating within a group context, inspired by theories from social science. Individuals relate to in-groups and out-groups and have beliefs that are associated with emotions. Cognitive Appraisal Theory is used to evaluate incoming memes "pronounced" by external speakers, appraising the effects of the memes on an individual's self-esteem taking account of their group relationships as indicated by social identity theory, and leading to an emotion in the individual. Appraisal is followed by a process of coping that seeks to handle the effects by either performing problem-focussed (critical) or emotion-focussed (uncritical) thinking, according to the current emotional state of the individual. This

model is implemented within a Cognitive Architecture (SOAR) as a set of reasoning processes that handle beliefs and emotion. The model is integrated into a multi-agent simulation tool (Repast Simphony) allowing the simulation of populations of individuals interacting and spreading rumours, or memes, together with interventions. We describe how this framework could be used to construct experiments to explore how different situations lead to group mutability and behaviour, together with the effects of interventions by coalition forces.

118: Karen Myers (USA, SRI International), Tim Ellis (USA, SRI International) and Tancrede Lepoint (USA, SRI International)

Privacy Technologies for Controlled Information Sharing in Coalition Operations

Abstract:

Information sharing among coalition partners must balance the benefits that can accrue from improved coordination with the risks of releasing information that ideally would be kept private. We consider how advanced privacy technologies can enable improved information sharing among coalition partners by both providing increased control over how information is used or released, and enabling principled characterizations of the impact of individual and cumulative sharing activities. We describe this work in the context of a humanitarian aid and disaster relief (HADR) scenario, showing how the technologies can enable significantly increased and informed sharing.

121: Erica P. Viklund (USA, Pacific Science & Engineering Group), Heather M. Oonk (USA, Pacific Science & Engineering Group) and Manuela Jaramillo (USA, Pacific Science & Engineering Group)

The Role of Transactive Memory (TM) in Proactive Decision Support (PDS)

Abstract:

Advances in technology have exponentially increased the information and data at our fingertips. While there are many benefits of such access, a tradeoff is that information seekers can be overwhelmed by the vast sea of information at their disposal. Challenges multiply when information seekers operate as part of a team where there are differences in knowledge, information access, and decision-making responsibilities. Coalition operations are examples of such situations, involving decisions that impact a complicated network of different countries and actors. Proactive decision support (PDS) tools have the potential to make more manageable the tasks of selecting, verifying, compiling, and analyzing relevant information, so that good decisions can be made more efficiently. Effective PDS requires a system that "understands" and adapts to the context in which information seeking and decision-making occur. Context includes aspects of the physical environment within which the technology and user are embedded, and the cognitive or mission objectives of users. We argue that for teams, PDS context must also include a collection of team member and team dynamic variables such as shared and differential tasks, requirements, knowledge, and expertise. Collectively, these

variables can be conceptualized as transactive memory (TM). We describe how PDS that incorporates TM variables as a form of context can facilitate and streamline validation and communication of information among team members, which is crucial for realizing the potential benefits of PDS for coalition operations. We discuss considerations for implementing TM variables into PDS tools and key research and development questions to be addressed.

122: Adrienne Raglin (USA, Army Research Lab) and Christian Schlesiger (USA, Army Research Lab)

Data Analyzer Software: a Knowledge System Supporting Coalition and Team Information Sharing

Abstract:

As current and future operations integrate soldiers from multiple nations, information that supports short term and long term teaming is critical. Among coalition forces it is important to maintain unity of effort, to plan concurrently, and to make adjustment in sync ensuring operations are carried out successfully. Combatant commanders have many responsibilities including ensuring the capability and capacity of the forces with partnering nations.

However, in multinational operations there is the added need to consider differences in organization, doctrine, terminology, and objectives. This can be achieved through knowledge capturing, information sharing, and training. Additionally, giving commanders required information with explanation, linking knowledge and uncertainty can improve teamed operations in complex and dynamic environments. The Data Analyzer was initially designed for data analysis of training software previously developed at the Army Research Laboratory. Now that this training software is being used by US and coalition partners, the Data Analyzer has been expanded as a platform for wider analysis and knowledge capturing.

The Data Analyzer provides commanders with the ability to view data capturing detailed experiential knowledge and find trends in tactics, techniques and procedures (TTPs) employed within their units and within different coalition partners. This information from the analyzer provides the joint forces with similarities and differences highlighted that aid in joint engagement preparation and insights into actions that can impact joint mission TTPs. We present the Data Analyzer software and use case scenarios illustrating utilizing this approach in supporting knowledge capturing, information sharing, and decision making for multinational operations.