
Nicolas Tsingos

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Multi-modal perception and audio-visual rendering for immersive virtual environments

<http://www-sop.inria.fr/reves/Nicolas.Tsingos>

Born 11/18/72. French, married, 2 children.

Overview

Nicolas Tsingos holds MSc and PhD degrees in Computer Science from the Joseph Fourier University in Grenoble, France. Currently he is a permanent researcher in the REVES research project at INRIA (The French National Institute for Computer Science and Control). Previously, he was a Member of the Technical Staff at Bell Laboratories, Lucent Technologies in Murray Hill, NJ, USA.

Dr Tsingos' research interests include realistic audio simulation for complex virtual environments, algorithmic tools for interactive architectural acoustics, efficient and expressive audio rendering from physical simulations and scalable solutions for spatial audio rendering leveraging perceptual knowledge of human hearing. Dr Tsingos has authored more than 30 scientific papers in the fields of computer graphics, acoustics and audio rendering. He has continuously served as a program committee member or reviewer of numerous journals and conferences in the field of computer graphics and acoustics. In 2001, he also organized and co-chaired the Campfire on Acoustic Rendering for Virtual Environments, sponsored by ACM Siggraph and Eurographics.

His work has been featured in journals such as Computer Graphics World, Journal of the Audio Eng. Soc. and Physics today.

Dr Tsingos is also teaching computer graphics and audio rendering techniques at Masters' level at the University of Nice/Sophia Antipolis and at Ecole Centrale de Paris and has supervised numerous interns, postdocs and 2 Ph.D. students.

He holds a patent on perceptual techniques for audio rendering, a technology that has been used in commercial games, e.g., Test Drive Unlimited and Alone in the Dark 5 by ATARI.

Experience

Researcher 2002-present

REVES Team – INRIA (French National Institute for Computer Science and Control), Sophia Antipolis, France

- 2005-present: Participation in EU project *XMOD* (Cross-modal Perceptual Interaction and Rendering) (IST-2006-04891). <http://www.crossmod.org>.
- 2002-2005: Participation in EU project *CREATE* (Constructivist Mixed Reality for Design, Education and Cultural Heritage) (IST-2001-34231). <http://www.cs.ucl.ac.uk/research/vr/Projects/Create>.
- 2004-2006: Project *OPERA* on perceptual audio rendering. Obtained a grant from the Ministry of research and ministry of industry (ranked 1st) and coordinated the project. <http://www-sop.inria.fr/reves/OPERA>.
- Ongoing Ph.D. supervision ("Synthèse sonore en temps réel, réaliste et expressive, à partir de simulations physiques"). Collaboration with EdenGames, an ATARI game studio.
- One Ph.D. graduated on 03/19/2007 (Emmanuel Gallo, « Perceptual Sound Rendering for Multi-Modal Virtual Environments ».)
- Supervision of 5 students and 1 post-doc.
- Technology transfer : perceptual audio rendering technique (French and US patents) licensed to Eden Games for use in their in-game audio engine on next-generation platforms.

Member of the Technical Staff 1999-2001

Bell Laboratories – Lucent Technologies, Murray Hill, NJ, USA

- **Beam-tracing and geometrical theory of diffraction for interactive room-acoustics simulations**
Collaboration with the acoustics group at Bell Labs and the computer graphics group of Princeton to develop novel interactive tools for geometrical acoustics including the treatment of diffraction phenomena.
- Co-supervised with Pr. Funkhouser an undergraduate student from Princeton University.
- Development of an interactive audio rendering API
- Design and construction of the "Bell-labs box", a calibrated test-environment for room acoustic simulations
- Measurements and validation of simulations with the Bell Labs Box.
- **Co-chaired the ACM Siggraph/Eurographics campfire on acoustic rendering, Snowbird, Utah, may 2001.** <http://www.bell-labs.com/topic/conferences/campfire/>.

Experience (ctnd.)

- Ph.D. Computer Science (w. honors)**
J. Fourier University Grenoble, France
1995-1998
- IMAGIS Team/GRAVIR-IMAG Laboratory, Grenoble, France*
Simulating high-quality dynamic virtual sound fields for interactive graphics applications:
Acoustics simulations for virtual reality applications. Adaptation of the hierarchical radiosity technique developed in computer graphics for acoustic simulations. Sound scattering and occlusion models.
- IMAGIS, CSTB (Grenoble), LRI and France Telecom R&D (Paris), France*
« Télémedia » project: collaboration with France Telecom, University of Paris (Orsay) CHI Lab and CSTB. Design of a telepresence system for informal gatherings (cocktail parties, cafeterias, remote dining).
- Master Computer Science Robotics, Vision, Image INPG, France**
1994-1995
- IMAGIS and Institut de la Communication Parlée (ICP), Grenoble, France*
Modeling of talking lips with implicit surfaces: development of a novel animation technique for talking lips using implicit surfaces. The model can be controlled by external parameters (phonemes, visemes) and can respond to physical constraints such as contact between teeth and lips, lips and tongue, lips and external objects (cigarettes, etc.).
- IMAGIS et TIMC/GMCAO, Grenoble, France*
Automatic surface reconstruction from tomographic data: Development of an automatic surface reconstruction approach from unstructured 3D point clouds for medical applications. Pioneered the combined use of implicit surfaces and medial axis information to produce a compact and watertight model.
- Magistère d'informatique**
J. Fourier University Grenoble, France
1993-1994
- IMAGIS, Grenoble, France*
Implicit Surfaces for animation and modeling: development of techniques for interactive modeling, visualisation and animation of objects defined as implicit surfaces generated by skeletons (e.g., "blobby models").
- IMAGIS and Institut Français du Pétrole (IFP), Grenoble, France*
Visualization of massive 3D databases: Collaboration with IFP on techniques aimed at visualizing large 3D data sets using level of detail techniques.

References

Ingrid Carlbom *Visual Communications Research Department, Bell Laboratories - Lucent Technologies*
Former Department Head Murray Hill, NJ 07974, USA.

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Thomas Funkhouser *Department of Computer Science, Princeton University*
Professor 35 Olden Street, Room 422
Princeton, NJ 08544, USA.

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Olivier Warusfel *IRCAM*
Group leader Room Acoustics team

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Durand Begault *NASA AMES Research Center*
Researcher Advanced Controls and Displays Group

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James E. West *Johns Hopkins University*
Research Professor of Electrical and computer engineering
Electrical and Computer 3400 N. Charles Street, 105 Barton Hall
Engineering Baltimore, Maryland 21218

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Publications
Journals (7)**3D Audio Matting, Post-Editing and Re-rendering from Field Recordings**

E. Gallo and N. Tsingos

EURASIP Journal on Advances in Signal Processing, 2007

Design and evaluation of a Real-World Virtual Environment for Architecture and Urban Planning

George Drettakis, Maria Roussou, Alex Reche and N. Tsingos

Presence : Teleoperators and Virtual Environments, 2007.

Perceptual Audio Rendering of Complex Virtual Environments

N. Tsingos, E. Gallo and G. Drettakis.

ACM Transactions on Graphics (SIGGRAPH Conference Proceedings) 3(23) , July 2004.

A beam tracing method for interactive architectural acoustics.

T. Funkhouser, N. Tsingos, I. Carlbom, G. Elko, M. Sondhi, J.E. West, G. Pingali, P. Min and A. Ngan.

Journal of the Acoustical Society of America (JASA), 115(2), Feb. 2004.

Validation of Acoustical Simulations in the "Bell Labs Box"

N. Tsingos, T. Funkhouser, G. Elko, R. Kubli and I. Carlbom. IEEE Computer Graphics & Applications 22(4), special issue on "virtual worlds, real sounds", july/august 2002.

Modeling Acoustics in Virtual Environments using the Uniform Theory of Diffraction.

Nicolas Tsingos, Thomas Funkhouser, A. Ngan and Ingrid Carlbom. ACM Siggraph 2001, Los Angeles.

Adaptive sampling of implicit surfaces for interactive modeling and animation.

M. Desbrun, N. Tsingos and M.P. Gascuel, Computer Graphics Forum, 15(5), December 1996.

**International
peer-reviewed
conferences (20)****Instant Sound Scattering**

Nicolas Tsingos, Sylvain Lefebvre, Carsten Dachsbacher and Matteo Dellepiane.

Eurographics Symposium on Rendering, 2007.

Progressive perceptual audio rendering of complex scenes

T. Moeck, N. Bonneel, N. Tsingos, G. Drettakis, I. Viaud-Delmond and D. Alloza

ACM I3D Symposium on Interactive 3D graphics and games, 2007.

On-the-fly auditory masking for scalable VoIP bridges

A. Nagle, N. Tsingos., G. Lemaitre and A. Sollaud

30th AES Intl. Conf. on Intelligent Audio Environments, 2007.

Extracting and Re-rendering structured Auditory Scenes from Field Recordings

E. Gallo and N. Tsingos. 30th AES Intl. Conf. on Intelligent Audio Environments, 2007.

Scalable mixing and filtering of audio signals using an augmented spectral representation

N. Tsingos. DAFX'07 COST-G6 Conf. on Digital Audio Effects, 2007.

Prioritizing signals for selective real-time audio processing

E. Gallo, G. Lemaitre and N. Tsingos. Intl. Conf. on Auditory Displays, ICAD, 2007.

A User-Centered Approach on Combining Realism and Interactivity in Virtual Environments

Maria Roussou, George Drettakis, Nicolas Tsingos, Alex Reche and Emmanuel Gallo.

Proc. of IEEE VR 2004 (ext. abstract), March 2004.

Image-based Techniques for the Creation and Display of Photorealistic Interactive Virtual Environments.

George Drettakis, Maria Roussou, Nicolas Tsingos, Alex Reche and Emmanuel Gallo.

Proceedings of the Eurographics Symposium on Virtual Environments , June 2004.

Efficient 3D Audio Rendering with the GPU

E. Gallo and N. Tsingos.

GP², ACM workshop on general purpose computing with graphics processors (poster), Los Angeles, Aout 2004.**The CREATE Project: Mixed Reality for Design, Education, and Cultural Heritage with a Constructivist Approach**

Céline Loscos, Hila Ritter Widenfeld, Maria Roussou, Alexandre Meyer, Franco Tecchia, Emmanuel Gallo, George Drettakis, Alex Reche, Nicolas Tsingos, Yiorgos Chrysanthou, Luc Robert, Massimo Bergamasco, Andrea Dettori and Souheil Soubra.

ISMAR 03, The 2nd IEEE and ACM International Symposium on Mixed and Augmented Reality , October 2003.

Publications (cntd.)

International peer-reviewed conferences (contd.)

Artefact-free asynchronous geometry-based audio rendering.

Nicolas Tsingos. IEEE ICASSP, Salt Lake City, 2001.

A versatile software architecture for virtual audio simulations.

N. Tsingos. Intl. Conf. on Auditory Displays, ICAD, Helsinki, Finlande, 2001.

A general model for the simulation of room acoustics based on hierarchical radiosity.

N. Tsingos and J.D. Gascuel, technical sketch, in visual proceedings of SIGGRAPH'97, Los Angeles, USA, august 1997.

Fast rendering of sound occlusion and diffraction effects for virtual acoustic environments.

N. Tsingos and J.D. Gascuel, 104th Audio Engineering Society convention, Amsterdam, The Netherlands, may 1998. Preprint no. 4699 (P4-7).

Soundtracks for computer animation: sound rendering in dynamic environments with occlusions.

N. Tsingos and J.D. Gascuel, in proceedings of Graphics Interface'97, Kelowna B.C., Canada, May 1997.

Adaptive sampling of implicit surfaces for interactive modeling and animation.

M. Desbrun, N. Tsingos and M.P. Gascuel, proceedings of the 1st international workshop on implicit surfaces, Grenoble, France, April 1995.

Automatic reconstruction of unstructured 3D data: combining medial axis and implicit surfaces.

E. Bittar, N. Tsingos and M.P. Gascuel, proceedings of Eurographics'95, Maastricht, The Netherlands, 1995.

Implicit surfaces for semi-automatic medical organs reconstruction.

N. Tsingos and M.P. Gascuel, in Computer Graphics - developments in virtual environments, Academic Press, 1995. (Proceedings of CGI'95, Leeds, U.K., 1995)

3D models of the lips for realistic speech animation.

T. Guiard-Marigny, N. Tsingos, A. Adjoudani, C. Benoit and M.P. Gascuel, proceedings of Computer Animation'96, Geneva, Switzerland, 1996.

Building and exploiting Levels Of Detail: An overview and some VRML experiments.

J.L. Pajon, Y. Collenot, X. Lhomme, N. Tsingos, F.X. Sillion, P. Guilloteau, P. Vuylsteker, G. Grillon, and D. David, in proceedings of VRML'95, San Diego, USA, 1995.

Other

Invited Papers

Perceptually-based auralization

N. Tsingos. Invited paper, 19th Intl. Congress on Acoustics, ICA, 2007.

Extending Geometrical Acoustics to Highly Detailed Architectural Environments

N. Tsingos, S. Lefebvre, C. Dachsbacher and M. Dellepiane.

Invited paper, 19th Intl. Congress on Acoustics, ICA, 2007.

Modeling Sound Reflection and Diffraction in Architectural Environments with Beam Tracing

Thomas Funkhouser, Nicolas Tsingos, Ingrid Carlbom, Gary Elko, Mohan Sondhi and James West.

Forum Acusticum, Invited paper, Septembre 2002.

Book chapters

Traité de la Realite Virtuelle, tome I, ch. 3 – Les sens de l'homme

P. Fuchs, M. Hafez, M. B. Koudja, J.-P. Papin, N. Tsingos and O. Warusfel

Presses de l'école des Mines de Paris, 2006.

Traité de la Realite Virtuelle, tome II, ch. 15 – Dispositifs et Interfaces de Restitution Sonore spatiale

N. Tsingos and O. Warusfel. Presses de l'école des Mines de Paris, 2006.

Traité de la Realite Virtuelle, tome III, ch. 4 – Modeles pour le rendu sonore

N. Tsingos and O. Warusfel. Presses de l'école des Mines de Paris, 2006.

SIGGRAPH Courses

Sounds Good to Me! : Computational Sound for Graphics, VR, and Interactive Systems.

T. Funkhouser, J.M. Jot and N. Tsingos. Course #45, SIGGRAPH 2002, San Antonio, 2002.

Misc.

Breaking the 64 spatialized sound sources barrier.

N. Tsingos, E. Gallo and G. Drettakis. Gamasutra Audio Resource Guide 2003, www.gamasutra.com.

Patents

- 2003** **Perfected device and method for the spatialization of sound**
 French patent FR #03 13875 (26/11/2003) and US application #10/748,125 (31/12/2003).
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Other Activities

Teaching Teaching computer graphics and audio rendering computer graphics and audio rendering techniques at Masters' level at the University of Nice/Sophia Antipolis and at Ecole Centrale de Paris since 2002.

Conference Program committees ACM International Workshop on Immersive Telepresence 2002.
 ACM Multimedia Interactive Art Program's (Technical Program Committee) 2004-2007.
 Pacific Graphics 2007.
 EGSR (Eurographics Symposium on Rendering) 2006 -2008.
 ACM Symposium on Solid and Physical Modeling 2007 - 2008.

Journal and Conference reviewing ACM Siggraph, ACM Symposium on Computational Geometry, ACM Symposium on Solid and Physical Modeling, Eurographics, Eurographics Symposium on Rendering, IEEE Computer Graphics and Applications, Computers & Graphics, Journal of the Acoustical Society of America, Journal of Discrete Algorithms, Eurasip JASP, Pacific Graphics, 30th AES Intl. Conference.

Ph.D. committee External examiner for the following Ph.D. thesis :

- Marie Samozino, « Voronoi Centered Radial Basis Functions» defended 11/07/2007 at INRIA Sophia Antipolis, France.
- Arnault Nagle, « Enriching VoIP conferencing with improved quality and spatial audio techniques » , to be defended Feb. 2008, FranceTélécom R&D, Lannion, France.

Invited talks Accenture Technology Labs, 2006.
 IRCAM, Journées Francaises sur la spatialisation, 2006.
 Creative Labs Advance Technology Center, 2001.
 Bell Labs, Multimedia Center Technical Challenges Discussion Series, 1998.
 Dynamic Graphics Project, University of Toronto, Toronto, Canada, 1995.
 Imager Computer Graphics Lab, University of British Columbia, Vancouver, Canada, 1995.

Artworks *TRACE - Brooklyn Academy of Music (BAM), NY, USA, 2001.*
 « Art In Multimedia » project (sponsored by Lucent Technologies) in collaboration with multimedia artist Paul Kaiser. Trace is an immersive art installation premiered on november 2001 as part of BAM's "Next Wave Festival". <http://www.openendedgroup.com/artworks/trace/trace.htm>.

Feature papers

- *Seeing Sound*
 by Diana Phillips Mahoney
 Computer Graphics World, Volume: 24 Issue: 8, August 2001.
<http://www.cgw.com>
- *Intelligent audio environments*
 Staff technical writer
 J. Audio Eng. Soc., Vol. 55, No. 10, October 2007.
- *Animation uses old physics to new effect*
 by Toni Feder
 Physics Today, Nov. 2007 issue, p. 24.
 Available online at <http://www.physicstoday.org>
http://ptonline.aip.org/journals/doc/PHTOAD-ft/vol_60/iss_11/24_1.shtml

Misc.

Programming C/C++, Tcl, Open Inventor, OpenGL, Matlab, Maple on Windows and UNIX systems.
OpenGL, OpenAL, DirectX, Ageia PhysX.
Tens of thousands of C++ lines written since 1993.

Languages Fluent French and English
Notions of Greek, Spanish and Polish.

01/12/2007