FRIEDRICH-ALEXANDER
UNIVERSITÄT
ERLANGEN-NÜRNBERG
FACULTY OF ENGINEERING

# Computeranimation

## A Practical Introduction

LGDV
COMPUTER GRAPHICS • ERLANGEN

# Introduction

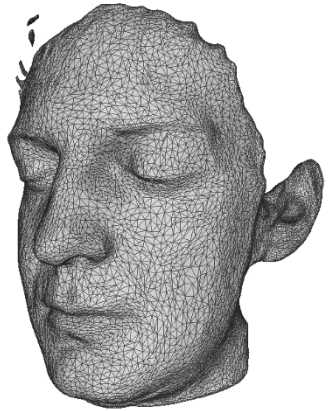
## Computer Graphics

## Motivation

## Organization

# Matteo Colaianni

**Member of the scientific staff at Computer Graphics Group Erlangen**



**Languages:**

- English
- Italian
- German
- Espero aprender um pouco de Portugês

**Topics:**

- Virtual Cloth Simulation/Modeling/Fitting
- Physically Based Animation
- Statistical Shape Models

**Contact Information:** matteo.colaianni@fau.de

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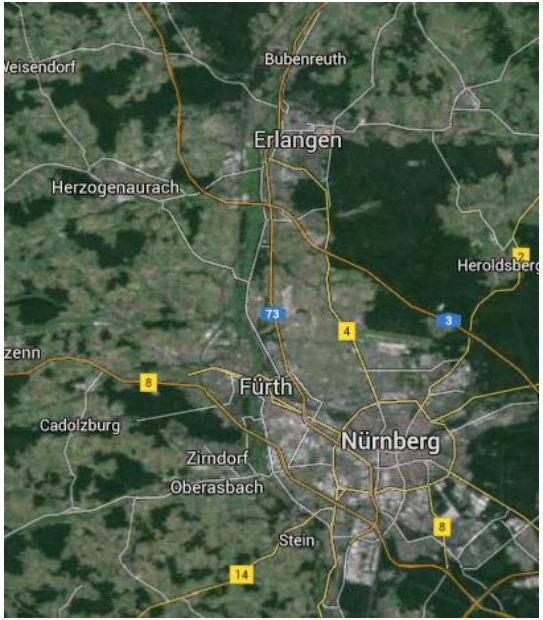
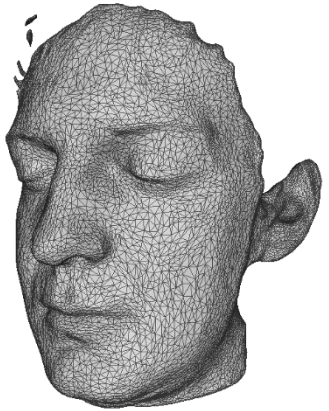
# Matteo Colaianni

## Member of the scientific staff at Computer Graphics Group Erlangen

Erlangen:
105.000 habitants

Nuremberg:
495.000 habitants

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# Nuremberg

## This is where I live

Kaiserburg

Christkindlesmarkt

Dokumentationszentrum

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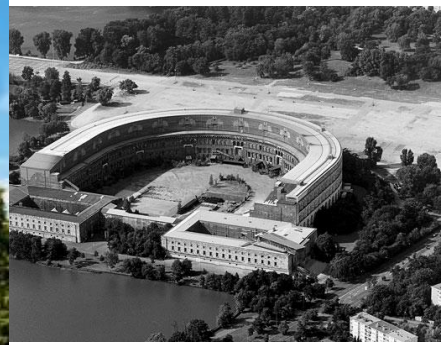
# Nuremberg

## You may suppose what we have in Bavaria:

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# Erlangen

## This is where I spend most of my time (working)

Technical Faculty

Department CS

Schloßgarten Erlangen

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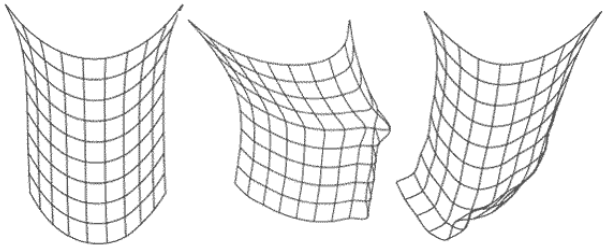
# Erlangen

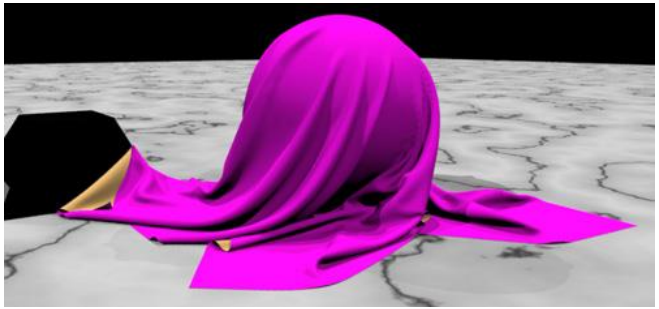
## Guess it! There is also beer in Erlangen


# Virtual Cloth Simulation

## Simulate Garment's inner Structure



## Resolve Collision Cases



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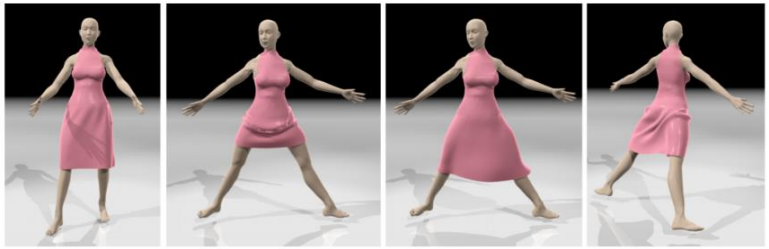
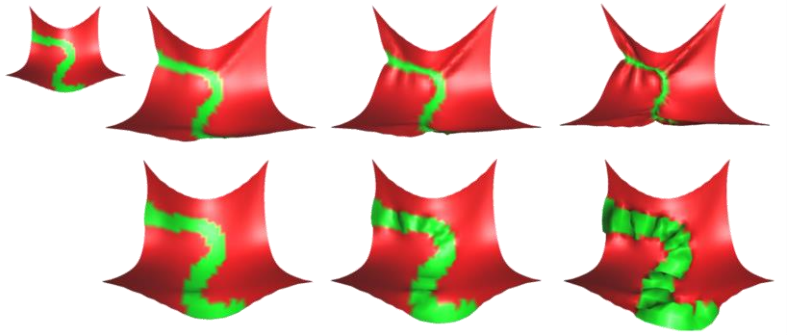
# Virtual Cloth Modelling

## Manipulate Garments Shape During Simulation





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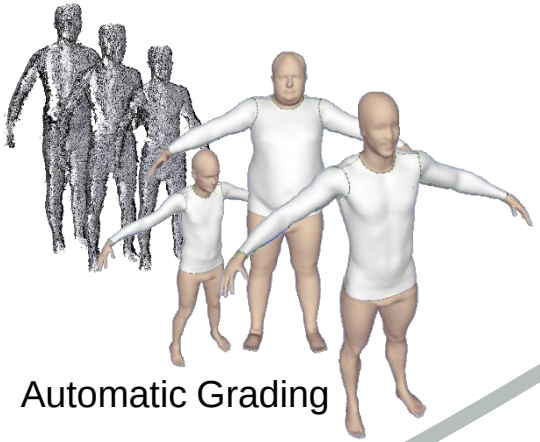
# Virtual Cloth Fitting

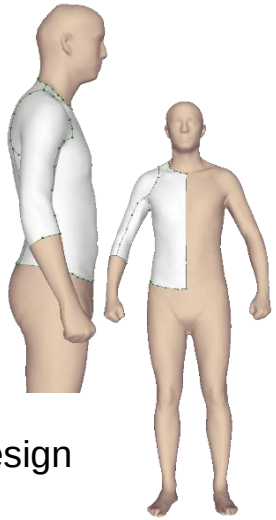
## Morph Garment Cut Lines with Scan Data

- Virtual Apparel

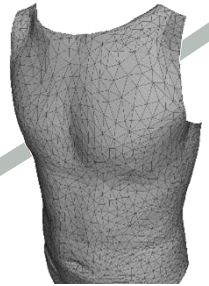
Prototyping/Analysis

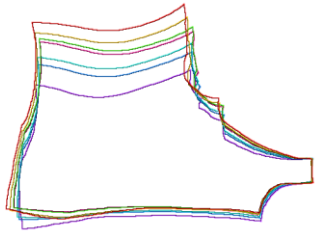


Automatic Grading



3D Design





Cut and Flattening

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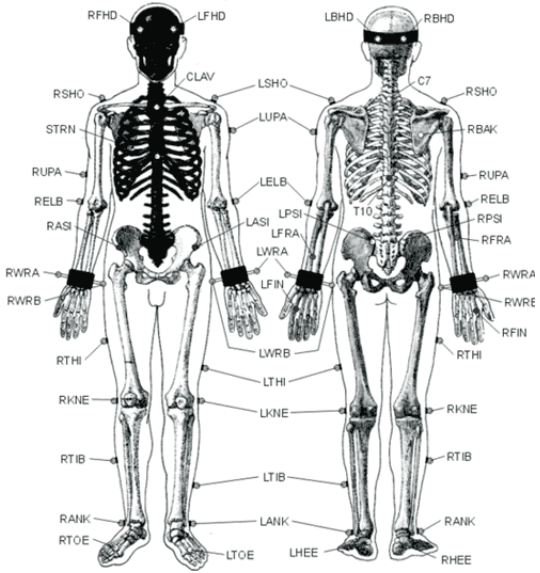
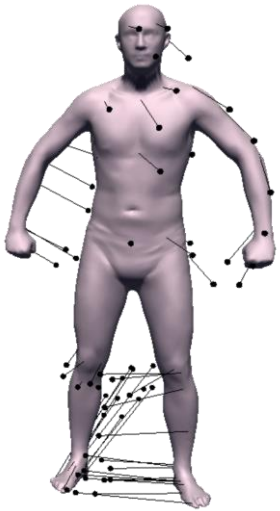
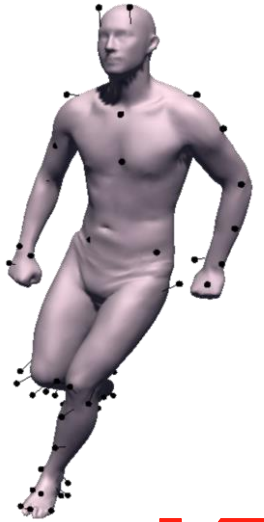
# Physically Based Animation (1)

## Project Motion Data into A Statistical Space For Deformation Analysis





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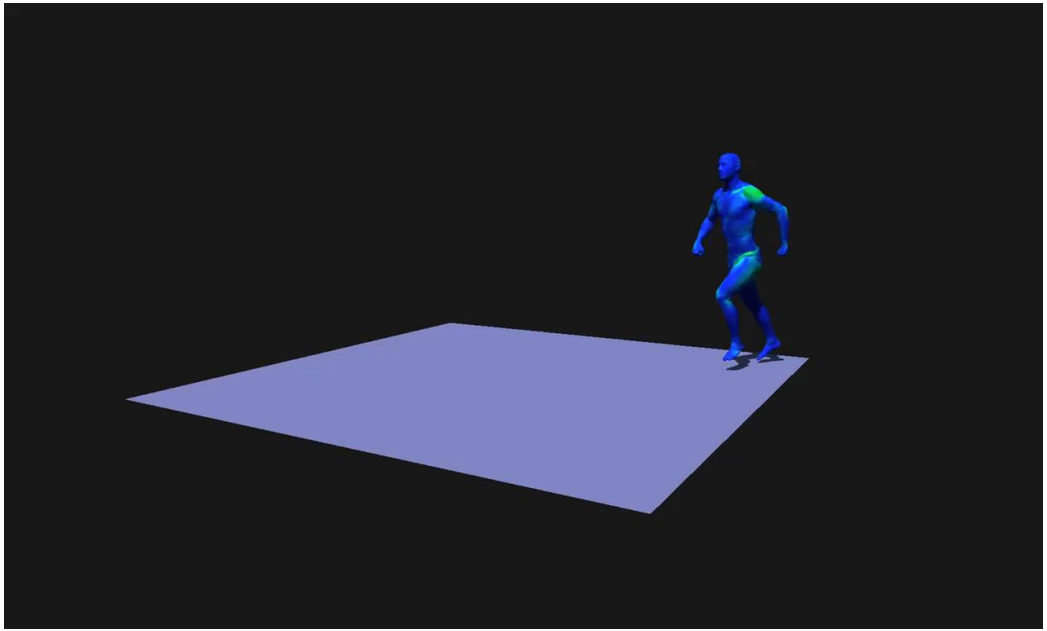
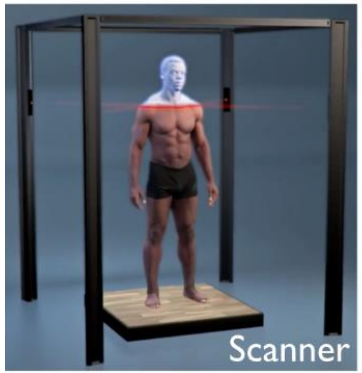
# Physically Based Animation (2)

## This Way we get Deformation Information for Motion



# Storefactory (1)





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# Storefactory (2)


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Introduction

**Computer Graphics**

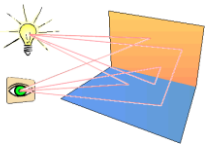
Motivation

Organization

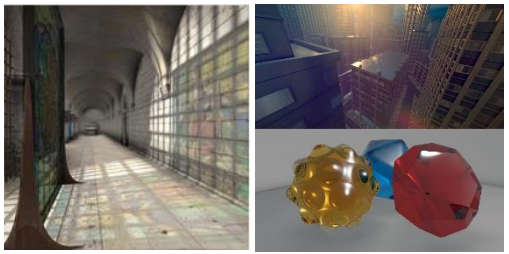
# LGDV

## Overview

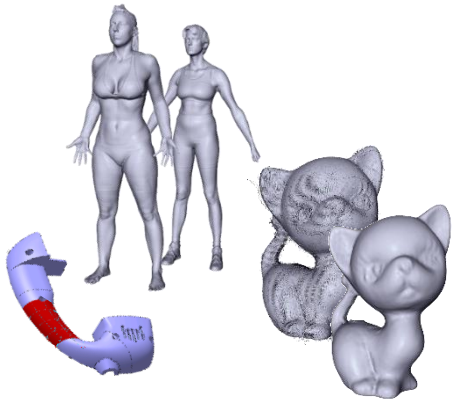
- Computer Graphics Group Erlangen (Department of Computer Science FAU Erlangen-Nürnberg)
- Mainly divided into three research/teaching fields:



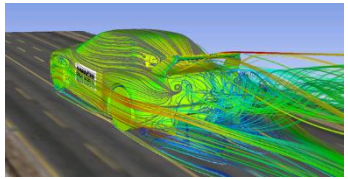
Rendering

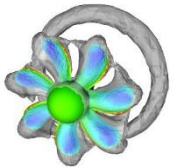


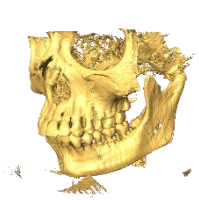
Geometry Processing



Scientific Visualization







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# LGDV

## Special Fields of Research

- Ongoing Research on Mixed Reality

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# LGDV

## Special Fields of Research

- Ongoing Research on Mixed Reality

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## Special Fields of Research

- Kinect Fusion at Scale

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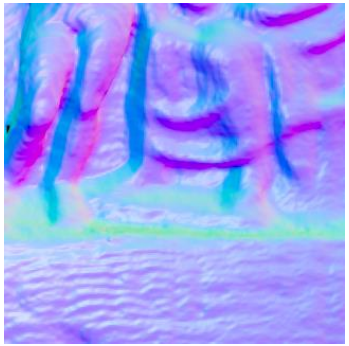
## Special Fields of Research

- Shading based scan refinement

Original



Fusion

Refined (Close-Up)

Refined Result

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Introduction

Computer Graphics

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# Motivation

**Rendering creates stunning effects**

- Photorealistic Synthesis of Images
- Photometric simulation of different Materials
- Great Effects in Real Time

**…but: “Animation is where things come to life!”**

*[https://www.youtube.com/watch?v=K16xFw5SDFk]*

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# Motivation

**Animation can be classified**

| | Kinematics | Dynamics |
|---|---|---|
| **Rigid Bodies** | Movement along Paths | Accelerated Objects |
| **Non Rigid** | Skeletal Deformation | Cloth Simulation |

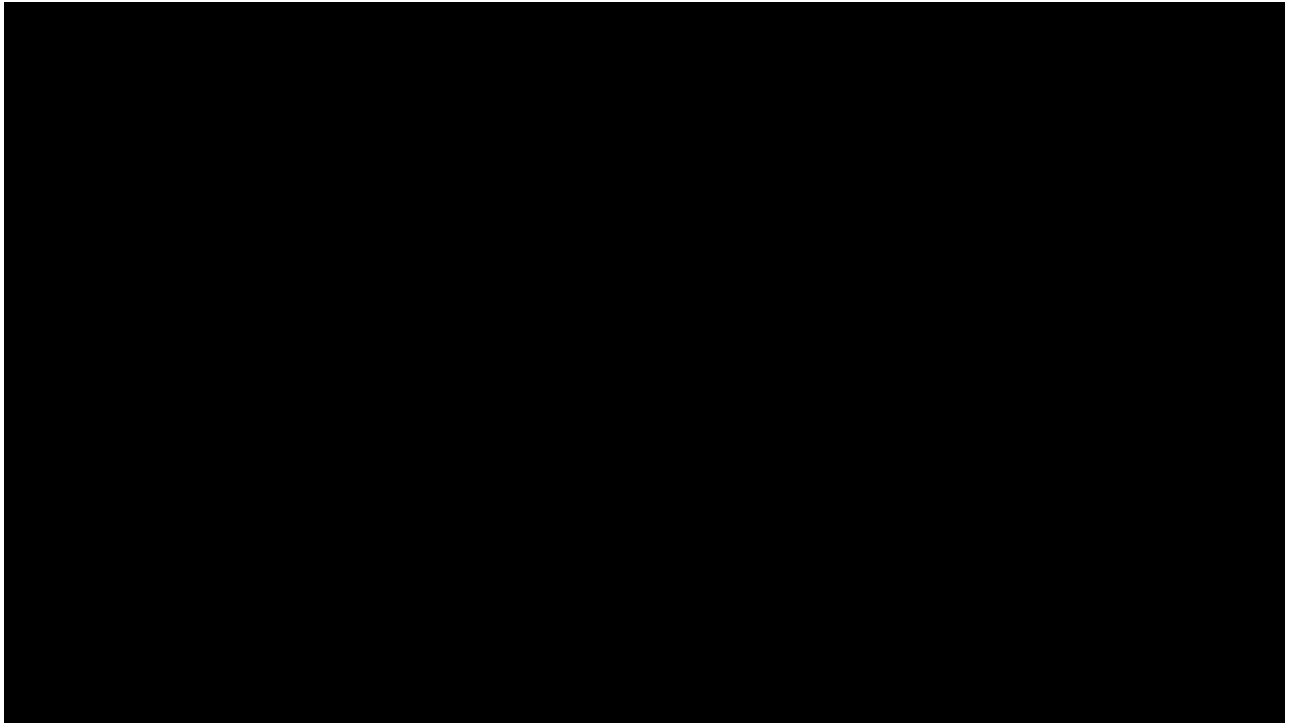
# Rigid Movement In Video Games


*[Official Star Citzien Dogfight Launch Trailer]*

# Non-rigid Deformation

*[https://www.youtube.com/watch?v=BolgBSXjxeE]*

# Particle Based Effects in Movies



*[Unreal Engine 4 – Elemental Demo]*

Introduction

Computer Graphics

Motivation

**Organization**

# Organization

**In this course you will learn**

- An understanding of how different types of animation work
- Basic knowledge in creating Animation
- Basic skills in Programming Animation Techniques in C/C++ and GLSL

**Requirements**

- Basics in Linear Math
- Solid Programming Skills (preferable in C/C++)

**Optional**

- Basic Knowledge in Blender
- Basic OpenGL and GLSL (Shading Language)

# Organization

**Lectures**

- 3 Times / Week (1,5 h each)
- Impart knowledge about the basic theoretical Concepts
- Theory and application Part

**Dates**

- 1st Week: May 29th; May 31st; June 2nd → **every second day**
- 2nd Week: June 5th; June 6th; June 7th → **every day from Mon to Wed**

**Exercises**

- 1st Week: Lecture 1, 2 and 3 are coupled to Exercises/Applications each
- 2nd Week: Lecture 4, 5 and 6 have one (bigger) Exercise/Application

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# Organization

**Topics**

- Rigid Transformation
- Animation
- Collision

- Dynamic
- Mass-Spring Simulation
- Rigging and Skeletal Animation

# I want to know you now!!!