

# Curriculum Vitae

Michael Bang Nielsen  
Born March 26<sup>th</sup> 1976.

## **Contact Information**

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## **Education**

- **December 2006:** PhD in Computer Science, Aarhus University.
- **January 2003:** Master's degree in computer science and a minor in mathematics, Aarhus University.
  - **Relevant courses include:**
    - 3D Modeling and Animation (Introduction to Maya)
    - Computational Geometry
    - Computer Vision and Image Processing
    - Introduction to Computer Graphics
    - Differential Geometry
    - Numerical Solution of Partial Differential Equations
    - Linear Algebra
    - Topology
    - Calculus
    - Mathematical Methods for Physicists
    - Data Structures and Algorithms
    - Graph Algorithms
    - Algorithmic and Complexity Theory
    - Search and Optimization
    - Aspects of Object Oriented Programming
    - Fluid Mechanics
    - Continuum Physics
    - Advanced Mechanics

## **Research Areas**

Data structures and algorithms for level set methods, fluid animation for computer graphics, inverse rendering, vision tracking.

## **Scientific Visits and Internships**

- April 2007, November 2007, February 2008: Visiting [Institute for Numerical Simulation](#), Bonn University, Germany
- April 2005 – May 2005: Research intern at [Digital Domain](#), Venice, CA, USA.
- September 2004 – March 2005: Visiting [Department of Science and Technology](#), Linköping University, Sweden.

## **Professional Experience**

- **August 2006 – January 2010:** Postdoc at Department of Computer Science, Aarhus University. Funded by the Faculty of Science and the [Danish Agency for Science, Technology and Innovation](#).
  - Research in [finite element based](#), out-of-core and parallel data structures and algorithms for level set computations. Research in mathematical models and numerics (e.g. multigrid) for fluid animation control based on variational principles. During my postdoc I have taken supplementary courses in fluid mechanics and continuum physics at the [Technical University of Denmark \(DTU\)](#). (Software development in C++, MFC, Matlab, Perl).
- **August 2003 – July 2006:** PhD student at Department of Computer Science, Aarhus University. Advisors: [Professor Ken Museth](#) and [Professor Kaj Grønbaek](#).
  - Research in [efficient](#), [flexible](#) and [out-of-core](#) data structures and algorithms for high resolution level set computations (Software development in C++, MFC, Matlab).
  - For two months (April - May 2005) I was a research intern at the [Digital Domain](#) software group.
- **February 2003 – July 2003:** Full-time research assistant in the [Workspace](#) project at Aarhus University
  - The objective of the Workspace project was to develop software components and hardware artefacts that could be combined and integrated into augmented reality work places. I developed a [real-time augmented reality tracking system](#) based on homographies to assist landscape architects on site (Software development in C++, MFC, Qt for Linux/Windows).

- **July 2001 – January 2003:** Part-time student programmer in the [Workspace](#) project at Aarhus University
  - My work focused on video tracking and augmented reality (Software development in C++, MFC, Qt for Linux/Windows).
- **August 2000 – June 2001:** Part-time student programmer in the [DESARTE](#) project at Aarhus University
  - The goal was to create a collaborative and distributed 3D virtual environment. My primary focus was on designing and implementing a [3D spatial parser](#) that detects implicit structures in the spatial layout of 3D objects (Software development in C++, MFC, Qt for Linux/Windows).
- **December 1998 – July 2000:** Part-time student programmer in the COCONUT project at Aarhus University.
  - The aim was to develop a generic infrastructure and tools for collaborative hypermedia over the internet. I designed and implemented the distributed cache in the infrastructure and the dynamic runtime system for the [hypermedia client](#) (Software development in Java).

## **Software and Programming Languages**

- C/C++ (Linux/Windows), Qt, Boost, TBB, MKL, VTune, OpenGL, Perl, Bash, Java, Maya, Visual Studio, Matlab.

## **Teaching Experience**

- [Simulating Fluids in Computer Graphics](#) (Lecturer), co-taught with Brian B. Christensen, 2009.
- [Simulating Smoke and Water in Computer Graphics](#) (Lecturer), 2006
- [Modeling and Animation with Level Sets](#) (Lecturer and TA), co-taught with Professor Ken Museth, 2005
- Web Technology (TA), 2004
- Usability (TA), 2003
- Computer Science – In Perspective (TA), 2003

## **Awards**

- [Danish Society of Computer Science](#)'s Best Computer Science Master's Thesis 2002 award for the thesis "[Inverse Rendering under Uncontrolled Illumination](#)" co-written with Anders Brodersen.

## **Grants**

- 2M DKR. (\$0.4M) from the [Danish Agency for Science, Technology and Innovation](#), 2006.

## **Invited Talks**

- “Fluid Simulation and Control for Computer Graphics”, Friday Lecture Series, Department of Computer Science, Aarhus University, October 2009.
- “High Resolution Level Set Simulations”, Institute for Numerical Simulation, Bonn University, Germany, April 2007. (Host: Martin Rumpf).
- “Efficient and High Resolution Level Set Simulations”, UCLA Math Department, USA, August 2005. (Hosts: Stanley Osher, Luminita Vese and Tony Chan)
- “Inverse Rendering under Uncontrolled Illumination”, CMVT, Aalborg University, Denmark, April 2004.
- “Inverse Rendering under Uncontrolled Illumination”, DIKU, Copenhagen University, Denmark, October 2003.

## **References**

Dr. Ken Museth  
Adjunct Professor  
Senior R&D Software Engineer  
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### ***Refereed Journal Publications***

- **Nielsen, M.B.**, Christensen, B.B.: Improved Variational Guiding of Smoke Animations. Accepted to the Eurographics 2010 conference. To appear in a special issue of the Computer Graphics Forum journal. 8 pages.
- Nemitz, O., **Nielsen, M. B.**, Rumpf, M., Whitaker, R.: [Finite Element Methods on Very Large, Dynamic Tubular Grid Encoded Implicit Surfaces](#), SIAM Journal of Scientific Computing, Vol. 31, No. 3. pp. 2258-2281, 2009.
- **Nielsen, M.B.**, Nilsson, O., Söderström, A., Museth, K.: [Out-Of-Core and Compressed Level Set Simulations](#), ACM Transactions on Graphics 26(4), October 2007 (Presented at SIGGRAPH 2008, Partial Differential Equations paper session).
- **Nielsen, M.B.**, Museth, K.: [Dynamic Tubular Grid: An Efficient Data Structure and Algorithms for High Resolution Level Sets](#). Journal of Scientific Computing, Volume 26, Number 3, March 2006. Pages 261-299.
- Houston, B., **Nielsen, M.B.**, Batty, C., Nilsson, O., Museth, K.: [Hierarchical RLE Level Set: A Compact and Versatile Deformable Surface Representation](#). ACM Transactions on Graphics, Volume 25, Number 1, January 2006. Pages 151-175.

- **Nielsen, M.B., Ørbæk, P.:** [Finding Hyper-Structure in Space: Spatial Parsing in 3D](#). The New Review of Hypermedia and Multimedia, Volume 7, Number 1, July 2002. Pages 153-183.

### **Peer-Reviewed Conference Publications**

- **Nielsen, M.B., Christensen, B.B., Zafar, N.B., Roble, D., Museth, K.:** [Guiding of Smoke Animations Through Variational Coupling of Simulations at Different Resolutions](#). Proceedings of ACM SIGGRAPH/Eurographics Symposium on Computer Animation (SCA) 2009, pages 217-226.
- Nemitz, O., **Nielsen, M. B.**, Rumpf, M., Whitaker, R.: [Narrow Band Methods for PDEs on Very Large Implicit Surfaces](#). In Vision, Modeling and Visualization Proceedings, pages 171-180, November 2007.
- **Nielsen, M.B.**, Nilsson, O., Söderström, A., Museth, K.: [Virtually Infinite Resolution Deformable Surfaces](#). In Proc. SIGGRAPH 2006 Sketches and Applications, August 2006.
- Houston, B., **Nielsen, M.B.**, Batty, C., Nilsson, O., Museth, K.: [Gigantic Deformable Surfaces](#). In Proc. SIGGRAPH 2005 Sketches and Applications, August 2005.
- **Nielsen, M.B.**, Museth, K.: [An Optimized, Grid Independent, Narrow Band Data Structure](#). In Proc. SIGRAD 2004 Sketches and Applications, November 2004.
- **Nielsen, M.B.**, Brodersen, A.: [Inverse Rendering of Polished Materials under Constant Complex Uncontrolled Illumination](#). Proceedings of WSCG, Volume 12, February 2004. Pages 309-316.
- **Nielsen, M.B.**, Kramp, G., Grønbæk, K.: [Mobile Augmented Reality Support for Architects based on Feature Tracking Techniques.](#)” In Proc. ICCS, LNCS 3038. June 2004. Pages 921-928.

### **Dissertations**

- **Nielsen, M.B.:** [Efficient and High Resolution Level Set Simulations – Data Structures, Algorithms and Applications](#), PhD Dissertation, Aarhus University, December 2006.
- **Nielsen, M.B.**, Brodersen, A.: [Inverse Rendering under Uncontrolled Illumination](#), Master's Thesis, Aarhus University, December 2002.

### **Technical Reports**

- **Nielsen, M.B.**, Museth, K.: [Dynamic Tubular Grid: An Efficient Data Structure and Algorithms for High Resolution Level Sets](#), Michael B. Nielsen and Ken Museth, Electronic Press, 2004.

### **Workshop Publications**

- **Nielsen, M.B., Ørbæk, P.:** [Spatial Parsing within the Topos 3D Environment](#). First Workshop on Spatial Hypertext, August 2001.

## ***Reviewing Activities***

- IEEE Transactions on Visualization and Computer Graphics
- Eurographics
- Journal of Graphics Tools
- IEEE EuroVis