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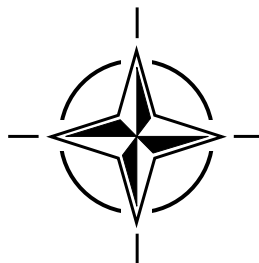
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RTO MEETING PROCEEDINGS 50

Multimedia Visualization of Massive Military Datasets

(Atelier OTAN sur la visualisation multimédia d'ensembles massifs de données militaires)

Papers presented at the RTO Information Systems Technology Panel (IST) Workshop held in Quebec, Canada, 6-9 June 2000.



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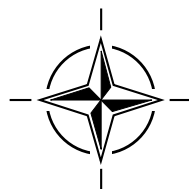
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RTO is the single focus in NATO for Defence Research and Technology activities. Its mission is to conduct and promote cooperative research and information exchange. The objective is to support the development and effective use of national defence research and technology and to meet the military needs of the Alliance, to maintain a technological lead, and to provide advice to NATO and national decision makers. The RTO performs its mission with the support of an extensive network of national experts. It also ensures effective coordination with other NATO bodies involved in R&T activities.

RTO reports both to the Military Committee of NATO and to the Conference of National Armament Directors. It comprises a Research and Technology Board (RTB) as the highest level of national representation and the Research and Technology Agency (RTA), a dedicated staff with its headquarters in Neuilly, near Paris, France. In order to facilitate contacts with the military users and other NATO activities, a small part of the RTA staff is located in NATO Headquarters in Brussels. The Brussels staff also coordinates RTO's cooperation with nations in Middle and Eastern Europe, to which RTO attaches particular importance especially as working together in the field of research is one of the more promising areas of initial cooperation.

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- AVT Applied Vehicle Technology Panel
- HFM Human Factors and Medicine Panel
- IST Information Systems Technology Panel
- NMSG NATO Modelling and Simulation Group
- SAS Studies, Analysis and Simulation Panel
- SCI Systems Concepts and Integration Panel
- SET Sensors and Electronics Technology Panel

These bodies are made up of national representatives as well as generally recognised 'world class' scientists. They also provide a communication link to military users and other NATO bodies. RTO's scientific and technological work is carried out by Technical Teams, created for specific activities and with a specific duration. Such Technical Teams can organise workshops, symposia, field trials, lecture series and training courses. An important function of these Technical Teams is to ensure the continuity of the expert networks.

RTO builds upon earlier cooperation in defence research and technology as set-up under the Advisory Group for Aerospace Research and Development (AGARD) and the Defence Research Group (DRG). AGARD and the DRG share common roots in that they were both established at the initiative of Dr Theodore von Kármán, a leading aerospace scientist, who early on recognised the importance of scientific support for the Allied Armed Forces. RTO is capitalising on these common roots in order to provide the Alliance and the NATO nations with a strong scientific and technological basis that will guarantee a solid base for the future.

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Multimedia Visualization of Massive Military Datasets

(RTO MP-050 / IST-020)

Executive Summary

The workshop IST-020/RWS-002 “Multimedia Visualisation of Massive Military Datasets” was held at the Defence Research Establishment Valcartier, near Quebec, Canada, June 6-9, 2000, under the responsibility of Task Group IST-013/RTG-002.

Military operations today depend heavily on the C4ISR (Command Control, Communications, Computing, Intelligence, Surveillance and Reconnaissance) framework. Unfortunately many military systems make it difficult for users to understand the information available in the massive amount of data that flows from the various intelligence sources.

Users may not be able to use the systems to extract the information they need from the data, or they may not be able to create effective displays that allow them to visualise it. Potential information sources may be ignored, or not well used, because techniques for extracting information are deficient. As a consequence, users of many current systems discard much data unassessed. Inability to access, assimilate and exploit all the available information may lead to reduction in the effectiveness of strategic and tactical actions, both in simulation and training and in actual operation.

In the workshop, “visualisation” was taken to mean what it does in everyday language—“seeing” in one’s head a situation and its possible development. Effective visualisation requires users to interact closely with presentations that need not be graphical, or even necessarily visual, but might also be auditory or even haptic (i.e. using active touch).

New technologies and data sources now envisaged will require radically improved ways for allowing users to interact with data. Interaction is critical, but at present information is usually presented to commanders, analysts and executives as a passive situation display. Indeed, the term “visualisation” is sometimes used to mean the presentation of information on a display in graphical form.

Solutions to these problems can seldom be bought off-the shelf, but require research and development. The military needs, however, may not be the same as those that drive academic research or commercial development, and researchers and developers may not often be aware of what problems military users face.

The workshop participants were drawn from all three communities: military serving officers, system developers, and visualisation research scientists. The workshop was intended to bring these three communities together, so that the developers and researchers could improve their understanding of the problems faced by the military, and the military could appreciate some of the possibilities afforded by known visualisation technology.

The workshop was not intended either to present completed solutions to the military or for the military to present specifications and official requirements to the researchers and developers, though instances of either would be welcomed. Rather, it was intended to lead to improvements in the future orientation of visualisation research and development in the military context.

Before the workshop, participants were asked to suggest problematic issues that might be expected to highlight military or research areas to the possible benefit of all three communities. During the workshop, 28 separate presentations were made in seven sessions. Each session treated a theme, and concluded with an extended discussion of the theme developed in the presentations.

Two sessions were devoted to visualisation of operations, for air, land, and sea operations, as well as in peacekeeping. Exemplary applications, some of them fielded, were illustrated, as were facets of

research bearing on the problems. Related to these was a session on visualisation for Command, including logistics planning, and planning for air and land operations.

A different thread concerned Information Operations, the control of computer networks and the identification of intrusions. Some presentations concerned methods of visualising the contents of a collection of documents and the relations among them.

The proceedings here include most of the presentations in Microsoft PowerPoint form, with short textual abstracts. Many of the presentations were followed by discussions, of which recorders made brief notes of key points raised. These notes are usually in the form of bullet lists rather than texts. The same is true of the longer session discussions on the general themes of the sessions.

It is hoped that the presentations made at this workshop, and their reproduction here, may help to bring closer the researchers and developers of visualisation technology on the one hand and the military users of that technology on the other.

Atelier OTAN sur la visualisation multimédia d'ensembles massifs de données militaires

(RTO MP-050 / IST-020)

Synthèse

L'atelier IST-020/RWS-002 sur "La visualisation multimédia d'ensembles massifs de données militaires" a été organisé à l'Établissement de recherche pour la défense Valcartier, à Québec, au Canada, du 6 au 9 juin 2000, sous la responsabilité du groupe de travail IST-013/RTG-002.

Les opérations militaires d'aujourd'hui dépendent dans une large mesure du cadre C4IST (commandement, contrôle, communications, informatique, renseignement, surveillance et reconnaissance). Malheureusement, bon nombre de systèmes militaires pose des difficultés pour l'utilisateur qui souhaite acquérir une compréhension pratique des informations correspondant à ses besoins immédiats, informations qui existent pourtant dans les masses énormes de données transmises par les différentes sources de renseignements.

Soit l'utilisateur ne peut utiliser le système pour extraire des données les informations dont il a besoin, soit il ne lui est pas possible de créer des affichages adéquats, lui permettant de les visualiser. Des sources possibles d'information peuvent être ignorées, ou bien mal exploitées, parce que les techniques d'extraction d'information sont défectueuses. Par conséquent, de nombreux utilisateurs de systèmes courants suppriment des données sans les évaluer. L'incapacité d'accéder à l'ensemble des informations disponibles, de les assimiler et de les exploiter, peut avoir pour effet de réduire l'efficacité d'actions stratégiques et tactiques, tant en ce qui concerne la simulation et l'entraînement que pour les opérations elles-mêmes.

Aux fins de l'atelier, le terme "visualisation" a été défini comme dans le langage courant, c'est à dire comme la capacité de "voir" mentalement une situation donnée et son évolution possible. Pour être efficace, la visualisation exige une interaction étroite entre l'utilisateur et les présentations, qui n'est pas forcément graphique, ni visuelle, mais qui peut être auditive et même haptique (c'est à dire au toucher actif).

Les nouvelles technologies et les nouvelles sources de données actuellement envisagées nécessiteront des moyens radicalement différents d'interaction entre l'utilisateur et les données. Si l'interaction est essentielle, à présent l'information est présentée aux chefs militaires, aux analystes et aux décideurs sous forme d'un affichage passif de la situation. En effet, le terme "visualisation" est parfois utilisé pour signifier la présentation d'une information sur un affichage sous forme graphique.

Les solutions de ces problèmes se trouvent rarement dans le commerce; elles sont normalement le fruit d'efforts de recherche et développement. Cependant, les besoins militaires peuvent être différents de ceux qui animent la recherche académique ou le développement commercial, et les chercheurs et développeurs ne sont pas forcément au courant des problèmes auxquels les militaires sont confrontés.

Les participants à l'atelier représentaient les trois principaux groupes d'intéressés, à savoir : des cadres militaires en activité, des développeurs de systèmes, et des chercheurs en visualisation. L'atelier a eu pour objectif de rassembler ces trois communautés, pour permettre aux chercheurs et aux développeurs de mieux comprendre les problèmes rencontrés par les militaires, et aux militaires d'apprécier quelques unes des possibilités offertes par les technologies de visualisation confirmées (reconnues ?).

L'atelier n'avait pas pour objectif de présenter aux militaires des solutions définitives, ou de présenter aux chercheurs et aux développeurs des spécifications et des besoins officiels, bien que de tels échanges aient été encouragés. L'intention était plutôt d'améliorer l'orientation future de la recherche et du développement en visualisation dans un contexte militaire.

Avant l'ouverture de l'atelier, il avait été demandé aux participants de signaler aux organisateurs la nature des problèmes qu'ils avaient pu rencontrer, ceci afin de mieux cerner les domaines militaires et les domaines de recherche susceptibles de profiter aux trois communautés. En tout, 28 communications ont été présentées lors des 7 sessions de l'atelier. Chaque session a traité un thème et a été conclue par une discussion des sujets développés lors des présentations.

Deux sessions ont été consacrées à la visualisation des opérations aériennes, maritimes et terrestres, ainsi qu'au maintien de la paix. Des exemples d'applications, dont certaines sont en service, ont été présentées, ainsi que divers aspects de certains travaux de recherches connexes. Une session a également été organisée sur la visualisation pour le commandement, y compris la planification de la logistique et des opérations aériennes et terrestres.

Un autre thème concernait les informations, le contrôle des réseaux informatiques et l'identification d'intrusions. Un certain nombre de présentations portaient sur des méthodes permettant de visualiser le contenu de documents et les relations entre eux.

Le compte rendu inclut la majorité des présentations, sous forme Microsoft PowerPoint, accompagnées de résumés succincts. De nombreuses présentations ont été suivies de discussions, dont les points clés ont été notés par les rapporteurs. En général, ces notes sont rédigées en style télégraphique. Les notes sur les discussions approfondies concernant les grands thèmes des différentes sessions sont rédigées de la même façon.

Il faut espérer que les communications présentées lors de cet atelier, telles que reproduites ici, permettront de rapprocher les chercheurs et les développeurs de technologies de visualisation d'un côté, et les utilisateurs militaires de ces technologies de l'autre.

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<p>The workshop IST-020/RWS-002 on Multimedia Visualisation of Massive Military Datasets was held at the Defence Research Establishment Valcartier, Quebec, Canada from 6-9 June 2000.</p> <p>Five major themes were addressed in 28 presentations with extended discussion, in separate sessions entitled:</p> <ul style="list-style-type: none"> • Operations Visualisation • Visualisation for Command • Network Visualisation • Data Fusion • Maths and Techniques 			

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