

# Marco da Silva

[dasilva@mit.edu](mailto:dasilva@mit.edu)

<http://people.csail.mit.edu/dasilva>

## Research Interests

Computer graphics. Physically-based animation. Optimal Control. Reinforcement Learning. Motion Planning. Robotics. Biomechanics. Software Engineering.

## Education

*Massachusetts Institute of Technology*, Cambridge, MA

Ph.D., Computer Science, September 2010

*Thesis: Pre-Computation for Controlling Character Behavior in Interactive Physical Simulations*

*Massachusetts Institute of Technology*, Cambridge, MA

M.S., Computer Science, February 2008

*Thesis: Practical Optimization for Online Control of Animated Characters*

*Brown University*, Providence, RI

Sc.B with Honors., Mathematics and Computer Science, May 2001

*Senior Thesis: Visualizing Differences in DT-MR images of Brains*

## Professional Experience

**Robotics Engineer**, August 2010-present

*Boston Dynamics*, Waltham, MA

**Research Assistant**, September 2005-August 2010

*Massachusetts Institute of Technology*, Cambridge, MA

Graduate student researcher with Dr. Jovan Popovic in the Computer Graphics Group. Research focused on physically based animation of humanoid characters using optimal control techniques.

**Technical Director**, June 2004 – August 2005

*Pixar Animation Studios*, Emeryville, CA

Optimized set rendering on the film Cars. Designed and implemented the crowd animation pipeline for Cars. Animated several crowd shots on this film.

**Graphics Engineer**, July 2001 – June 2004

*Pixar Animation Studios*, Emeryville, CA

Developed new animation software such as a direct manipulation system and a new system for handling constraints. Unified all animator tools into a single undo framework. Implemented novel inverse kinematics based animation tools.

**Research Assistant**, *Spring 1999-Spring 2001*  
**Brown University**, Providence, RI

Undergraduate researcher with Dr. David Laidlaw in the Computer Graphics Group. Worked on projects to measure blood pressure from MR images. Worked on fluid visualization and visualization of differences in MR brain scans.

## Publications

*Linear Bellman Combination for Control of Character Animation*, Marco da Silva, Fredo Durand, Jovan Popovic. ACM Transactions on Graphics, Proceedings of Siggraph, 2009, pages 82:1-10, New Orleans, August 2009

*Deformable Object Animation using Reduced Optimal Control*, Jernej Barbic, Marco da Silva, Jovan Popovic. ACM Transactions on Graphics, Proceedings of Siggraph, 2009, pages 53:1-9, New Orleans, August 2008

*Interactive Simulation of Stylized Human Locomotion*, Marco da Silva, Yeuhi Abe, Jovan Popovic. ACM Transactions on Graphics, Proceedings of Siggraph, 2008, pages 82:1-10, Los Angeles, August 2008

*Simulation of Human Motion Data using Short-Horizon Model-Predictive Control*, Marco da Silva, Yeuhi Abe, Jovan Popovic. Eurographics, 2008.

*Guided Time Warping for Motion Editing*, Eugene Hsu, Marco da Silva, Jovan Popovic. Symposium on Computer Animation 2007

*Multiobjective Control with Frictional Contacts*, Yeuhi Abe, Marco da Silva, Jovan Popovic. Symposium on Computer Animation 2007.

*Comparing 2D vector field visualization methods: A user study*. David H. Laidlaw, Michael Kirby, Cullen Jackson, J. Scott Davidson, Timothy Miller, Marco da Silva, William Warren, and Michael Tarr. Transactions on Visualization and Computer Graphics, 11(1):59–70, January-February 2005.

*Quantitative comparative evaluation of 2D vector field visualization methods*. David H. Laidlaw, Michael Kirby, J. Scott Davidson, Timothy Miller, Marco da Silva, William Warren, and Michael Tarr. In Proceedings of IEEE Visualization 2001, pages 143–150. IEEE, October 2001.

*Toward application of virtual reality to visualization of DT-MRI volumes*. Song Zhang, Cagatay Demiralp, Marco da Silva, Daniel Keefe, David H. Laidlaw, Benjamin D. Greenberg, Peter J. Basser, Carlo Pierpaoli, E.A. Chiocca, and T. S. Diesboeck. In Proceedings MICCAI, October 2001.

*An immersive virtual environment for DT-MRI volume visualization applications: a case*

*study*. Song Zhang, Cagatay Demiralp, Daniel Keefe, Marco da Silva, Benjamin D. Greenberg, Peter J. Basser, Carlo Pierpaoli, E.A. Chiocca, T. S. Deisboeck, and David H. Laidlaw. In Proceedings of IEEE Visualization 2001, pages 437–440, October 2001.

*Visualizing the differences between diffusion tensor volume images*. Marco da Silva, Song Zhang, Cagatay Demiralp, and David H. Laidlaw. In Proceedings ISMRM Workshop in Diffusion MRI: Biophysical Issues, pages 237–238, March 2002.

*Visualizing diffusion tensor volume differences*. Marco DaSilva, Song Zhang, Cagatay Demiralp, and David H. Laidlaw. In Visualization '01 Work in Progress Proceedings, pages 16–17, October 2001.

*Reducing errors due to partial-volume effects and noise in pressure maps calculated for MR velocity data*. Marco DaSilva, David H. Laidlaw, and J. Michael Tyszka. In Proc. 8th International Society for MR in Medicine, April 2000.

## Teaching

**Product Owner Moki Combat**, *Summer 2008*

**GAMBIT**, *Massachusetts Institute of Technology*, Cambridge, MA

Worked with a group of eight students to design and implement a game. The purpose of the game was to illustrate the potential for physics based animation to enrich the game playing experience.

**Instructor Computer Graphics for Games**, *Summer 2006*

**Columbia University**, New York City, NY

Taught a class on computer graphics as part of Columbia's summer high school program. Students learned general programming skills in C++ and how to implement graphics features using OpenGL. Helped students design and complete a final game project.

**Teaching Assistant Intro Computer Graphics**, *Fall 2006*

**Massachusetts Institute of Technology**, Cambridge, MA

Gave a tutorial on linear algebra. Designed and implemented a ray tracing assignment. Held office hours to help students with assignments. Graded assignments and exams. Prof. Fredo Durand.

**Teaching Assistant Advanced Computer Graphics**, *Spring 2001*

**Brown University**, Providence, RI

Designed and implemented a rendering assignment on metropolis light transport. Graded assignments and held office hours. Prof. John Hughes.

**Teaching Assistant Intro Computer Graphics**, *Fall 1999*

**Brown University**, Providence, RI

Gave a lecture on user interface design. Graded assignments and held office hours. Prof. Andy van Dam.

**Teaching Assistant Intro to Data Structures and Algorithms, Spring 2009**  
*Brown University*, Providence, RI

Worked on a pedagogical Java implementation and visualization of a red-black tree.  
Graded assignments, exams, and held office hours. Prof. Roberto Tammasia.

## **Patents**

*Techniques for rendering complex scenes, 7532312*

*Techniques for animating complex scenes, 7064761*

*Patch picking methods and apparatus, 7057618*

*Scene graph analysis, 7330185*

## **Conference Presentations**

*Linear Bellman Combination for Control of Character Animation, SIGGRAPH, New Orleans, August 2009*

*Interactive Simulation of Stylized Human Locomotion, SIGGRAPH, Los Angeles, August 2008*

## **Awards**

*National Science Foundation Graduate Research Fellowship, 2007-2010*

## **Professional Activities**

Paper reviewing:

ACM SIGGRAPH

ACM SIGGRAPH ASIA

Memberships:

ACM SIGGRAPH

## **Foreign Language Skills**

Portuguese, Spanish

## **Interests**

Soccer, Basketball, Running, Guitar