

Physics Based Animation Fall 2008

Introduction

Imaging Media Research Center

KIST

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Introduction

Physically Based Animation

- Key frame animation



start frame



end frame



animation

- interpolate ***pre-defined*** key frames
- traditional technique
- difficult to make interactive

Introduction

Physically Based Animation

- Procedural animation
 - automatically generate animation
 - rule(model) based approach
 - kinematics
 - dynamics
 - can generate diverse range of animation ***if you have proper model***
 - can be interactive ***if it runs fast enough***

Introduction

Physically Based Animation

- Newton's physics law
 - If you push something, it will move
- Different governing equations
 - Particle
 - Rigid body
 - Articulated body
 - Elastic structure
 - Fluid
 - ...

Introduction

Particle Dynamics

**Realtime Simulation of an Hourglass
Based on Granular Dynamics**

Introduction

Hair Simulation



Introduction

Cloth Simulation



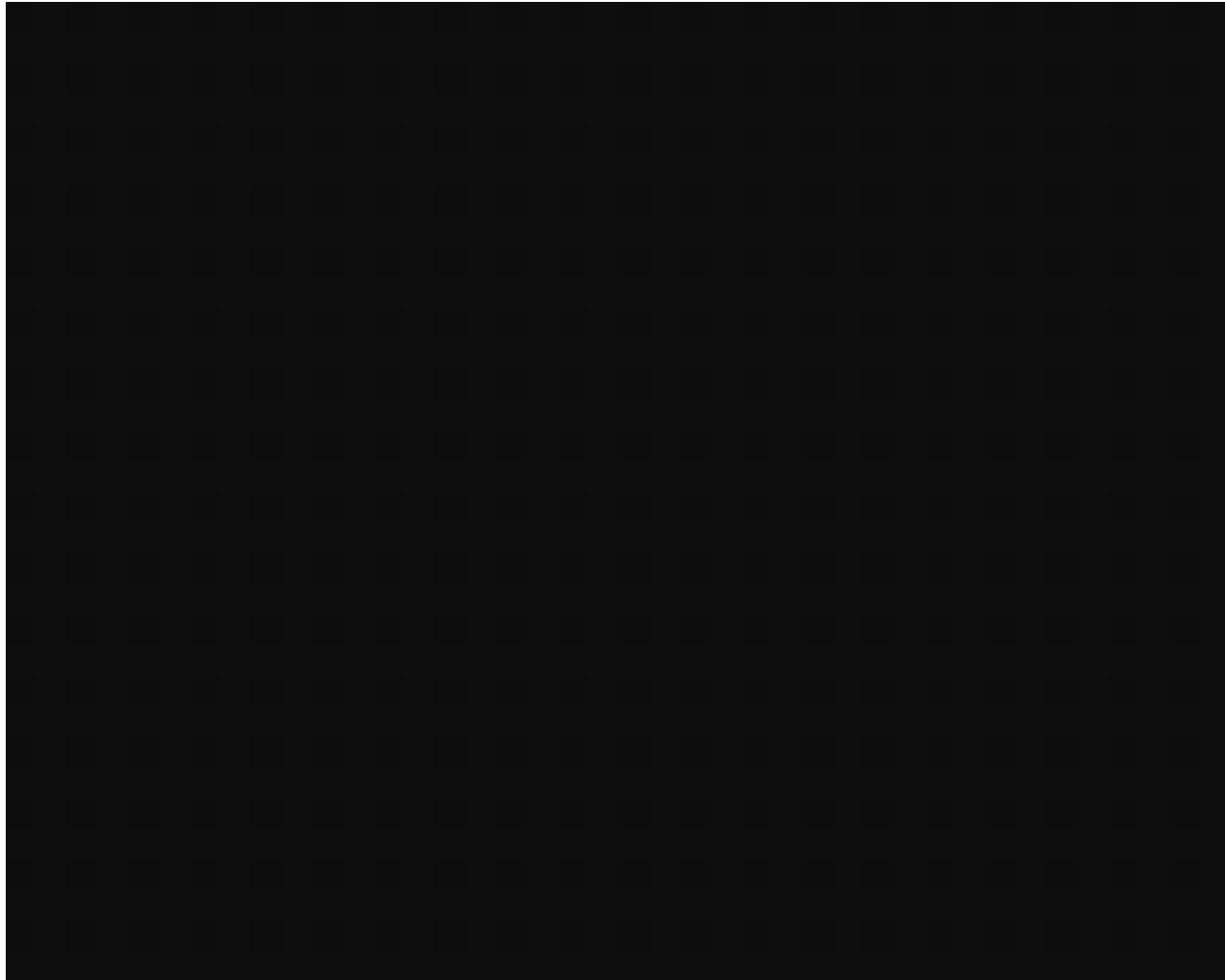
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Rigid Body Dynamics 1



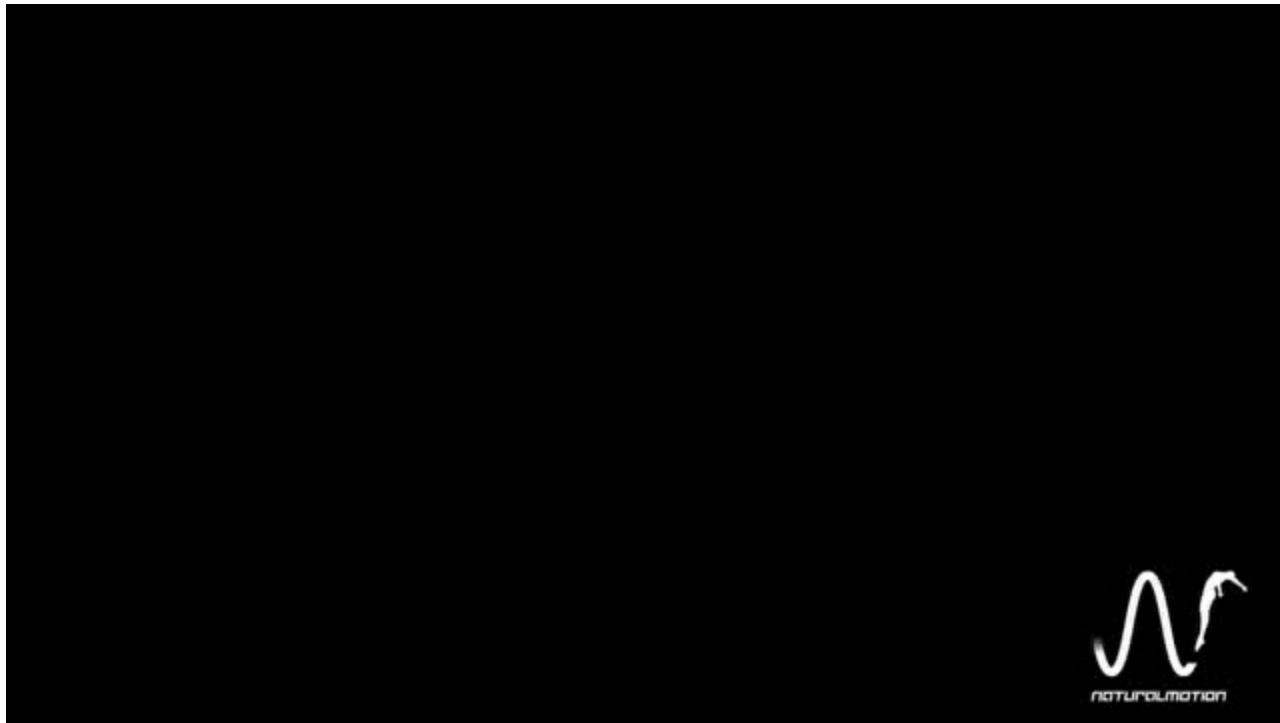
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Rigid Body Dynamics 2



Introduction

Articulated Body



Introduction

Elastic Structure



Introduction

Fluid

Rigid Fluid: Animating the Interplay Between Rigid Bodies and Fluid

Mark Carlson

Peter J. Mucha

Greg Turk

Georgia Institute of Technology

Sound FX by Andrew Lackey, M.P.S.E.

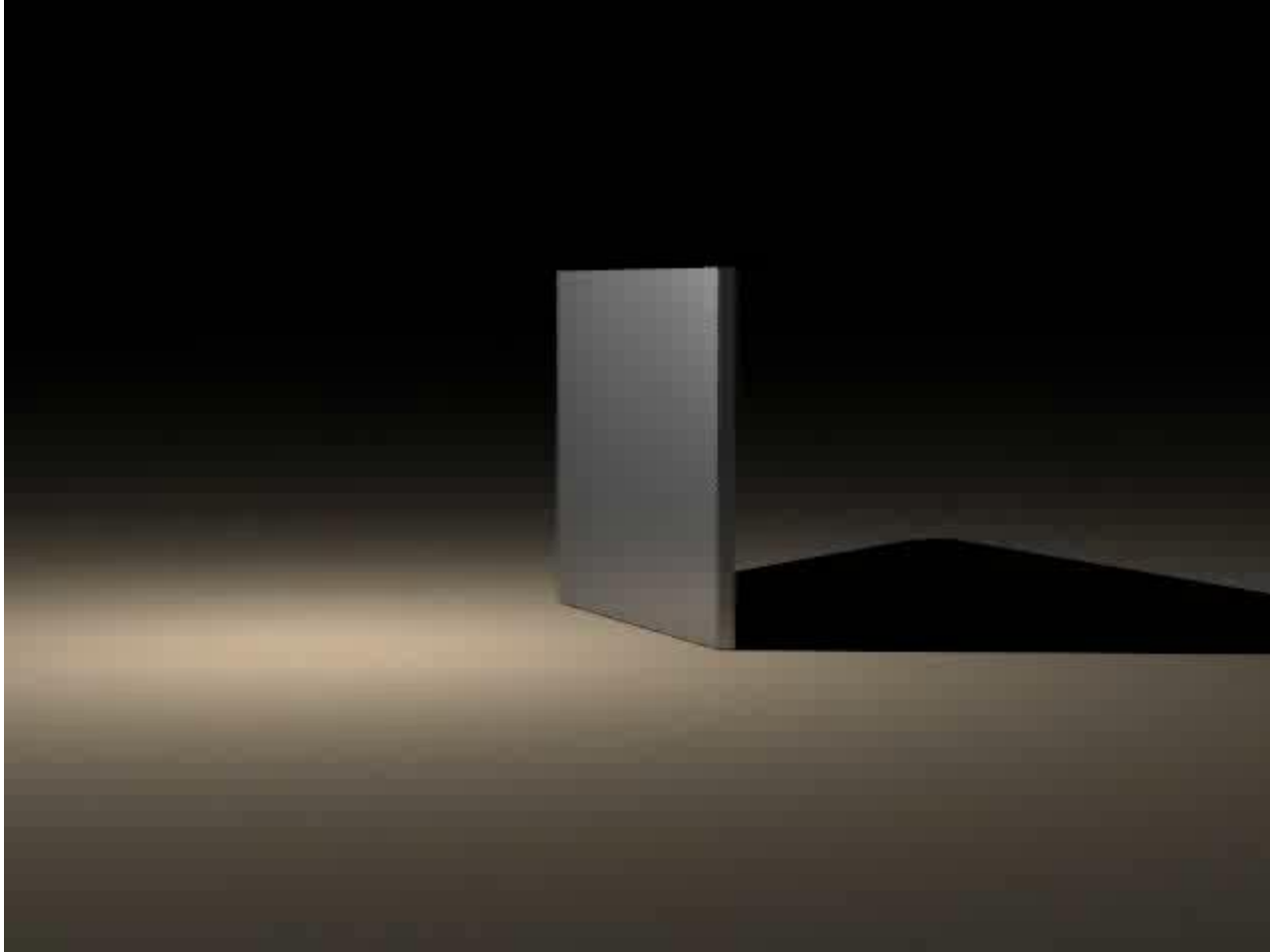
Introduction

Fire



Introduction

Fracturing



Introduction

Course Coverage

- Basic theory on physically based animation
 - emphasis on concepts rather than mathematics
 - Implementation details
- Various models
 - Particle system
 - Rigid Body system
 - Deformable structure
 - Fluid

Introduction

Notice

- Some run in real time
- Some require several hours to compute
- Animation does not mean rendering

- Basically biweekly homework
 - C++, java, whatever you are familiar with
 - please don't give me your source code
 - I want to see your videos