Recent Papers in Deformation and Physics

October 14, 2008

Some research areas and applications

General dynamics and collision handling

Articulated bodies

Elastic objects
consider also cloth, hair

Semi-fluid/squishy objects

Flexible characters

Skinning

Fractures

Sound synthesis

Real-time, but accurate methods for all of the above

Approaches to deformation

Modifying an object's definition
- geometric
- physically-based

Warping the space around an object

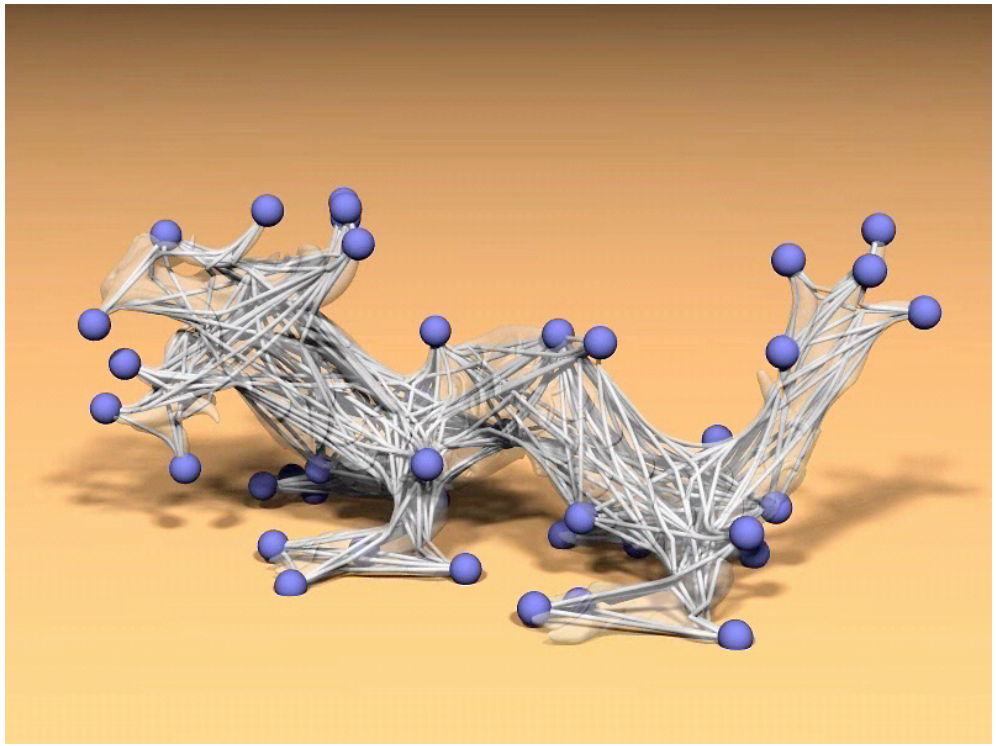
Data-driven
- from mocap
- from more computationally expensive simulations
- from other existing animation

Many systems use a hybrid of two or more of these approaches.

Meshless Modeling of Deformable Shapes and Their Motion

Bart Adams, Maks Ovsjanikov, Michael Wand,
Hans-Peter Seidel, Leonidas J. Guibas

SCA 2008



Real-time deformation based on finite elements. Deforms an object based on an interconnected model of key points. The resulting model allows for reconstruction of plausible deformations at interactive rates, as well as motion planning between keyframed poses.

More figure deformation papers

Spectral Surface Deformation with Dual Mesh

Guodong Rong, Yan Cao, Xiaohu Guo

CASA 2008

2D Shape Deformation Based on As-Rigid-As-Possible Squares Matching

Yan-Zhen Wang, Kai Xu, Yue-Shan Xiong, Zhi-Quan Cheng

CASA 2008

Interactive Shape Deformation Based on Space Deformation with Harmonic-Guided Clustering

Kai Xu, Yanzhen Wang, Yueshan Xiong, Zhiquan Cheng

CASA 2008

Constraint-based deformation papers

Directable animation of elastic bodies with point-constraints

Ryo Kondo and Ken Anjyo

CASA 2008

Constraint-Based Motion Synthesis for Deformable Models

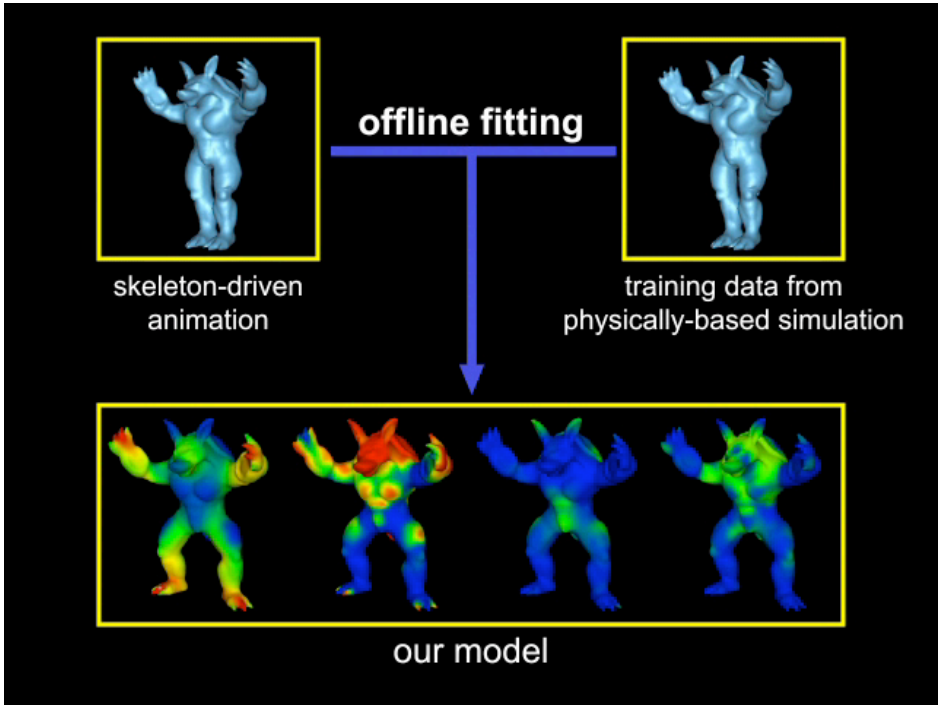
William Moss, Ming C. Lin, Dinesh Manocha

CASA 2008

Example-based Dynamic Skinning in Real Time

Xiaohan Shi, Kun Zhou, Yiying Tong, Mathieu Desbrun, Hujun Bao, Baining Guo

SIGGRAPH 2008



A method for skinning that uses computationally expensive physically-based simulation to build a model of how an object deforms. The model is suitable for use at interactive speeds. Both primary and secondary deformations are captured.

More skinning papers

Dynamic skin deformation with characteristic curves

L. H. You, Xiaosong Yang, Jian J. Zhang

CASA 2008

Geometric Skinning with Approximate Dual Quaternion Blending

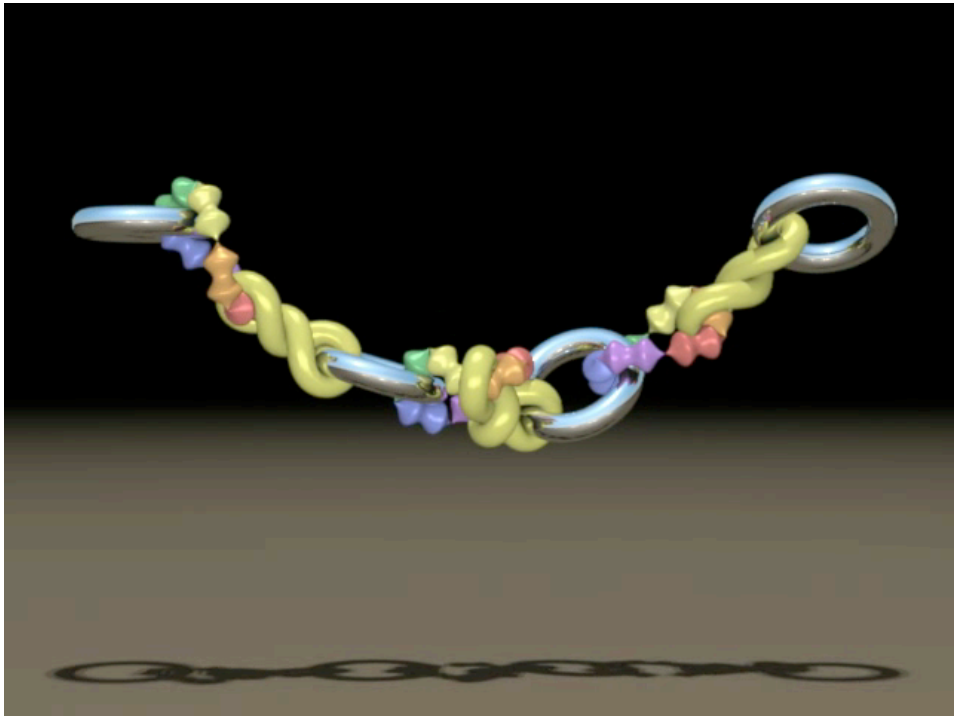
Ladislav Kavan, Steven Collins, Jiří Žára, Carol O'Sullivan

SIGGRAPH 2008

Two-Way Coupling of Rigid and Deformable Bodies

Tamar Shinar, Craig Schroeder, Ronald Fedkiw

SCA 2008

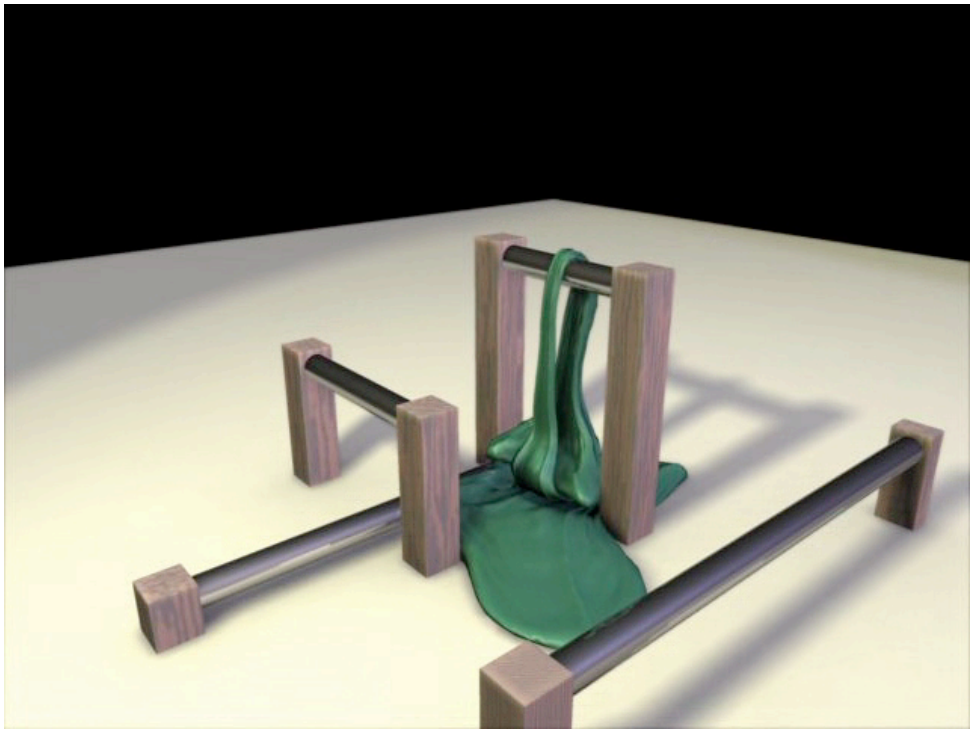


A framework which unifies integration of rigid-body and deformable object attributes over time. (The unified framework allows flexibility in the choice of algorithms for each type of object.) The framework allows for advanced features for both rigid bodies and deformable objects.

Fast Viscoelastic Behavior with Thin Features

Chris Wojtan and Greg Turk

SIGGRAPH 2008

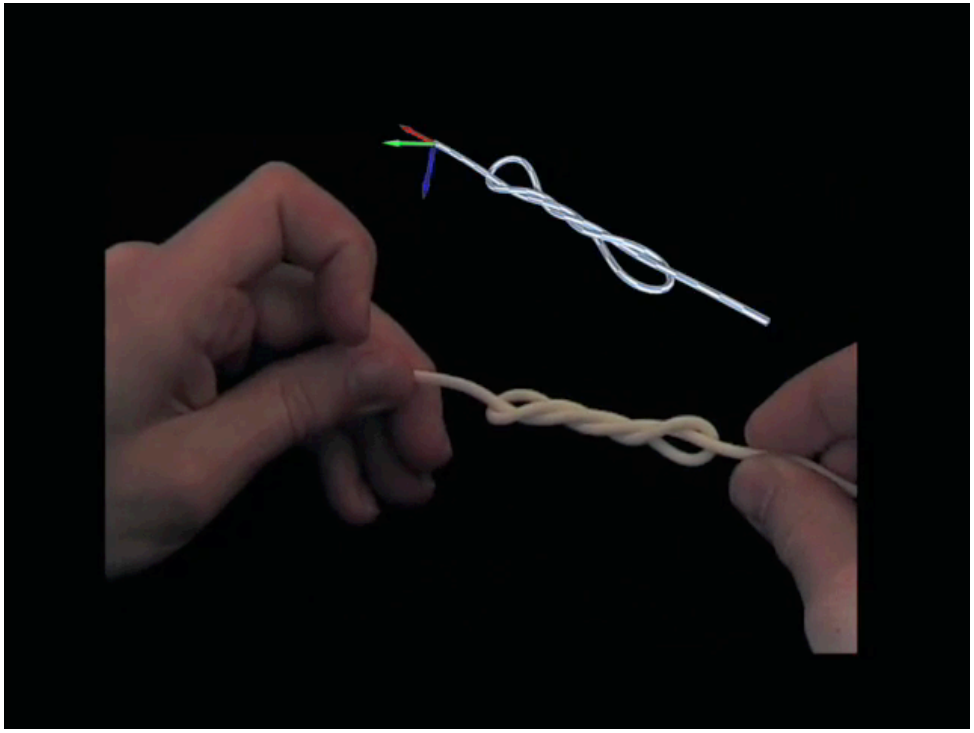


A method for simulating a wide range of objects, from fairly rigid to nearly fluid. Combines a high-resolution surface mesh with a low-resolution internal volume mesh. Relatively fast (still offline), but retains important features like thin sheets.

Discrete Elastic Rods

Miklós Bergou, Max Wardetzky, Stephen Robinson, Basile Audoly, Eitan Grinspun

SIGGRAPH 2008



Discrete Differential Geometry is a recent technique for building discrete models that preserve important continuous features. It is used here to model both the curvature and twist of elastic rods. The system allows for coupling to rigid bodies.

More general deformable-object papers

Fast Adaptive Shape Matching Deformations

Denis Steinemann, Miguel A. Otaduy, Markus Gross

SCA 2008

Flexible Simulation of Deformable Models Using Discontinuous Galerkin FEM

Peter Kaufmann, Sebastian Martin, Mario Botsch, Markus Gross

SCA 2008

Elevation Cable Modeling for Interactive Simulation of Cranes

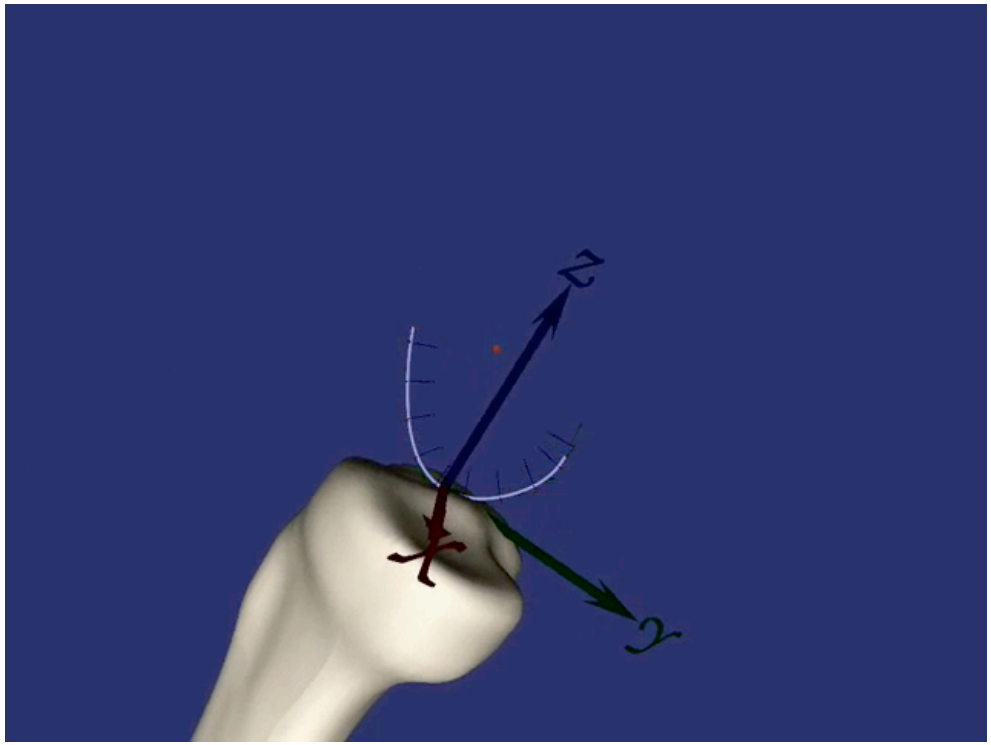
Ignacio García-Fernández, Marta Pla-Castells, Rafael J. Martínez-Durá

SCA 2008

Spline Joints for Multibody Dynamics

Sung-Hee Lee and Demetri Terzopoulos

SIGGRAPH 2008



Simple joints fail to accurately capture complex skeletal motion. Spline joints are based on spline curves and surfaces, rather than single points, and can be used to produce more natural animation.

More papers in general physics

Image-Based Collision Detection and Response between Arbitrary Volume Objects

François Faure, Sébastien Barbier, Jérémie Allard, Florent Falipou

SCA 2008

View-dependent dynamics of articulated bodies

Sujeong Kim, Stephane Redon, Young J. Kim

CASA 2008

Backward Steps in Rigid Body Simulation

Christopher D. Twigg and Doug L. James

SIGGRAPH 2008

Other related papers

Matrix Clustering Method for Real-Time Finite Element Based Deformation

Wen Tang, Cedric Niquin, Tao Ruan Wan, Alexandre Schildknecht

CASA 2008 (short paper)

Exact distance computation for deformable objects

Marc Gissler, Udo Frese, Matthias Teschner

CASA 2008

Out-Of-Core and Compressed Level Set Methods

Michael B. Nielsen, Ola Nilsson, Andreas Söderström, Ken Museth

SIGGRAPH 2008 (from Transactions on Graphics, October 2007)

A Survey of Spatial Deformation from a User-Centered Perspective

James Gain and Dominique Bechmann

SIGGRAPH 2008 (from Transactions on Graphics)