

# Roberto Ranon

## [Human-Computer Interaction Lab](#)

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Born: June 8, 1971—Pordenone, Italy

Nationality: Italian

## Current position

*Assistant Professor (it. Ricercatore)*, Faculty of Sciences, University of Udine, Italy

## Areas of specialization

Human-Computer Interaction; 3D Graphics; Artificial Intelligence.

## Main research interests & results

Roberto Ranon's current main research interests are in the areas of Human-Computer Interaction, Virtual Reality (VR) and Artificial Intelligence, and most of his results are at the crossroads of these three areas.

Concerning the topic of navigation in 3D Virtual Environments (VE), he has proposed *VU-Flow*, a tool for the visual analysis of navigation patterns of moving entities, such as users, virtual characters or vehicles in VEs. VU-Flow provides a set of interactive visualizations that highlight interesting navigation behaviors of single or groups of moving entities that were the VE together or separately. The visualizations help to improve the design of VEs and to study the navigation behavior of users, e.g., during controlled experiments. Moreover, to help users with navigation issues in VEs, he has also proposed and evaluated navigation aids based on humanoid guides, automatic cameras, and methods for the automatic creation of maps of VEs.

He has worked on introducing adaptivity (i.e., the capability of an interface to automatically adapt its content, presentation and interaction on the basis of its knowledge about the users' preferences, interests, capabilities, ...) into VR systems. In particular, the research pursued has considered methods, ideas and tools developed in the field of Adaptive Hypermedia and tried to extend them to VEs and 3D interfaces. Results obtained include both analyses of possibilities for adaptivity in VEs (with respect to hypermedia), two architectures for the delivery of personalized 3D content through the Web, and various experimental systems that:

- teach students how to build interactive 3D graphics content using the eXtensible 3D (X3D) language,
- present products in the context of 3D e-commerce applications,
- use physiological sensors (e.g. heart rate monitor) to adapt graphics and gameplay in fitness games.

Adaptivity has also been explored in the context of Web and mobile systems, and in the context of e-health, by developing a suitable user profile and a knowledge-based system to support emergency medical services for disabled patients.

More recently, he has started to work on automatic camera control in VEs, and has proposed an approach to the Virtual Camera Composition (VCC) problem (automatically positioning a camera in a VE, such that the resulting image satisfies a set of visual cinematographic properties) based on Particle Swarm Optimization. The approach, in realistic situations, outperforms a discretized, exhaustive search method previously proposed in the literature. He has then applied the method for the assisted derivation of tours in virtual museums and exhibitions.

Previously, he has mainly worked in the area of knowledge-based systems, particularly on model-based hierarchical diagnosis, where he has developed a theory of structural abstraction, a study of its properties for diagnosis, and efficient algorithms for the diagnosis of structurally-abstracted hierarchical systems, including flow-based approaches to diagnosis, i.e. approaches that focus on the flows (of mass,

energy, or information) in the system and on the actions performed by components on the considered flow.

### Appointments held

- Feb 2010 Invited Professor, INRIA/IRISA Rennes, France, collaboration with [Bunraku Team](#)
- 2004- Assistant Professor, University of Udine, Italy (current position)
- 2001-2003 Research Fellow, Human Computer Interaction Lab, University of Udine, Italy

### Education

- 2001 PHD in Computer Science, University of Udine, Italy  
Advisor: prof. Luca Chittaro
- 1996 MSC (IT. LAUREA) in Computer Science, University of Udine, Italy (full marks cum laude)  
Advisor: prof. Luca Chittaro

### Recent Projects & grants

- 2012- Principal Investigator and responsible of the Udine research unit in the research project *Architectural Perspective: digital preservation, content access and analytics*, cofinanced by Italian Ministry of Education, University and Research under the program PRIN 2010-2011. (PRIN 2010BMCKBS\_013)
- 2010-2012 Principal Investigator and responsible of the Udine research unit in the research project *Descriptive geometry and digital representation: memory and innovation*, cofinanced by Italian Ministry of Education, University and Research under the program PRIN 2008. (PRIN 2008E9ERT4.003)
- 2008-2011 Investigator in the research project [ICT for cultural heritage: innovative 3D and mobile services for tourism](#), cofinanced by the Friuli Venezia Giulia region. <sup>1</sup>
- 2008-2012 Investigator in the research project [Advanced emergency medical services for the disabled based on innovative ICT technologies](#), cofinanced by the Friuli Venezia Giulia region. <sup>2</sup>
- 2007- Investigator in the research project *International Institute for Applicable Mathematics and Information Sciences*, cofinanced by Italian Ministry of Education, University and Research under the FIRB program. (FIRB RBIN04M8S8)
- 2005-2007 Principal Investigator and responsible of the Udine research unit in the research project *Virtual Interactive Architecture*, cofinanced by Italian Ministry of Education, University and Research under the program PRIN 2005 (PRIN 2005087291\_003).
- 2004-2008 Investigator the research project *European Design Study Towards a Global TeV Linear Collider (EUROTeV)*, cofinanced under the FP6 Framework as a Specific Support Action.
- 2004-2007 Investigator and member of the Project Management Board in the research project

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<sup>1</sup><http://infobc.uniud.it>

<sup>2</sup><http://hclilab.uniud.it/soccorsodisabili/home.html>

*Grid Enabled Remote Instrumentation with Distributed Control and Computation (GRIDCC)*, cofinanced under the FP6 Framework as a STREP project.

2004-2006

Investigator in the research project *ICT for EU-India Cross-Cultural Dissemination*, cofinanced by the European Commission under the EU-India Economic Cross-Cultural Program (ECCP).

## International publications & communications

### PEER-REVIEWED JOURNAL ARTICLES

**R. Ranon**, T. Urli "Improving the Efficiency of Viewpoint Composition", *IEEE Transactions on Visualization and Computer Graphics* 20(5), 795 - 807, 2014 [[url](#)]

L. Chittaro, **R. Ranon**, "Adaptive Hypermedia Techniques for 3D Educational Virtual Environments", *IEEE Intelligent Systems* 22(4), 31-37, 2007 [[PDF](#)]

L. Chittaro, **R. Ranon**, "Web3D Technologies in Learning, Education and Training: Motivations, Issues, Opportunities", *Computers & Education* 49(2), 3-18, 2007 [[PDF](#)]

L. Chittaro, L. Ieronutti, **R. Ranon**, "Adaptable visual presentation of 2D and 3D learning materials in web-based cyberworlds", *The Visual Computer* 22(12), 1002-1014, 2007 [[PDF](#)]

L. Chittaro, **R. Ranon**, L. Ieronutti, "VU-Flow: A Visualization Tool for Analyzing Navigation in Virtual Environments", *IEEE Transactions on Visualization and Computer Graphics* 12(6), 1475-1485, 2006 [[PDF](#)]

L. Chittaro, L. Ieronutti, **R. Ranon**, "Navigating 3D Virtual Environments by Following Embodied Agents: a Proposal and its Informal Evaluation on a Virtual Museum Application", *PsychNology Journal* 2(1), 24-42, 2004 [[PDF](#)]

L. Chittaro, **R. Ranon**, "Hierarchical Model-based Diagnosis based on Structural Abstraction", *Artificial Intelligence* 155(1-2), 147-182, 2004 [[PDF](#)]

L. Chittaro, **R. Ranon**, "Diagnosis of multiple faults with flow-based function multiple faults with flow-based functional models: the functional diagnosis with efforts and flows approach", *Reliability Engineering and System Safety* 62(2), 137-150, 1999

L. Chittaro, **R. Ranon**, A. Soldati "Introducing Deviations and Multiple Abstraction Levels in the Functional Diagnosis of Fluid Transfer Systems", *Artificial Intelligence in Engineering* 12(4), 335-373, 1998 [[PDF](#)]

#### EDITED VOLUMES

O. Gervasi, **R. Ranon** (eds.) "Special Issue on Virtual Reality in Scientific Applications", *Virtual Reality* 13(4), 2009 [[Journal site](#)]

L. Chittaro, **R. Ranon** (eds.) "Special Issue on Web3D Technologies in Learning, Education and Training", *Computers & Education* 49(1), 2007 [[Journal site](#)]

D. Brutzman D., O. Gervasi, N. Polys, **R. Ranon** (eds.) Proceedings of the twelfth international conference on 3D web technology", *ACM Press*, 2007 [[ACM DL page](#)]

D. Gracanin, J. Gomez, **R. Ranon** (eds.) Proceedings of the eleventh international conference on 3D web technology", *ACM Press*, 2006 [[ACM DL page](#)]

#### BOOK CHAPTERS

L. Chittaro, **R. Ranon**. Adaptive 3D Web Sites, In Brusilovsky, P., Kobsa, A., Nejdl, W. (eds.): *The Adaptive Web: Methods and Strategies of Web Personalization*, Lecture Notes in Computer Science 4321, Springer-Verlag, pp. 433-464, 2007 [[PDF](#)]

#### PEER-REVIEWED CONFERENCE PAPERS

Lino C., Christie M., **Ranon R.**, Bares W., The director's lens: an intelligent assistant for virtual cinematography, Proceedings of MM 2011: 19th ACM International Conference on Multimedia, ACM Press, New York, December 2011, pp. 323-332. [[PDF](#)]

L. Chittaro, L. Ieronutti, **R. Ranon**, D. Visintini, E. Siotto. A High-Level Tool for Curators of 3D Virtual Visits and its Application to a Virtual Exhibition of Renaissance Frescoes,, *Proceedings of VAST 2010: 11th International Symposium on Virtual Reality, Archaeology and Cultural Heritage*, Eurographics/Blackwell Publishing, Oxford, UK, September 2010, pp. 147-154. [[PDF](#)]

L. Chittaro, L. Ieronutti, **R. Ranon**. VEX-CMS: A tool to design virtual exhibitions and walkthroughs that integrates automatic camera control capabilities, *Proceedings of SG 2010: 10th international symposium on Smart Graphics*, Lecture Notes in Computer Science 6133, Springer Verlag, 2010, pp. 103-114. [[PDF](#)]

**R. Ranon**, M. Christie, T. Urli. Accurately Measuring the Satisfaction of Visual Properties in Virtual Camera Control, *Proceedings of SG 2010: 10th international symposium on Smart Graphics*, Lecture Notes in Computer Science 6133, Springer Verlag, 2010, pp. 91-102. [[PDF](#)]

L. Chittaro, **R. Ranon**, L. Ieronutti. 3D Object Arrangement for Novice Users: the Effectiveness of Combining a First-Person and a Map View, *Proceedings of VRST-2009: 16th ACM Symposium on Virtual Reality Software & Technology*, ACM Press, pp. 171-178, 2009 [\[PDF\]](#)

L. Chittaro, **R. Ranon**, E. Carchietti, A. Zampa, E. Biasutti, L. De Marco, A. Senerchia. A knowledge-based system to support emergency medical services for disabled patients, *Proceedings of the 12th Conference on Artificial Intelligence in Medicine (AIME'09)*, Springer-Verlag, pp. 176-180, 2009 [\[PDF\]](#)

L. Chittaro, **R. Ranon**, L. De Marco, A. Senerchia. User modeling of disabled persons for generating instructions to medical first responders, *Proceedings of the International Conference on User Modeling, Adaptation, and Personalization (UMAP 2009)*, Springer-Verlag, pp. 435-440, 2009 [\[PDF\]](#)

L. Chittaro, **R. Ranon**. Serious games for training occupants of a building in personal fire safety skills, *Proceedings of the First International IEEE Conference in Serious Games and Virtual Worlds (VS-GAMES 2009)*, IEEE Press, pp. 76-83, 2009 [\[PDF\]](#)

P. Burelli, L. Di Gaspero, A. Ermetici, **R. Ranon**. Virtual Camera Composition with Particle Swarm Optimization, *Proceedings of SG 2008: 8th international symposium on Smart Graphics*, Lecture Notes in Computer Science 5166, Springer Verlag, pp. 130-141, 2008 [\[PDF\]](#)

L. Di Gaspero, A. Ermetici, **R. Ranon**. Swarming in a virtual world: a PSO approach to virtual camera composition, *Proceedings of the 6th International Workshop on Ant Colony Optimization and Swarm Intelligence (ANTS 2008)*, Lecture Notes in Computer Science 5217, Springer Verlag, 2008

L. Chittaro, **R. Ranon**. An Adaptive 3D Virtual Environment for Learning the X3D Language, *Proceedings of the 2008 International Conference on Intelligent User Interfaces (IUI 2008)*, ACM Press, pp. 419-420, 2008 [\[PDF\]](#)

F. Buttussi, L. Chittaro, **R. Ranon**, A. Verona. Adaptation of Graphics and Gameplay in Fitness Games by Exploiting Motion and Physiological Sensors, *Proceedings of SG 2007: 7th International Symposium on Smart Graphics*, Lecture Notes in Computer Science 4569, Springer Verlag, pp. 85-96, 2007 [\[PDF\]](#)

**R. Ranon**, L. De Marco, A. Senerchia, S. Gabrielli, L. Chittaro, R. Pugliese, L. Del Cano, F. Asnicar, M. Prica. A Web-based Tool for Collaborative Access to Scientific Instruments in Cyberinfrastructures, *Proceedings of INGRID 2007 - Instrumenting the Grid: 2nd International Workshop on Distributed Cooperative Laboratories*, Springer-Verlag, pp. 237-251, 2007 [\[PDF\]](#)

- L. Chittaro, **R. Ranon**, D. Corvaglia. Destroying Cultural Heritage: Technical, Emotional and Exhibition Aspects in Simulating Earthquake Effects on a Gothic Cathedral, *Proceedings of VAST 2006: 7th International Symposium on Virtual Reality, Archaeology and Intelligent Cultural Heritage*, Eurographics-Blackwell Publishing, pp. 229-236, 2006 [\[PDF\]](#)
- L. Ieronutti, **R. Ranon**, L. Chittaro. High-Level Visualization of Users' Navigation in Virtual Environments, *Proceedings of Interact 2005: 10th IFIP International Conference on Human-Computer Interaction*, Springer Verlag, pp. 873-885, 2005 [\[PDF\]](#)
- R. Pugliese, F. Asnicar, L. Del Cano, L. Chittaro, **R. Ranon**, L. De Marco, A. Senerchia. Collaborative Environments for the GRID: the GRIDCC Multipurpose Collaborative Environment, *Proceedings of Interact 2005: 10th IFIP International Conference on Human-Computer Interaction*, Springer Verlag, 2005 [\[Book site\]](#)
- L. Chittaro, **R. Ranon**, L. Chittaro. Using the X3D Language for Adaptive Manipulation of 3D Web Content, *Proceedings of AH-2004: 3rd International Conference on Adaptive Hypermedia and Adaptive Web-based Systems*, Lecture Notes in Computer Science, Springer Verlag, pp. 287-290, 2004 [\[PDF\]](#)
- L. Ieronutti, **R. Ranon**, L. Chittaro. Automatic Derivation of Electronic Maps from X3D/VRML Worlds, *Proceedings of Web3D 2004: 9th International Conference on 3D Web Technology*, ACM Press, pp. 61-70, 2004 [\[PDF\]](#)
- L. Chittaro, **R. Ranon**, L. Ieronutti. Guiding Visitors of Web3D Worlds through Automatically Generated Tours, *Proceedings of Web3D 2003: 8th International Conference on 3D Web Technology*, ACM Press, pp. 27-38, 2004 [\[PDF\]](#)
- L. Chittaro, **R. Ranon**. New Directions for the Design of Virtual Reality Interfaces to E-Commerce Sites, *Proceedings of AVI 2002: 5th International Conference on Advanced Visual Interfaces*, ACM Press, pp. 308-315, 2002 [\[PDF\]](#)
- L. Chittaro, **R. Ranon**. Dynamic Generation of Personalized VRML Content: a General Approach and its Application to 3D E-Commerce, *Proceedings of Web3D 2002: 7th International Conference on 3D Web Technology*, ACM Press, pp. 145-154, 2002 [\[PDF\]](#)
- L. Chittaro, **R. Ranon**. Hierarchical Diagnosis Guided by Observations, *Proceedings of IJCAI-2001: 17th International Joint Conference on Artificial Intelligence*, Morgan Kaufmann Publishers, 2001
- L. Chittaro, **R. Ranon**. Adding Adaptive Features to Virtual Reality Interfaces for E-Commerce, *Proceedings of AH-2000: International Conference on Adaptive Hypermedia and Adaptive Web-based Systems*, Lecture Notes in Computer Science

1892, Springer-Verlag, pp. 86-97, 2000 [\[PDF\]](#)

L. Chittaro, **R. Ranon**. Virtual Reality stores for 1-to-1 e-commerce, *Proceedings of the CHI2000 Workshop on Designing Interactive Systems for 1-to-1 E-Commerce*, 2000

L. Chittaro, **R. Ranon**. Automatic derivation of hierarchical representations for flow-based functional models, *Proceedings of DX-99: 10th International Workshop on Principles of Diagnosis, Loch Awe, Scotland*, 1999

**R. Ranon**. The closure properties of Functional Flow-Based Approaches and their relevance to diagnosis, *Proceedings of the Thirteenth European Conference on Artificial Intelligence (ECAI-98)*, John Wiley and sons, pp.289-290, 1998

L. Chittaro, **R. Ranon**. Augmenting the diagnostic power of flow-based approaches to functional reasoning, *Proceedings of AAAI-96: 13th Conference of the American Association for Artificial Intelligence*, AAAI Press/MIT Press, 1996

### Teaching

- 2009 A practical introduction to 3D interactive graphics with the X3D language  
Summer School on Foundations of Information Technologies (FIT), Novi Sad, Serbia
- 2004- 3D Interactive Graphics  
MSc in Computer Science, University of Udine, Italy
- 2003- Multimedia Systems Laboratory  
BSc in Multimedia and Web Technologies, University of Udine, Italy
- 2002-2004 Web Technologies Laboratory  
BSc in Multimedia and Web Technologies, University of Udine, Italy

### Service to the profession

- 2014 PC member, SmartGraphics 2014 - the 12th International Symposium on Smart Graphics
- 2013 PC member, INTERACT 2013 - the 14th IFIP TC13 Conference on Human-Computer Interaction
- 2012 PC member, 1st workshop on the social web of intelligent things and people (in conjunction with ECAI 2012)
- 2012 PC member, 17th ACM International Web3D Conference
- 2012 Reviewer for EU proposals and projects
- 2011 PC member, VAST 2011: International Symposium on Virtual Reality, Archaeology and Cultural Heritage
- 2011 PC member, [2011 Web3D ACM Conference](#)
- 2010 PC member, VAST 2010: International Symposium on Virtual Reality, Archaeol-



ogy and Cultural Heritage

- 2009 Guest co-editor, [Virtual Reality](#), Springer
- 2007 Reviewer for the Swiss National Science Foundation
- 2007 Guest co-editor, [Computers and Education](#), Elsevier
- 2007 Program Co-Chair, 12th International Symposium on 3D Web Technology ([Web3D 2007](#))
- 2006 Program Co-Chair, 11th International Symposium on 3D Web Technology ([Web3D 2006](#))
- 2006 PC member, 2nd International Symposium on Visual Computing ([ISVC06](#))

Occasional reviewer for: [User Modeling and User-Adapted Interaction](#), [Computers and Education](#), [International Journal of Human-Computer Interaction Studies](#).

### Languages

*Italian* (native speaker)

*English* (fluent)