

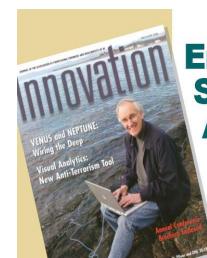
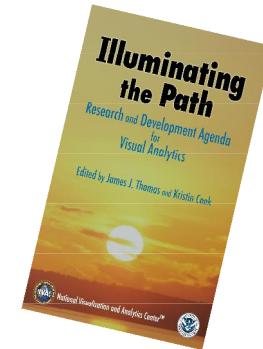
Building Visual Analytics Research Capability in Canada

*John Dill
Brian Fisher
Ron Rensink*



Initial Canadian involvement in VA

- Aug 2004 - R&D Agenda Panel
 - 2 Canadians on Panel
- Early 2005 - Contribution to *Illuminating the Path*
 - 3 Canadian Contributors
- Apr 2005 - Canadian named NVAC Scholar



**Engineering Smarter
Anti-Terrorism
Software**
Jean Sorenson

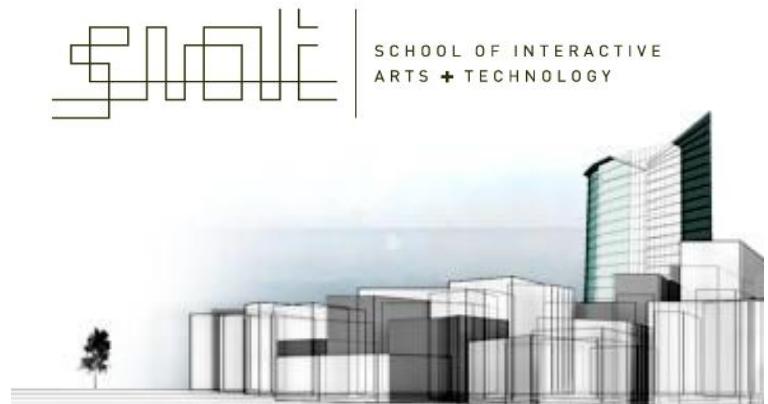


SFU professor Jean Sorenson is part of an initiative to develop new software tools for the US Department of Homeland Security-sponsored National Visualization and Analytics Centre. Photo: Greg Ehlers, LOCSFU.



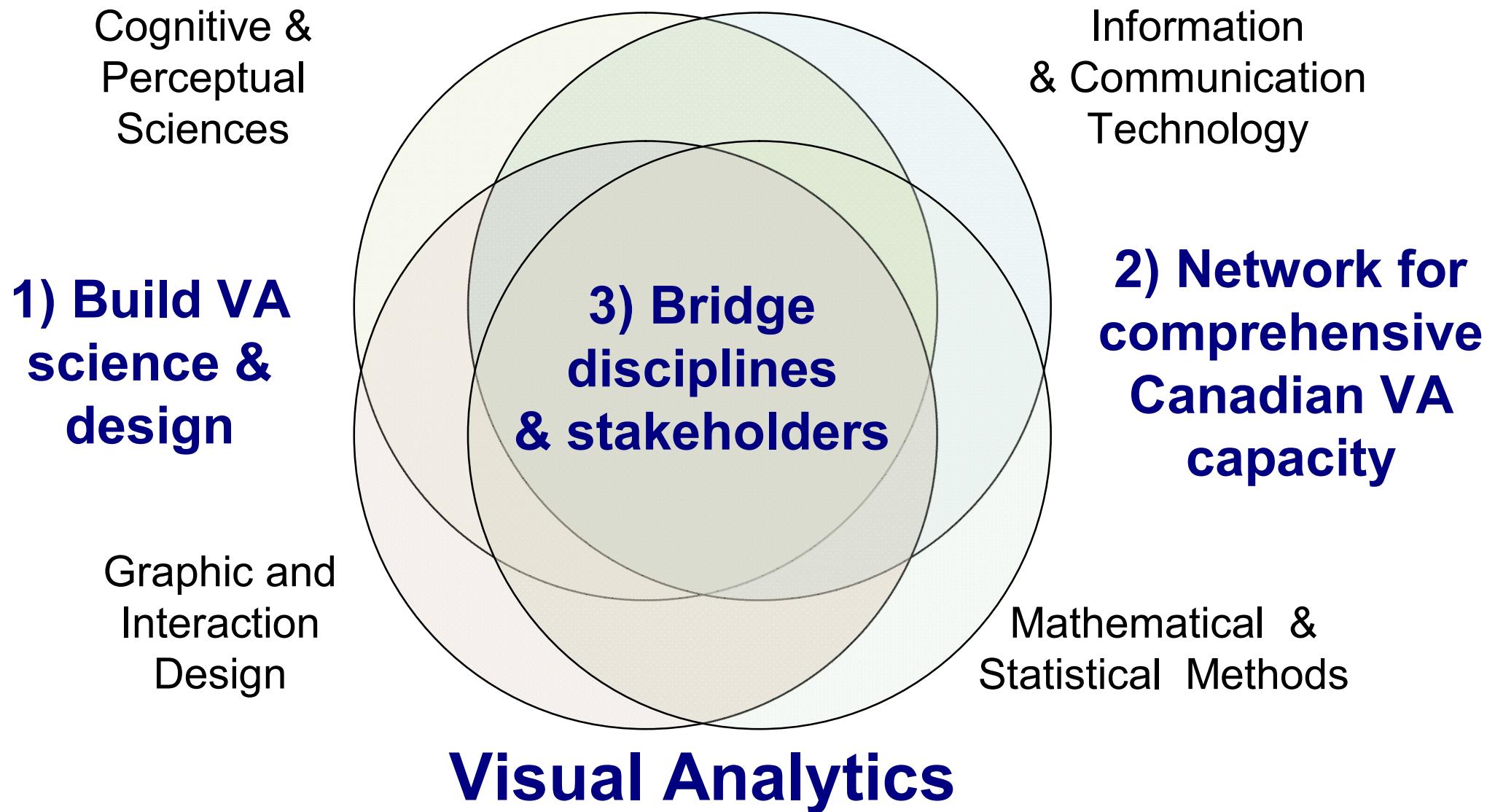
Supporting Universities

- **SFU School of Interactive Arts & Technology**
 - Design school + ICT & Cogsci
 - Interdisciplinary Ph.D, MSc. BSc.
 - Joint progs w Business, Cogsci, CompSci, Communications
- **UBC College For Interdisciplinary Studies**
Media & Graphics Interdisciplinary Centre (MAGIC)
 - Use-inspired basic research
 - Co-development w. industry





Expanding Canadian R&D Capability





Build Design & Cognitive Science of Visual Analytics



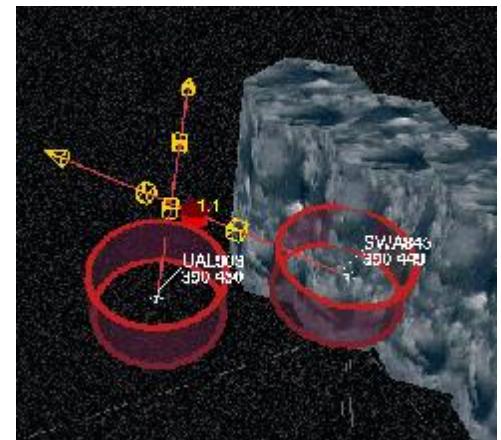
- NSERC Strategic grant “VA for Safety & Security”
 - Focus: Perceptual & spatial cognition
 - Boeing, MDA, CAE, Oculus, NVAC, PuRVAC, PARVAC
- Outreach to scientific community
 - International Cogsci society VA Symposium
- Outreach to design community
 - VA theme in Canadian Design Research NCE
- Industrial Research Grant
 - Boeing: \$1.3M over 5 years



ATC Study: Problem & Process

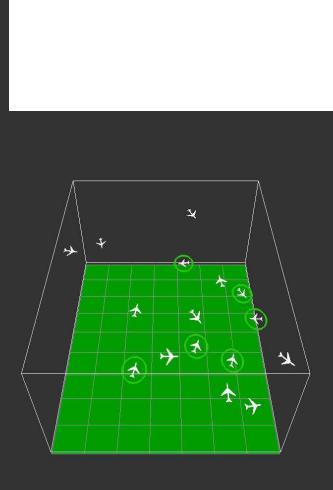
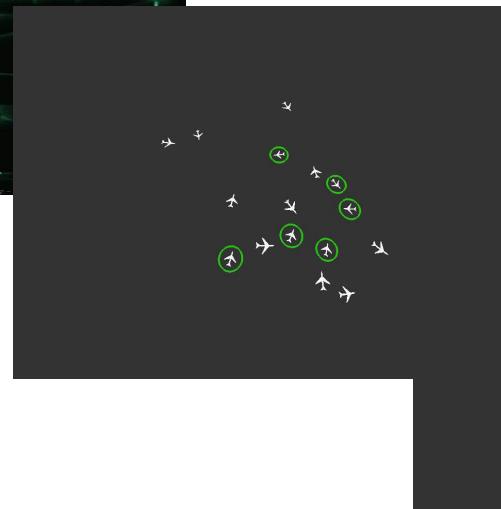
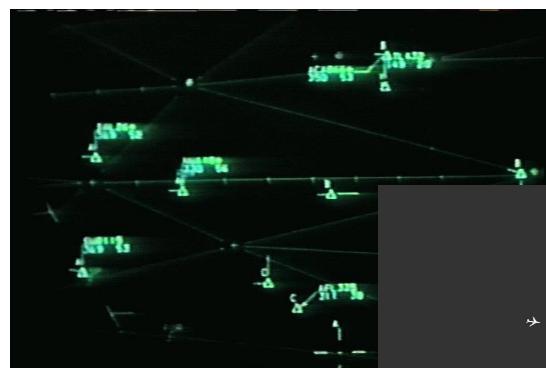
Problem:

- HRL Labs studying new possibilities for ATC including 3D, & ‘free flight’ regime

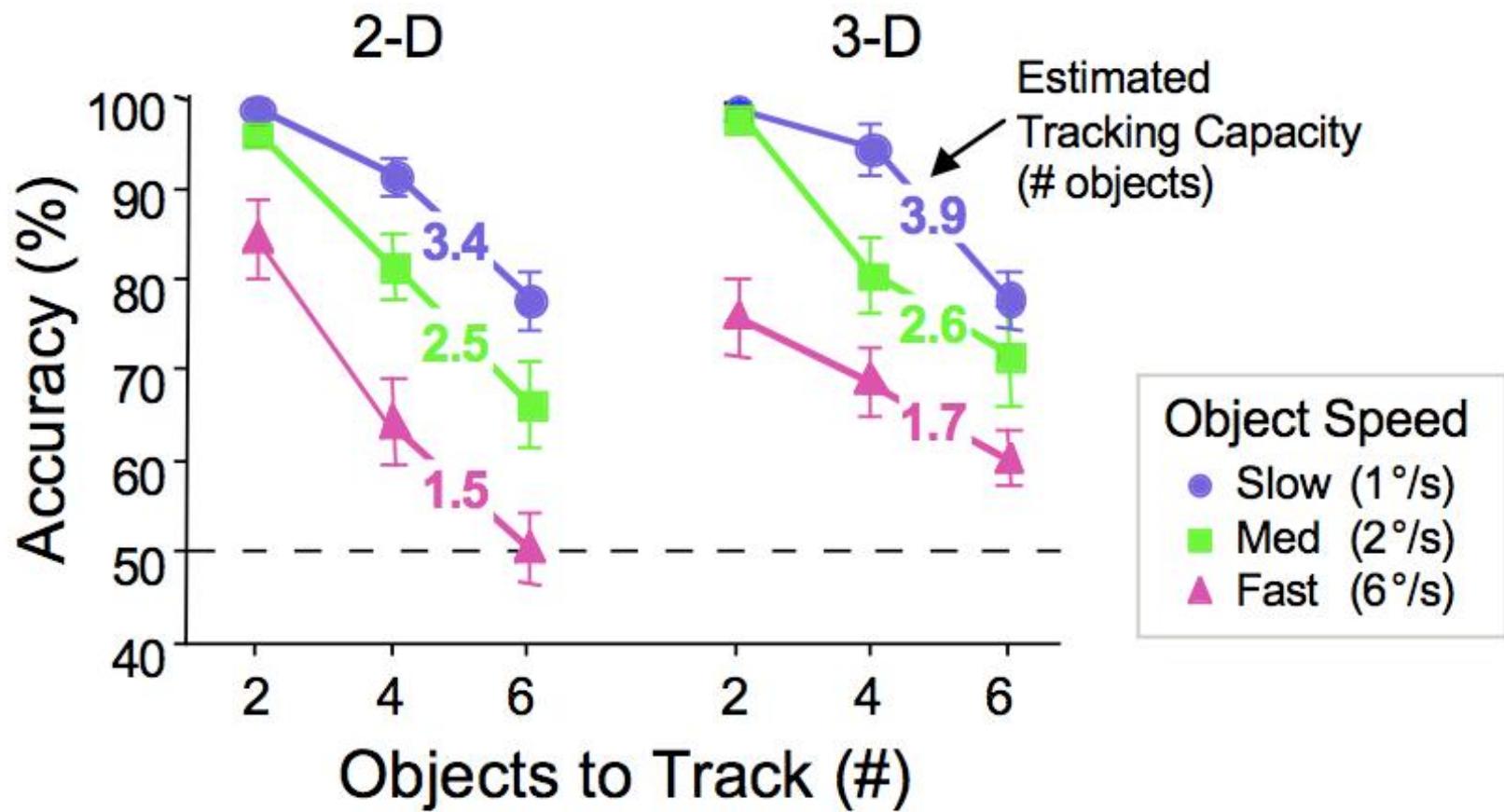


Process:

- “typical” flat, 2D ATC display
- Abstract into toy lab world
- Add depth clues
- Perform study:
[Video clip](#)



Fit Human Tracking Function (Lui)



Normal tracking: accuracy falloff with speed, # objects.

Can track around 4 objects at Slow speed

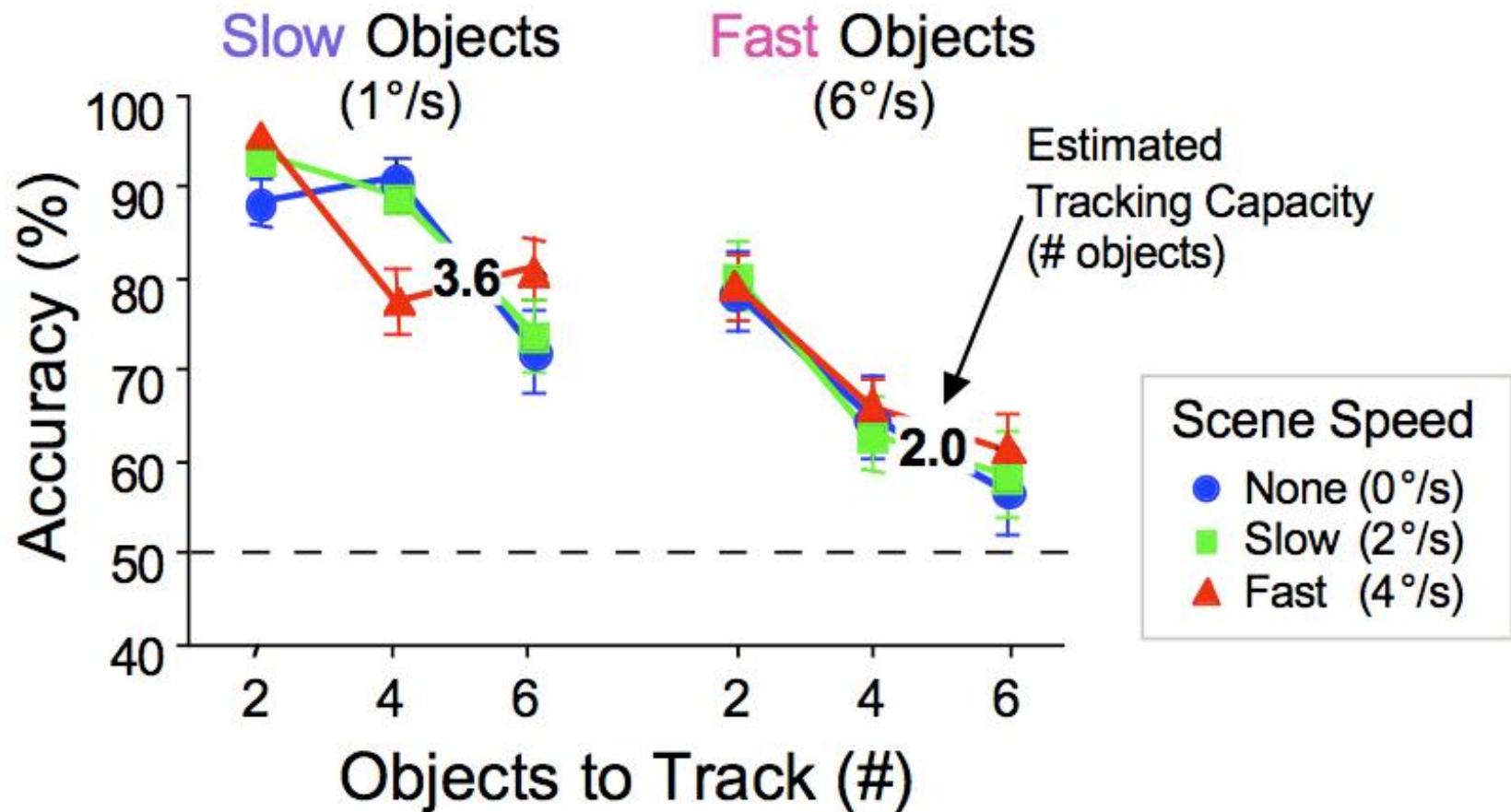
(Surprisingly, 3D performance seems better than 2D) [Enns, Fisher, Dill, Booth, Rensink]



HRL New Approach

- Wanted to show view from moving camera
- What would this look like?
- And could you still track multiple objects?
- Let's look at a [video clip of this variation](#)

Tracking vs Object Speed



Surprising result: Retinal speed did not predict tracking:

- Relative speed within the space did, regardless of overall motion
- So: performance is allocentric, not egocentric



Tracking Expt: Take-Home Message

Need to understand Human Capabilities

- Don't ask analysts to get things from tools that are just impossible for them
- And ... some experiments show humans can do things we thought impossible



Visual Analytics in Aerospace

- Grant from the Boeing Company
 - \$1.3M over 5 years (matching by MITACS, NSERC to \$2.6+M)
 - Minister for Industry Canada will formally announce soon
- Focus on safety, reliability, and maintainability data
 - Onsite field work
 - Tool & Data familiarization
 - Study use of tools in analyzing data from multiple databases: FAA, maintenance, incidents, manufacture etc.
- Curriculum development
 - Certificate in VA: joint SIAT-Business Masters level
 - Summer grad course

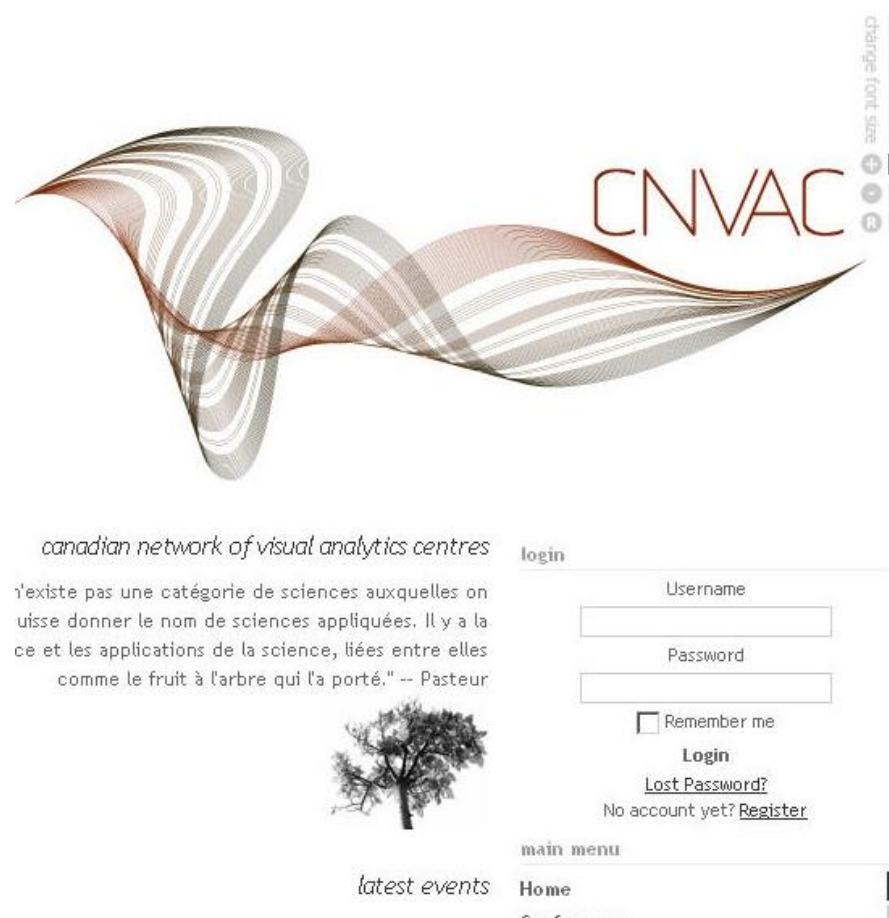


Towards comprehensive Canadian VA

- Mathematics and Statistics
 - SFU IRMACS: Inst. for Res in Math & CS
 - MITACS: Maths of Info Technology & Complex systems (NCE)
- Information & Communication Technology
 - SFU & UBC Computer Science & Engineering
 - National Research Council of Canada & Communications Research Centre of Canada
 - Colleagues in Alberta, Quebec, Maritimes, Ontario

Next steps: Collaboration models

- VA: Science & Technology Workshop in Vancouver Feb 2-5
 - Visualization S&T in key applications
 - Design analysis of 2 key applications
 - Cogsci-aware field researchers
- Interdisciplinary curricula, student exchange, researcher in residence
- Build telecollaboration infrastructure: CNVAC:
 - portal with telecon links, document repository, etc.
 - Planned advanced features: “Virtual lab” telecontrol, user-controlled lightpath, shared viz
 - New ventures, alternative funding sources



The screenshot shows the CNVAC website homepage. The header includes the UBC logo, a search bar, and navigation links for Home, Contact, and About. A sidebar on the left has a 'change font size' button with plus and minus signs. The main content area features a large graphic of overlapping red and grey wavy lines. To the right is the CNVAC logo in red. Below the logo is a section titled 'canadian network of visual analytics centres' with a quote from Pasteur: "Il n'existe pas une catégorie de sciences auxquelles on puisse donner le nom de sciences appliquées. Il y a la science et les applications de la science, liées entre elles comme le fruit à l'arbre qui l'a porté." -- Pasteur. There is a login form with fields for Username and Password, a 'Remember me' checkbox, and buttons for Login, Lost Password?, and Register. A small tree icon is next to the login form. At the bottom, there's a 'main menu' with links to Home, Events, and News, and a 'latest events' section.



Defence R&D Canada(*)

To help meet today's Security & Defence challenges
DRDC established the ***Centre for Security Science***

- Coordinates S&T reach-back into federal S&T community:
 - DRDC, RCMP, CBSA, NRCAN, many others (21 agencies)
- CSS Mission Areas
 - Defeat CBRNE (Chem, Bio, Rad/Nuc, Explosives) (CRTI)
 - Critical Infrastructure Protection
 - Surveillance, Intel. & Interdiction
 - Emergency Management, systems integration

With regard to Visual Analytics, to help with these mission areas:

- Engage “CNVACs”
 - Gov/Ind/Acad collaboration via workshops
 - Leverage NVAC/RVAC partnerships
 - Improve national capabilities

(*)This and the next slide are from Dr Andrew Vallerand's presentation at the Vancouver VA Workshop. Dr. Vallerand is Director of PSTP in DRDC's CSS



DRDC/CSS Proposed Approach

- Underpinned by:
 - CIPaBS treaty between the 2 nations;
 - CA/US PSTP “MOU” (DND’s DRDC---DHS S&T)
- Built Coop. Activity Agreement (CAA) on VA
- PSTP completing a “BAA”—like contract to:
 - Recognize CNVACs
 - Enable contracting vehicle to build S&T Agenda
 - Participate in Consortium coordination/networking
 - Recommend CNVACs as possible S&T cluster spanning acad, industry, gov; advise GOC



Thanks ... questions?

Acknowledgements:

Andrew Vallerand: support of Workshop, CNVAC, much more
Colleagues Brian Fisher, Ron Rensink, many others

Sponsoring agencies and Companies

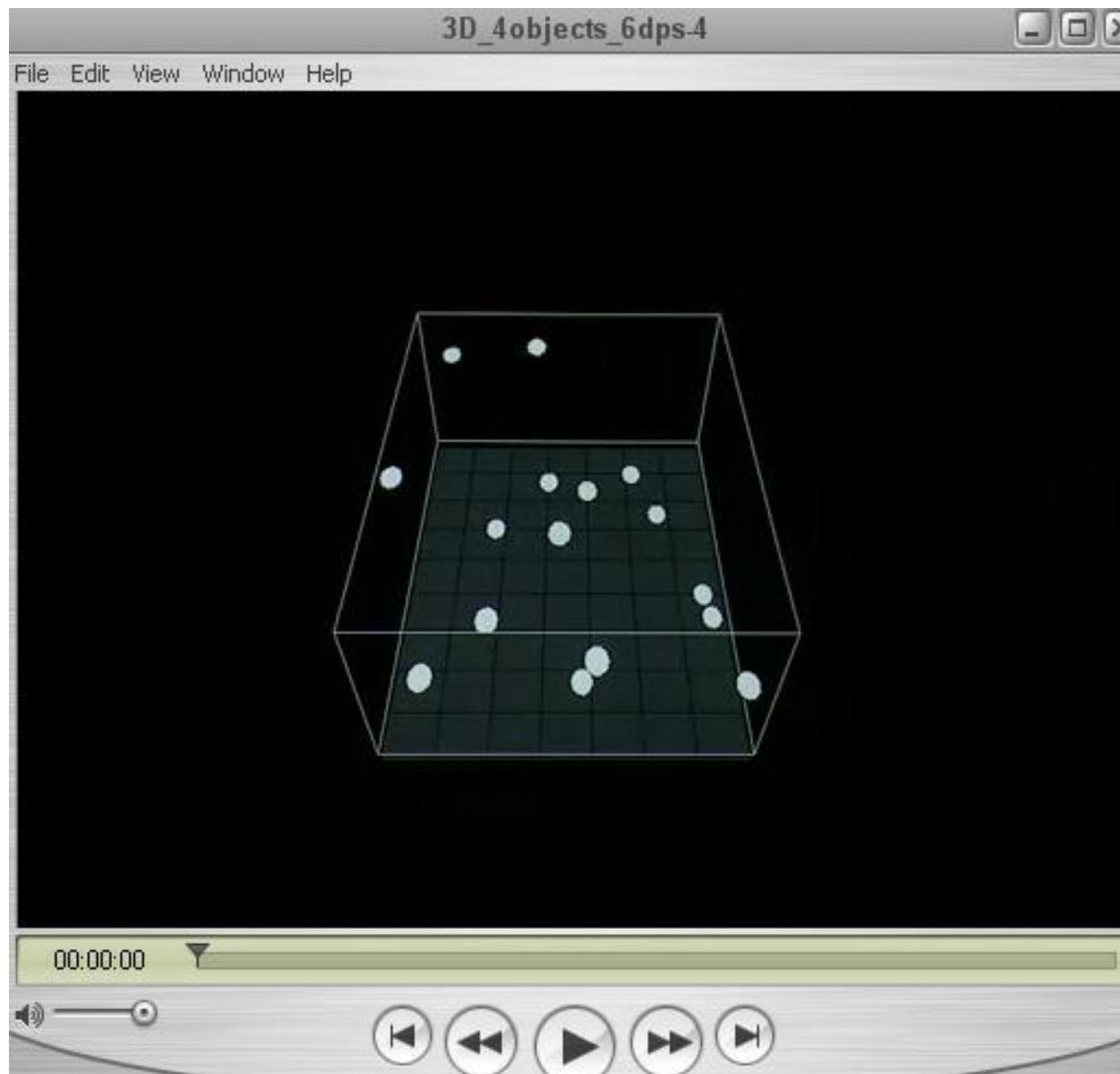
NSERC

Boeing

NRC

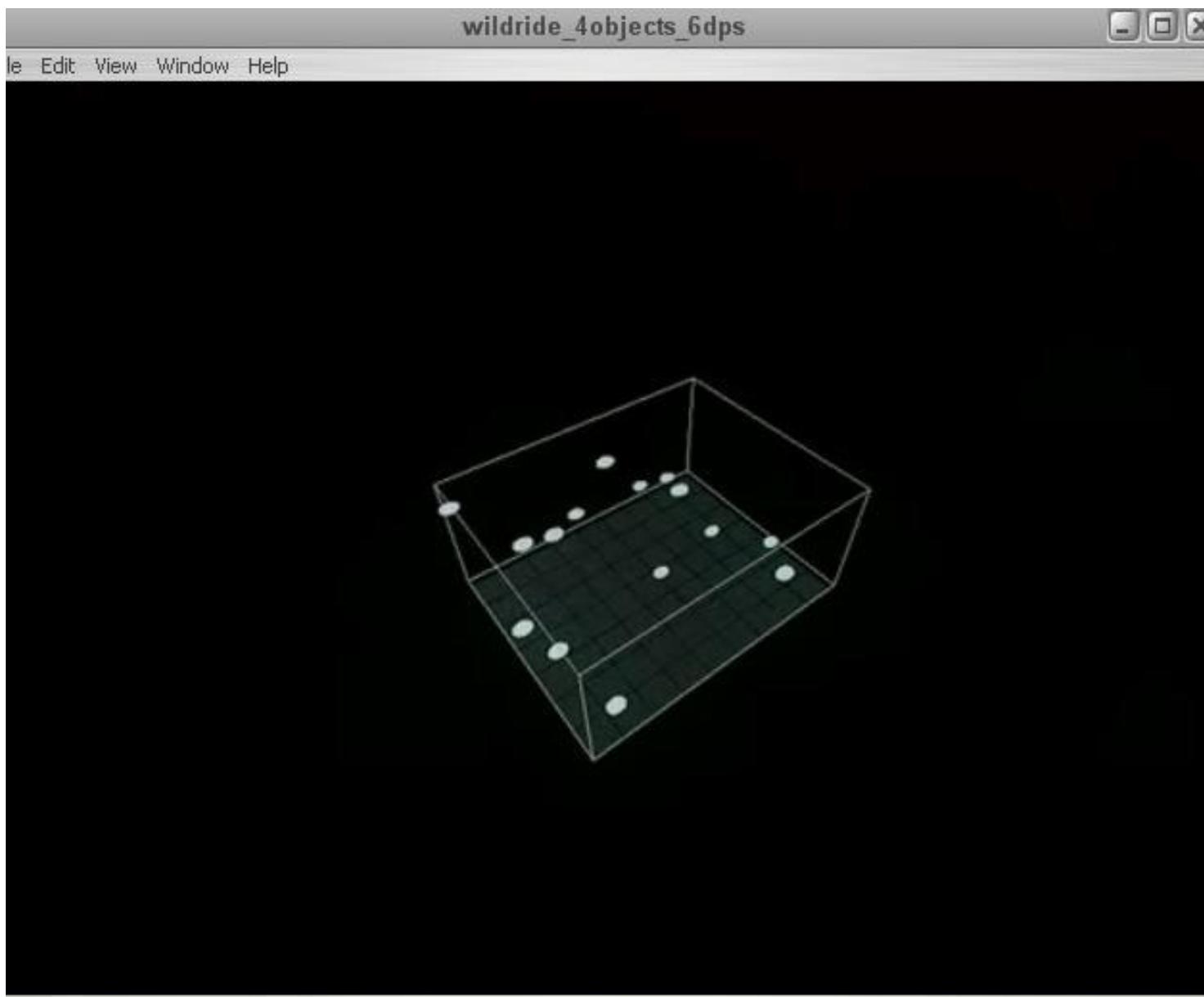


Still of Video 1: 3D

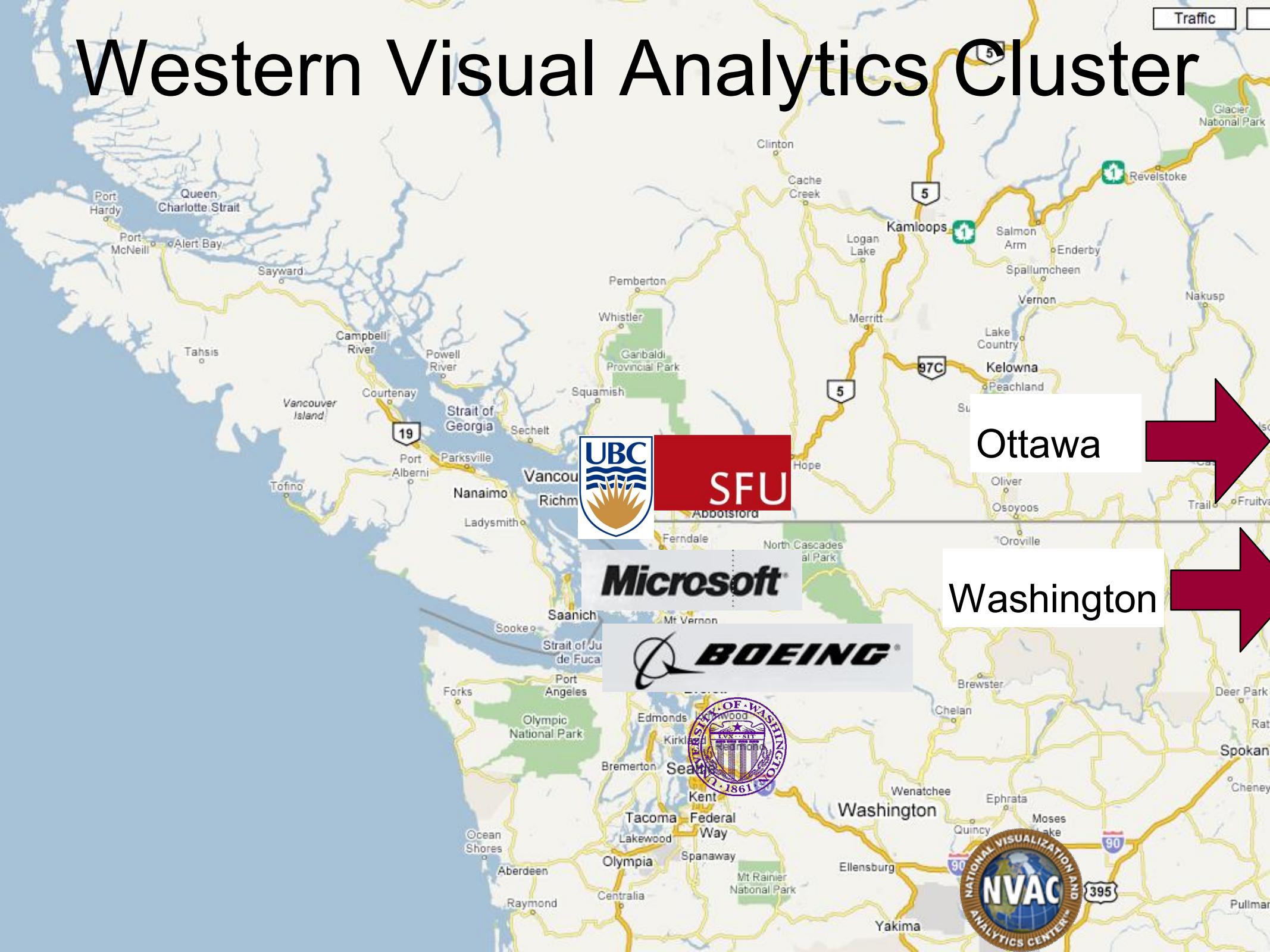




Still Image: Video 2 Moving Frame



Western Visual Analytics Cluster





Next slides see cogscisymp07.ppt

- Show atc slide for context
- Show the movie
 - This is simple and they should be able to do the task
- Notice 3d perf is better; can track about 4 obj at slow speed
- atc designers (HRL) wanted cameras moving through space; what does this look like??
- Show wildride movie: aud should say “no way this is possible!!
- Data shows NO DIFFERENCE! A paradoxical result! (we would not have found this in a typical hci test, nor in a typical exptal psych. We want to try to capture the needed actual function.
- Warped space: this breaks the independence: scene speed DOES make a difference
- Summary: humans have varied capabilities and it's important to understand so we don't ask our analysts to get things from tools that is impossible for them (other expts show humans can do things we thought impossible)



CNVAC

Visual Analytics requires collaboration but:

- Colleagues often scattered both geographically & institutionally,

CNVAC Mission

- forum for VA researchers to form contacts with peers
- repository for the VA centres themselves.

CNVAC Goal

- encourage informal dialogue amongst VA researchers in academia, industry & government.

- solutions promised by visual analytics only as nuanced and as comprehensive as the exploratory discourse that leads to their formulation allows.
- CNVAC hopes to provide a context for that discourse.

The screenshot shows the CNVAC Online homepage. At the top right is a navigation bar with links to Home, Contact Us, People, Links, and Overview. Below it is a section titled "about us" with a brief description of CNVAC Online's purpose and a "Read more..." link. The main content area features a large graphic of wavy lines in shades of brown and grey. To the left is a quote from Pasteur: "Il n'existe pas une catégorie de sciences auxquelles on puisse donner le nom de sciences appliquées. Il y a la science et les applications de la science, liées entre elles comme le fruit à l'arbre qui l'a porté." -- Pasteur. Below the quote is a small illustration of a tree. On the right side, there is a "login" form with fields for Username and Password, a "Remember me" checkbox, and "Login" and "Lost Password?" buttons. Below the login form is a "main menu" with links to Home, Conferences, Events, News, Discussion Forum, Branch Centres, and Administrator. The "Events" section lists "latest events" such as "Sat, Apr 5th, 2008 CHI 2008" and "Fri, May 9th, 2008 Vision Science Society 2008 Conference".



Draft Canadian R&D Agenda

Challenges:

- Real-time data access and aggregation, multi-source, large volume;
- Analyze structured & unstructured data;
- Distributed collaborative visualization platforms;
- Cognitive perception of large volume complex data representations
- Operational use of VA

Engage “CNVACs”

- Gov/Ind/Acad collaboration via workshops
- Leverage NVAC/RVAC partnerships
- Improve national capabilities