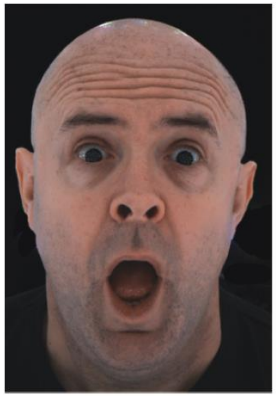
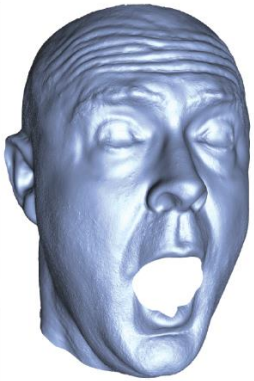

Input image


Reflectance





Graphics, Vision and Video Group

Computer Vision for Computer Graphics

Prof. Dr. Christian Theobalt
Dr. Christian Richardt

Summer Semester 2014

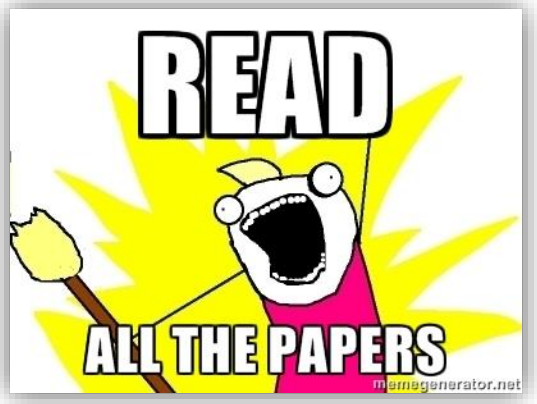
Coordinates

- MPI-INF – E1 4, room 019
- Thursdays, 14:15 – 16:00
- Mailing list:
  - itvc@lists.mpi-inf.mpg.de
  - https://lists.mpi-inf.mpg.de/listinfo
- Website:
  - http://gvv.mpi-inf.mpg.de/teaching/gvv_seminar_2014/

Organisers

- Christian Theobalt
  - MPI-INF, room 228
  - theobalt@mpi-inf.mpg.de
- Christian Richardt (organisational contact)
  - MPI-INF, room 215
  - richardt@mpi-inf.mpg.de

Formal requirements in a nutshell



- Your presence is required!
  - We will monitor attendance.
- Read all the papers
- Submit questions for and participate in discussion
- One topic is “Your Topic” (2 papers):
  - Deliver a 30 minute presentation
  - Write a 5–7 page report
- Grade: talk 30%, discussion 30%, report 40%

Prior knowledge

- Not for beginners in visual computing
- You need experience in:
  - computer vision
  - computer graphics
  - geometric modeling
  - basic numerical methods
- Examples: you should know how …
  - … a camera is modeled mathematically
  - … 3D transformations are described
  - … a system of equations is solved, etc.

Registration

- Register by email – richardt@mpi-inf.mpg.de
  - Matriculation number, degree program, semester, previous courses or experience (if you haven't done this yet)
- Fill in sign-up sheet
- Topic assignment:
  - Send a list of 3 topics (in order of preference) until **Monday, 21 April 2014**
  - Slots are filled in first-come, first-served fashion
  - We will try to accommodate wishes as much as possible
  - Topics will be assigned on **Tuesday, 22 April 2014**
- Lastly register in HiS POS in 2–4 weeks (email to come)

Organisation

- 18 topics to choose from
  - Listed on seminar website
  - Introduced in detail later today
- 10 presentation slots in total:
  - First presentation: **Thursday, 8 May 2014**
  - Each week until **Thursday, 24 July 2014** (including)
- Each topic has a supervisor:
  - You can ask questions by e-mail at any time
    - about your topic, the papers, your presentation and report
  - Up to one office hour per week

Presentations

- Same order as on seminar website
  - Slots can be swapped if necessary: talk to other participants first
- About 30 minutes long:
  - About 5 minutes:
    - summary of previous week
    - finding themes that join the two weeks
  - About 25 minutes:
    - presentation of the two papers
    - again finding the common links between the papers
- Direct public feedback from seminar organisers after talk

Suggested presentation preparation

- Schedule two meetings with your supervisor:
  - First meeting: 2–3 weeks before presentation:
    - Read the papers for this meeting
    - Ask questions if you have difficulties
    - Discuss your plans for presentation
  - Second meeting: 1 week before presentation:
    - Prepare a preliminary presentation
    - We can provide feedback
- It is your responsibility to arrange the meetings
- Do not rely on them proving last-minute feedback

Discussion

- 45–60 minutes long
- Day before the seminar:
  - Submit 2+ questions for discussion to richardt@mpi-inf.mpg.de
  - Important: your contribution will be marked
- At the seminar:
  - One person chosen at random leads the discussion
  - Will get digest of questions submitted before the seminar
  - Gives summary of the strengths and weaknesses
  - Moderates and guides discussion
  - Raises open questions that remain
  - This will also be marked

Report

- 5–7 page summary of the major ideas in your topic:
  - 3–4 pages on the two papers
  - 3–4 additional paper references
  - 2–3 pages with your own ideas, for example:
    - Limitations not mentioned in the paper + sketch of potential solution
    - Try to suggest improvements
    - Novel ideas based on content described in the papers
    - Can be the result of the discussion after your presentation
- The idea is that you get a feeling for your specific topic surpassing the level of simply understanding a paper.

Report

- Due date: **Thursday, 21 August 2014**
  (4 weeks after last seminar)
- Send PDF by e-mail
- We will provide a LaTeX template on seminar website
  - If you use other software, make it look like the LaTeX template
    - this is your responsibility
  - Strongly recommended to learn LaTeX

Grading

- **Presentation** (overall: 30%)
  - Form (30%): time, speed, structure of slides
  - Content (50%): structure, story line and connections, main points, clarity
  - Questions (20%): answers to questions
- **Discussion** (overall: 30%)
  - Submitted questions (33%): insight, depth, inquisition
  - Participation (33%): willingness, debate, ideas
  - Moderation (33%): strengths and weaknesses, integration of questions
- **Report** (overall: 40%)
  - Form (10%): diligence, structure, appropriate length
  - Context (20%): the big picture, topic in context
  - Technical correctness (30%)
  - Discussion (40%): novelty, transfer, own ideas / in own words

Benefits to you

- Practise important skills in research
  - Read and understand technical papers
  - Present scientific results and convince other people
  - Analyse and develop new ideas through discussions
- Discussion is essential:
  - If you don’t participate, you miss a big chance
  - Most ideas are developed in discussions about other papers
- Therefore:
  - Prepare for the seminar classes!
  - Participate actively in the discussions!
  - Benefit from the interaction in the group!

What this seminar is not …

- A course to just sit and listen
  - Come prepared
  - Read all papers before class, think about problems, submit questions and discuss them in class
  - Your participation benefits everyone
    - the group makes the seminar
- "Cheap" 8 credit points
  - Don't underestimate the time it takes to understand a paper, prepare a talk, and write a report
  - So take it seriously!

Schedule

- **17 April** – Introduction ◄ You are here
- **24 April** – Lectures:
  - “How to read an academic paper”
  - “How to give a good talk”
- **8 May** – First presentation by a student
- … 8 more weekly presentations
- **24 July** – Last presentation by a student
- **21 August** – Report deadline

Introduction to the topics

Vision or graphics?

Vision or graphics?

Vision or graphics?

Vision or graphics?

Vision or graphics?

Vision or graphics?

Vision or graphics?

Song Hye Kyo

Vision or graphics?

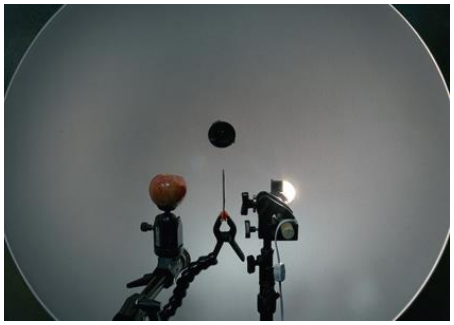
Geometry

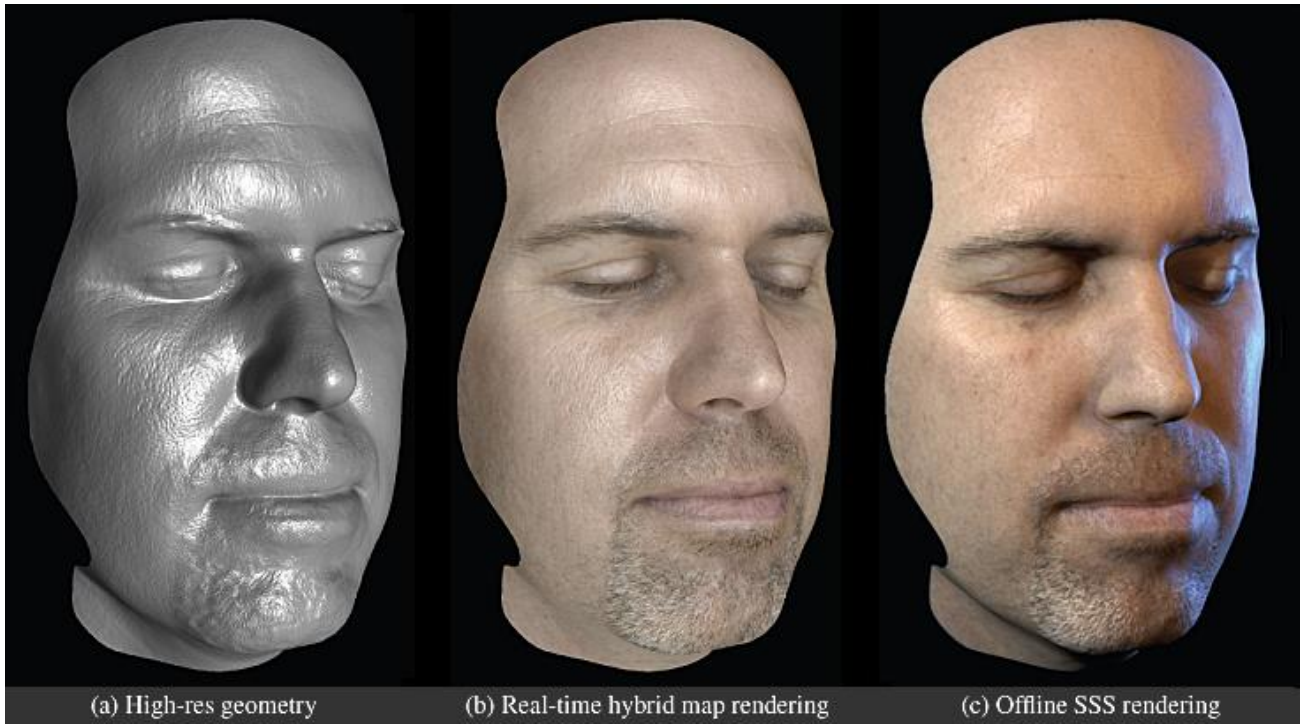
- e.g. environment models

[*Bokeloh et al.*, Eurographics 2009]

Appearance

- e.g. human appearance models:

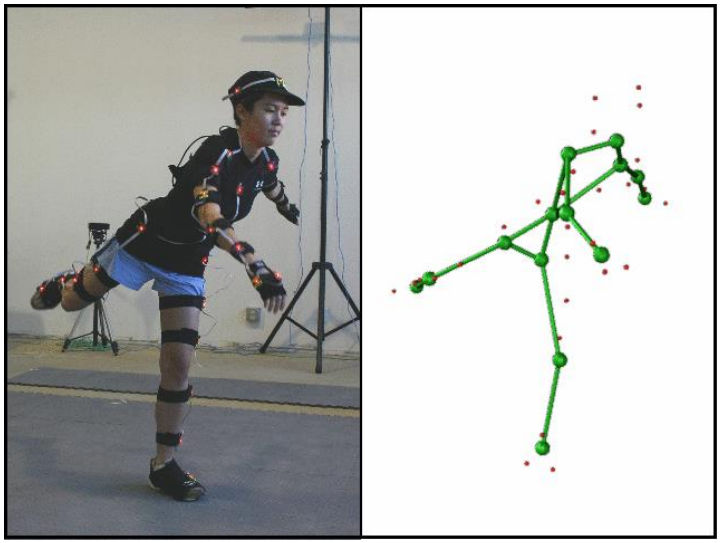




[*Ma et al.*, EGSR 2007]

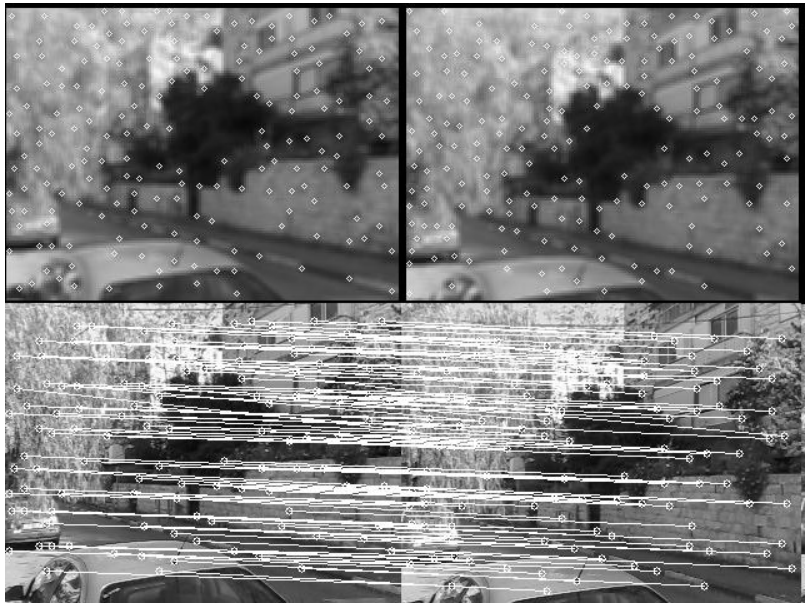
Motion

- e.g. marker-based performance capture:



Computer vision

- Low-level vision:



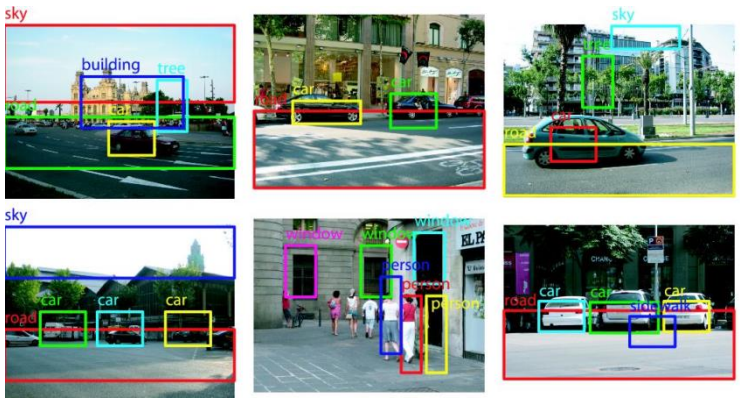
Feature detection
& correspondence

Optical flow

Computer vision

- High-level vision:
  - Scene understanding / recognition / reconstruction

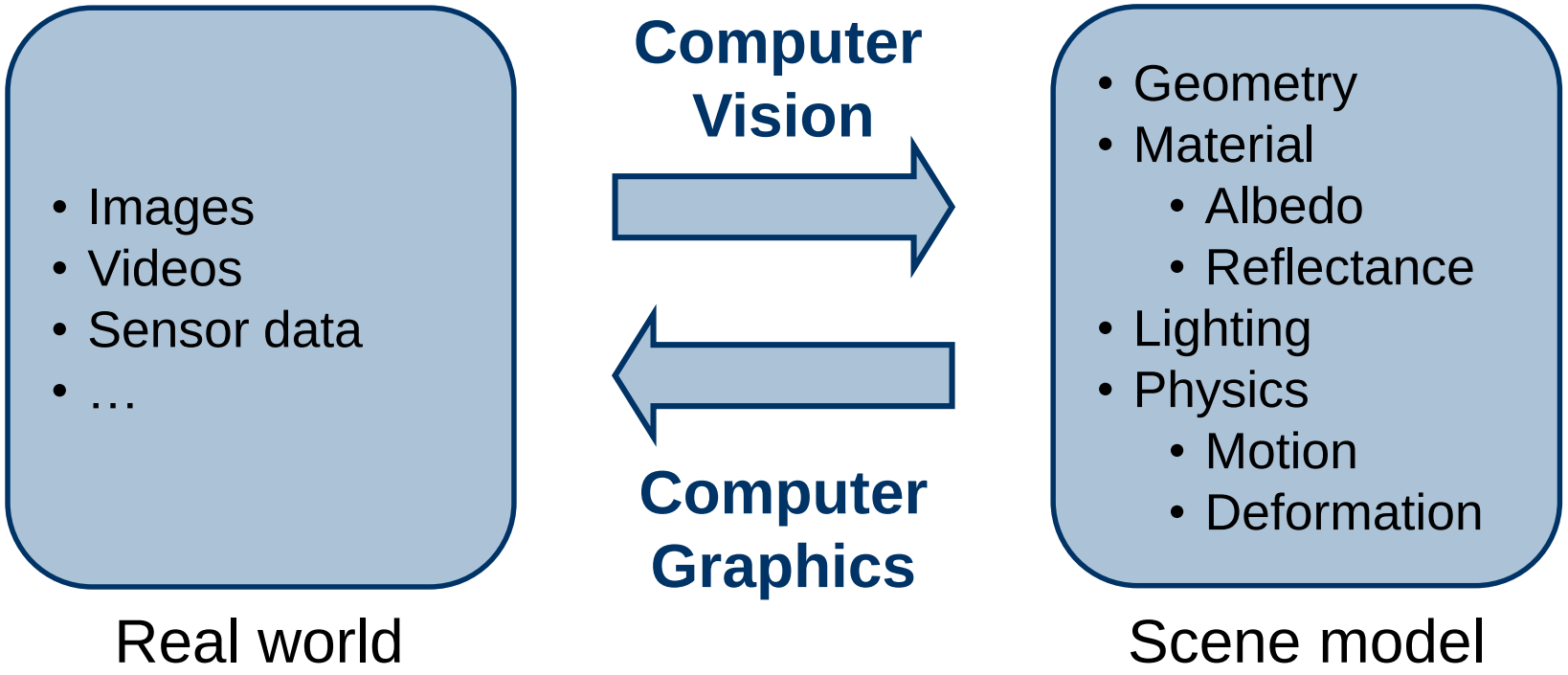
Human motion estimation



Object recognition

Multi-view stereo reconstruction

Computer Graphics / Computer Vision

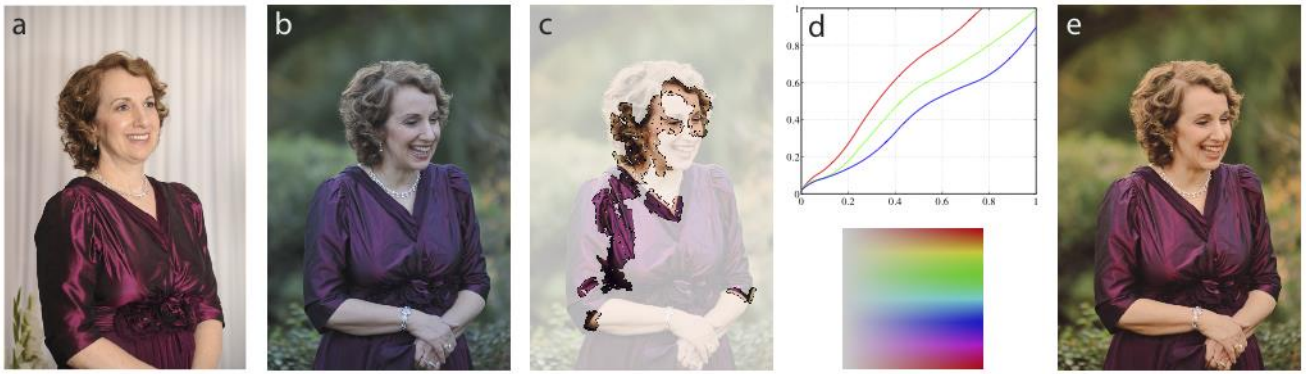


Topics

- Covering state-of-the-art research papers
- Strong focus on top conferences and journals in computer vision and computer graphics:
  - ACM SIGGRAPH & ACM SIGGRAPH Asia
  - Eurographics
  - IEEE Computer Vision and Pattern Recognition (CVPR)
  - International Conference on Computer Vision (ICCV)
  - European Conference on Computer Vision (ECCV)
  - International Journal of Computer Vision (IJCV)
  - IEEE Transactions on Pattern Analysis and Machine Intelligence (PAMI)

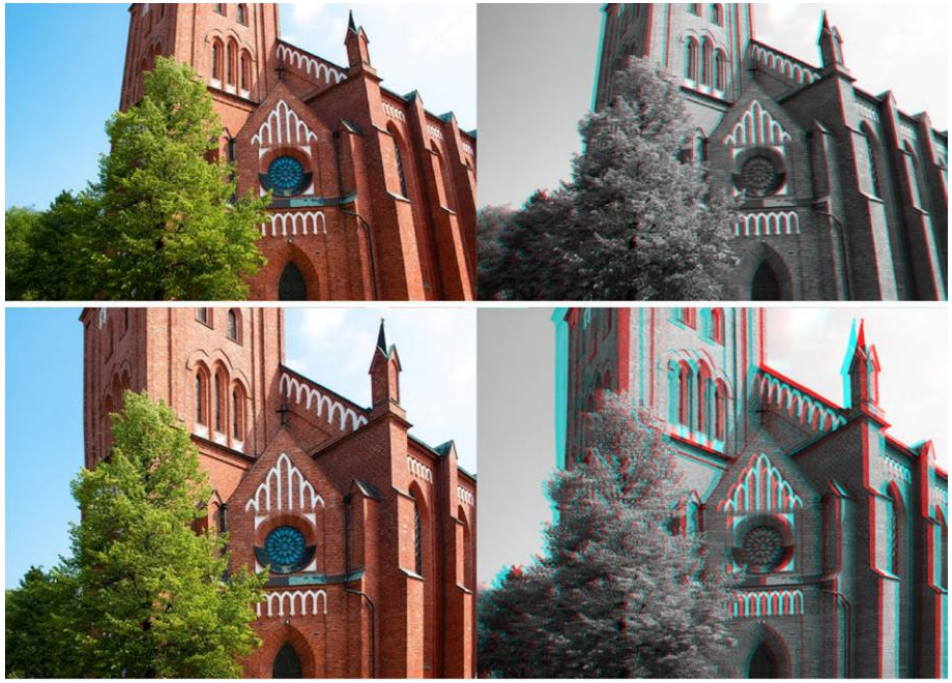
Dense correspondence

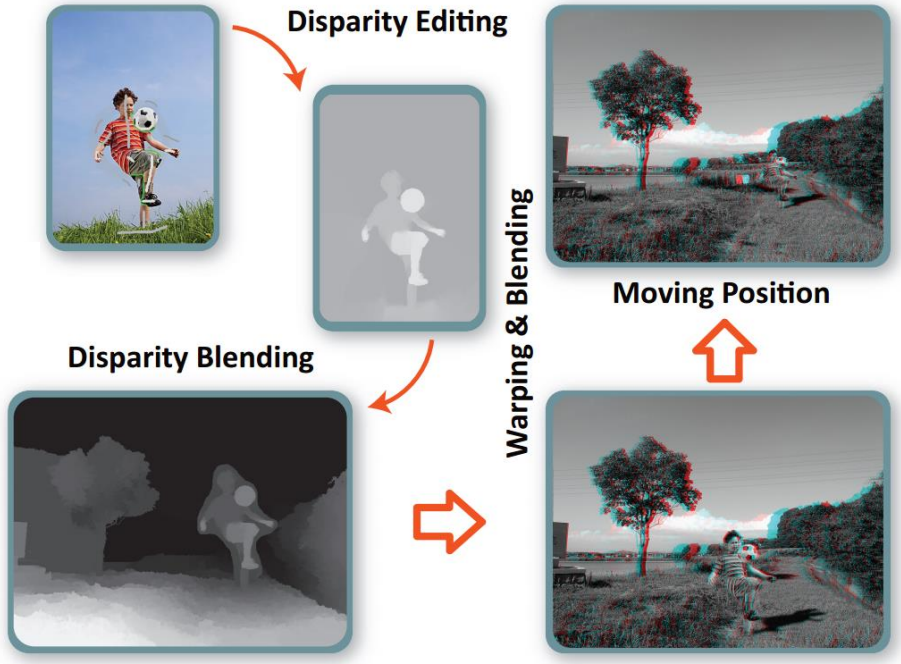
- PatchMatch: A Randomized Correspondence Algorithm for Structural Image Editing (*Barnes et al.*, SIGGRAPH 2009)
- Non-Rigid Dense Correspondence with Applications for Image Enhancement (*HaCohen et al.*, SIGGRAPH 2011)



Stereoscopic image editing

- Changing Perspective in Stereoscopic Images
  (*Du et al.*, TVCG 2013)
- StereoPasting: Interactive Composition in Stereoscopic Images
  (*Tong et al.*, TVCG 2013)





Supervisor: Christian R.

Image-based editing

- 3-Sweep: Extracting Editable Objects from a Single Photo
  (*Chen et al.*, SIGGRAPH Asia 2013)
- Interactive Images: Cuboid Proxies for Smart Image Manipulation
  (*Zheng et al.*, SIGGRAPH 2012)

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Supervisor: Christian R.

Intrinsic image decomposition

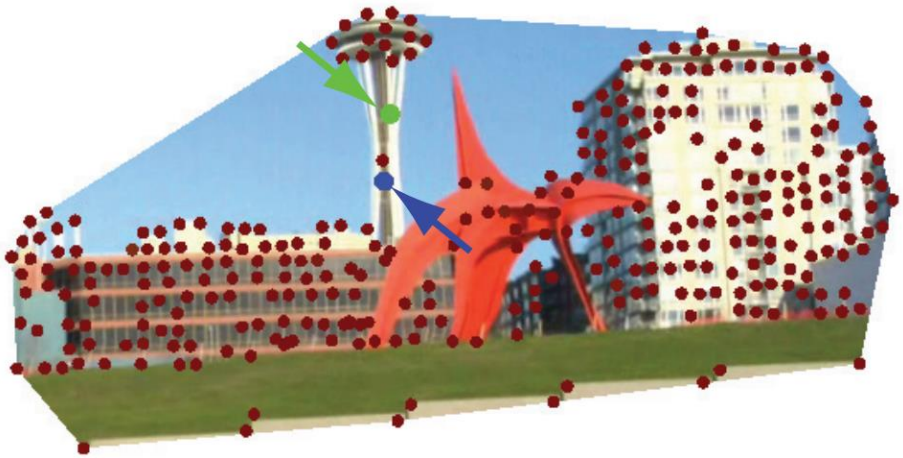
- User-Assisted Intrinsic Images
  (*Bousseau et al.*, SIGGRAPH Asia 2009)
- Coherent Intrinsic Images from Photo Collections
  (*Laffont et al.*, SIGGRAPH Asia 2012)

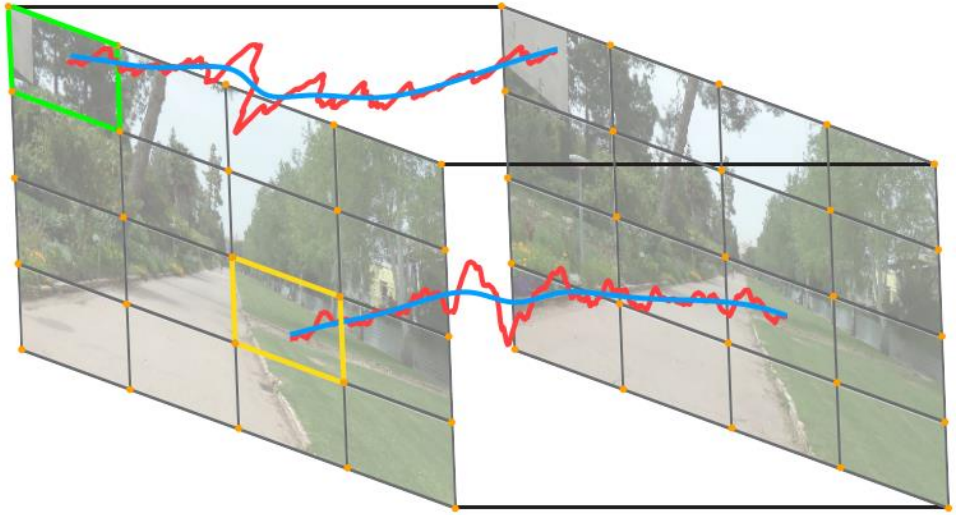
Applications

Re-texturing

Video stabilisation

- Subspace Video Stabilization
  (*Liu et al.*, TOG 2011)
- Bundled camera paths for video stabilization
  (*Liu et al.*, SIGGRAPH 2013)





Supervisor: Miguel

Multi-perspective panoramas

- Omnistereo: Panoramic Stereo Imaging
  (*Peleg et al.*, PAMI 2001)
- Megastereo: Constructing High-Resolution Stereo Panoramas
  (*Richardt et al.*, CVPR 2013)

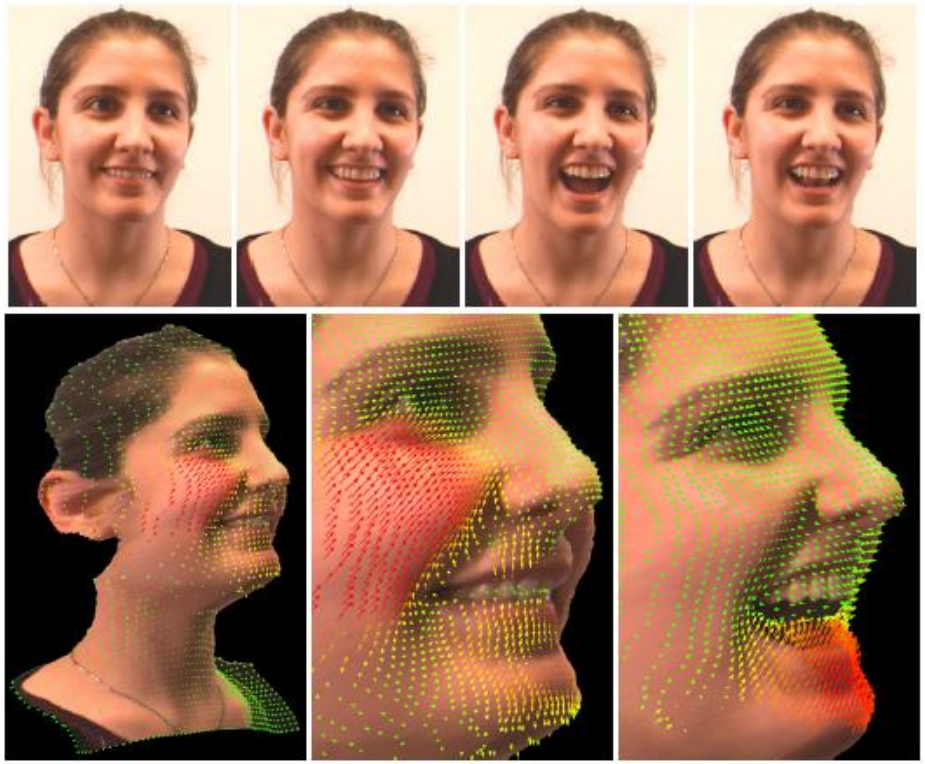
Depth-based SLAM

- KinectFusion: Real-time Dense Surface Mapping and Tracking (*Newcombe et al.*, ISMAR 2011)
- Real-time 3D Reconstruction at Scale Using Voxel Hashing (*Nießner et al.*, SIGGRAPH Asia 2013)

Supervisor: Thomas/Christian R.

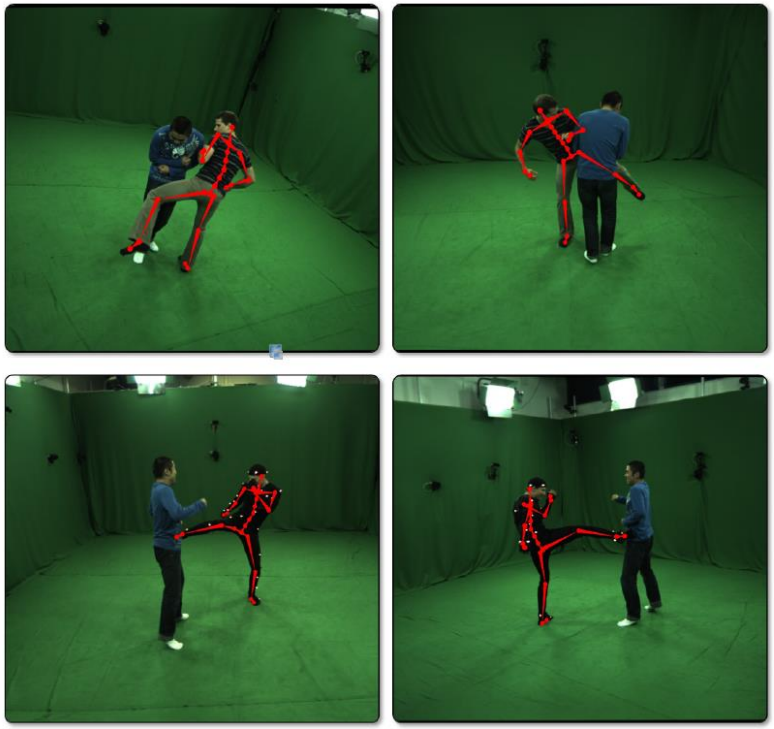
Multi-view stereo

- Multi-View Stereo Revisited (*Goesele et al.*, CVPR 2006)
- Joint Estimation of Motion, Structure and Geometry from Stereo Sequences (*Valgaerts et al.*, ECCV 2010)



Human pose estimation I

- Fast Articulated Motion Tracking using a Sums of Gaussians Body Model (*Stoll et al.*, ICCV 2011)
- Markerless Motion Capture with Unsynchronized Moving Cameras (*Hasler et al.*, CVPR 2009)



Supervisor: Ahmed/Thomas/Srinath

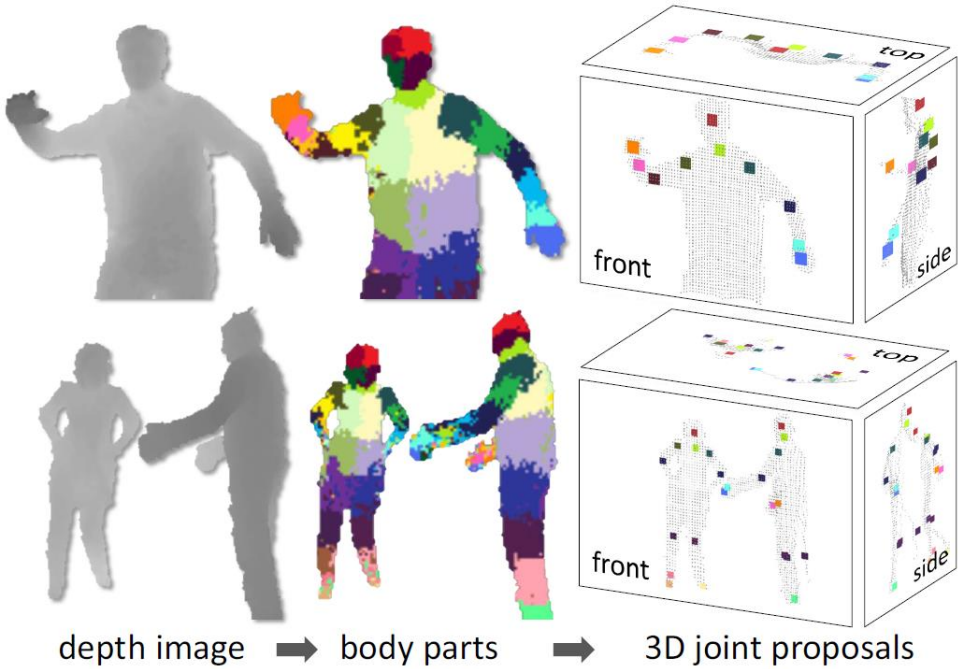
Human pose estimation II

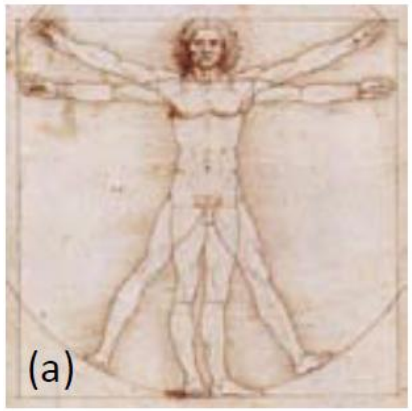
- Pictorial Structures Revisited: People Detection and Articulated Pose Estimation (*Andriluka et al.*, CVPR 2009)
- Strong Appearance and Expressive Spatial Models for Human Pose Estimation (*Pishchulin et al.,* ICCV 2013)

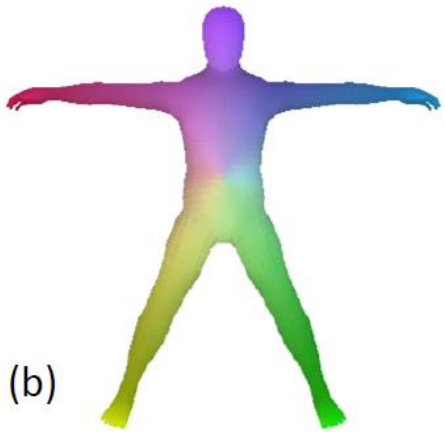
Supervisor: Hamid/Ahmed

Human pose estimation III

- Real-Time Human Pose Recognition in Parts from a Single Depth Image (*Shotton et al.*, CVPR 2011)
- The Vitruvian Manifold: Inferring Dense Correspondences for One-Shot Human Pose Estimation (*Taylor et al.*, CVPR 2012)



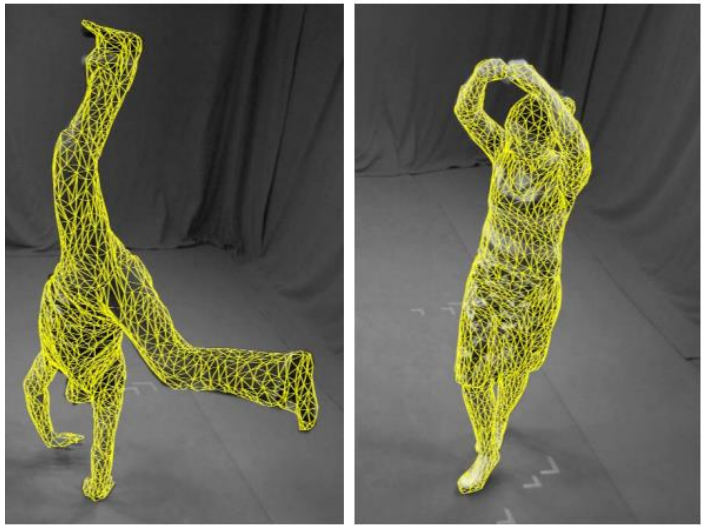




Supervisor: Helge/Srinath

Performance capture

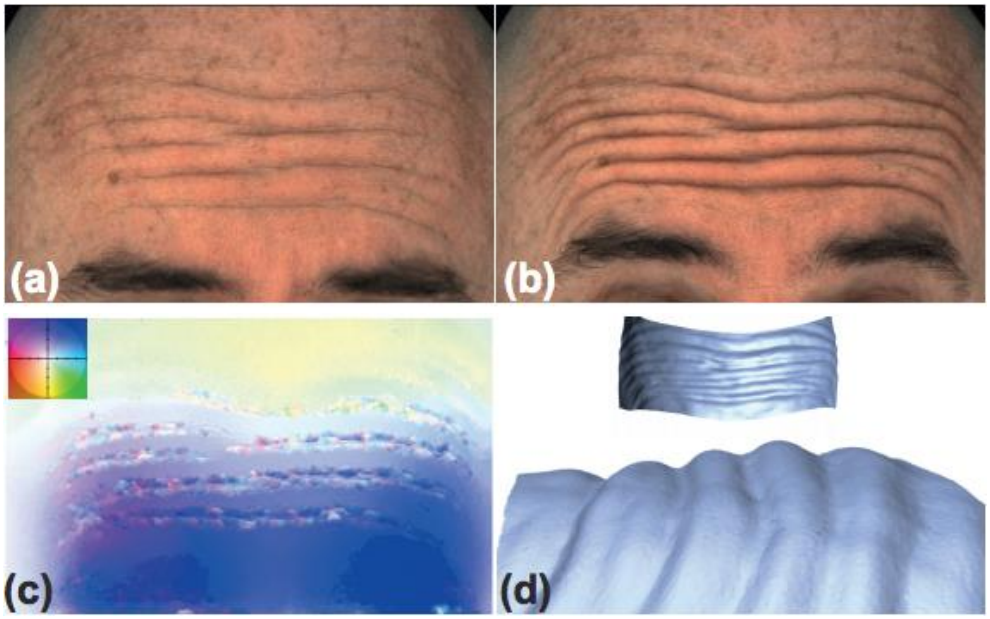
- Motion Capture Using Joint Skeleton Tracking and Surface Estimation (*Gall et al.*, CVPR 2009)
- Performance Capture from Sparse Multi-view Video (*de Aguiar et al.*, SIGGRAPH 2008)

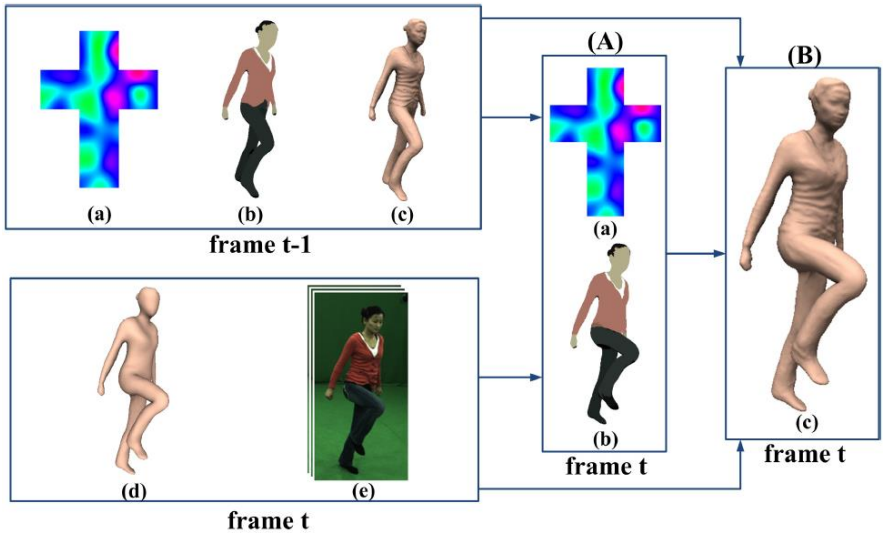


Supervisor: Nadia/Edilson/Christian T.

Shape and reflectance

- Improved Reconstruction of Deforming Surfaces by Cancelling Ambient Occlusion (*Beeler et al.*, ECCV 2012)
- Shading-based Dynamic Shape Refinement from Multi-view Video under General Illumination (*Wu et al.*, ICCV 2011)

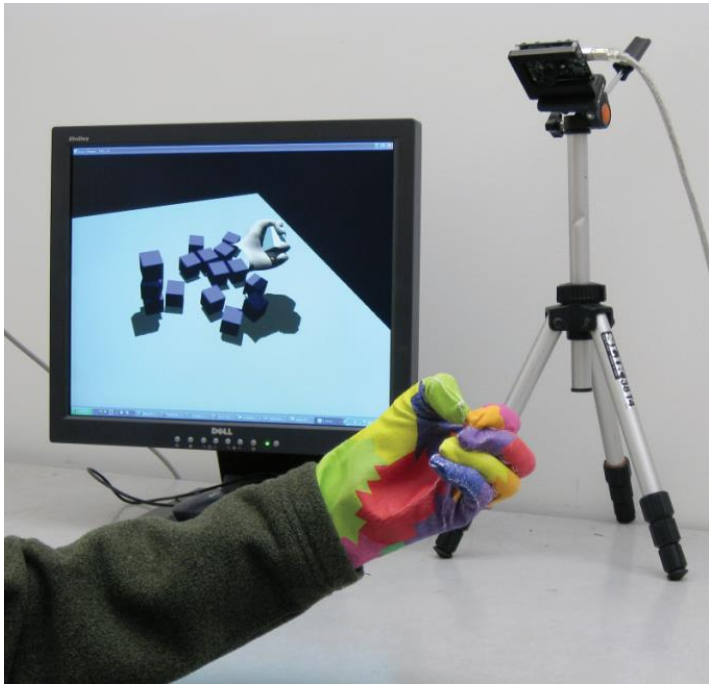


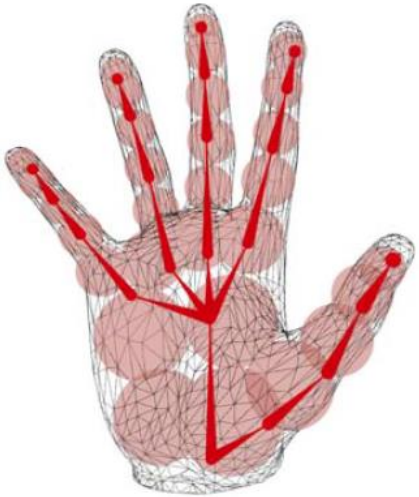


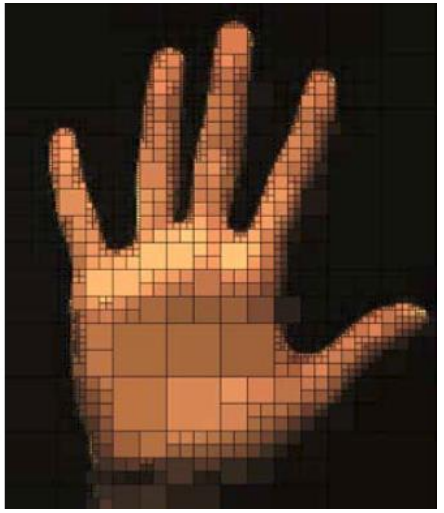
Supervisor: Hamid/Chenglei

Hand pose estimation

- Real-Time Hand-Tracking with a Color Glove (*Wang & Popović*, SIGGRAPH 2009)
- Interactive Markerless Articulated Hand Motion Tracking using RGB and Depth Data *(Sridhar et al.*, ICCV 2013)







Supervisor: Srinath

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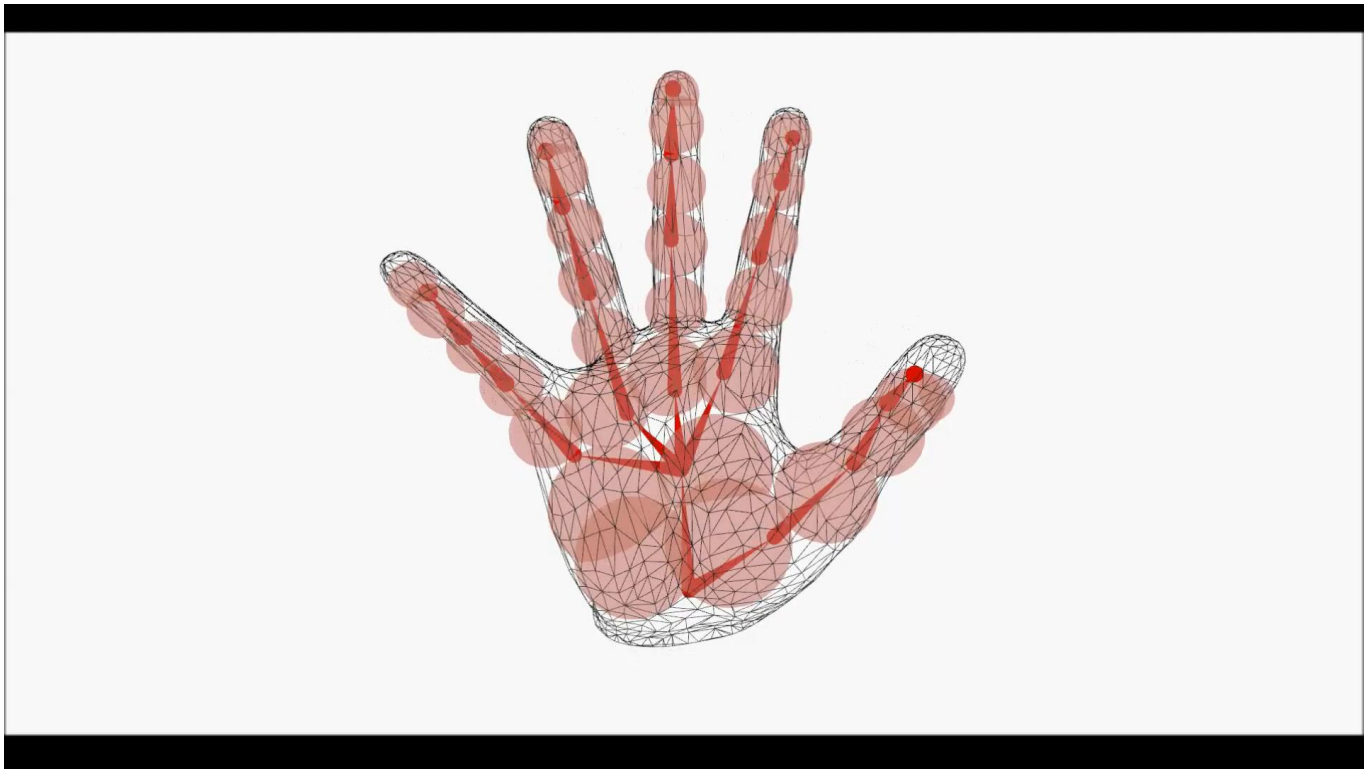
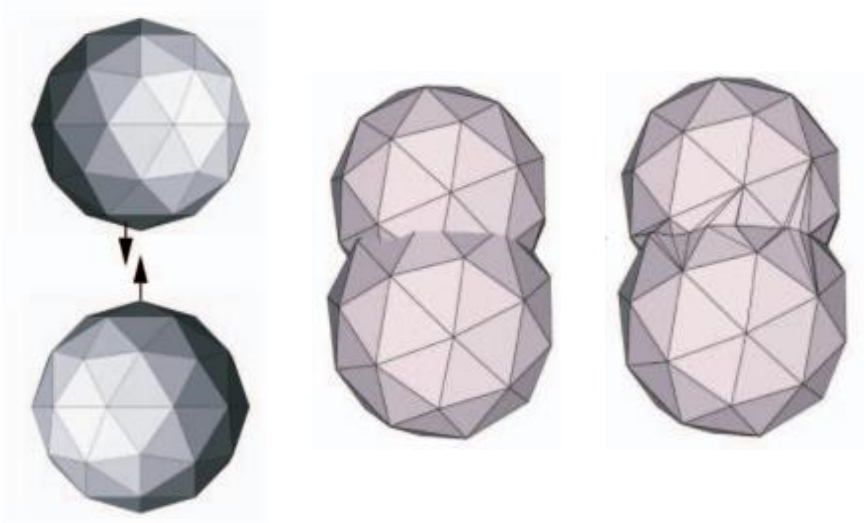
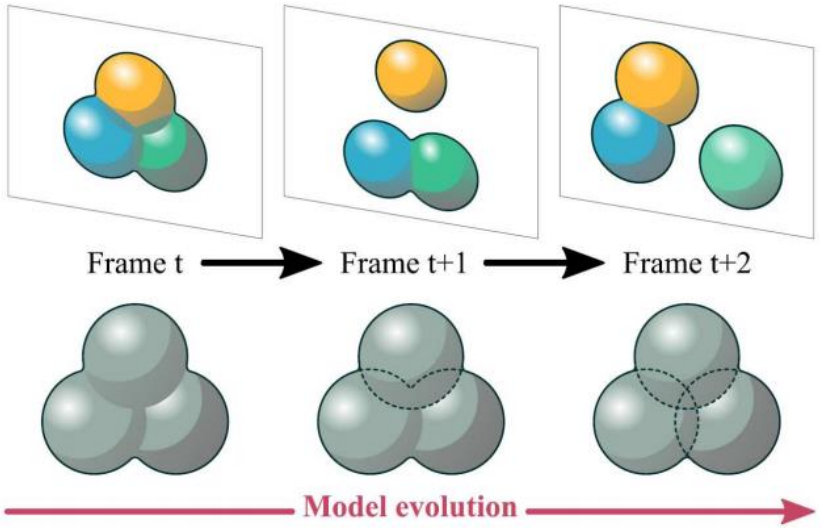


Supervisor: Srinath

Topology-adaptive meshes

- Topology-Adaptive Mesh Deformation for Surface Evolution, Morphing, and Multiview Reconstruction
  (*Zaharescu et al.*, PAMI 2011)
- Progressive Shape Models
  (*Letouzey and Boyer*, CVPR 2012)

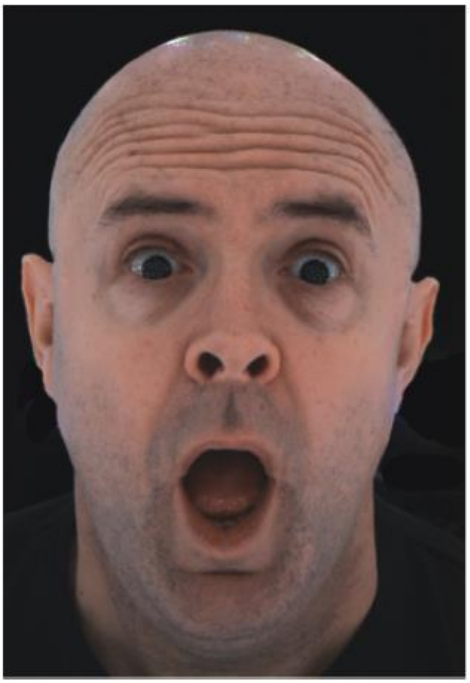


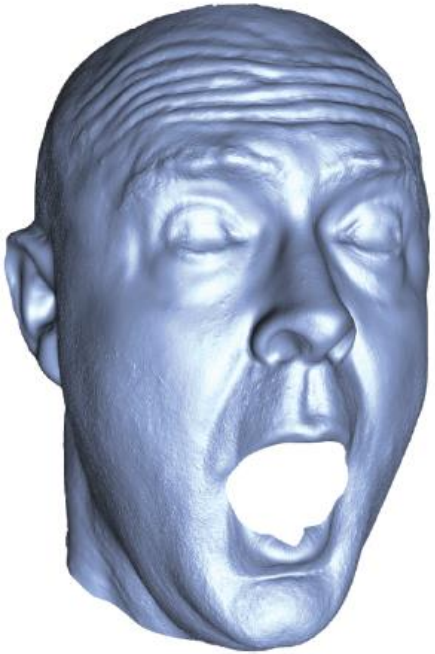


Supervisor: Nadia

Facial performance capture I

- High-Quality Passive Facial Performance Capture using Anchor Frames (*Beeler et al.*, SIGGRAPH 2011)
- Reconstructing Detailed Dynamic Face Geometry from Monocular Video *(Garrido et al.*, SIGGRAPH Asia 2013)

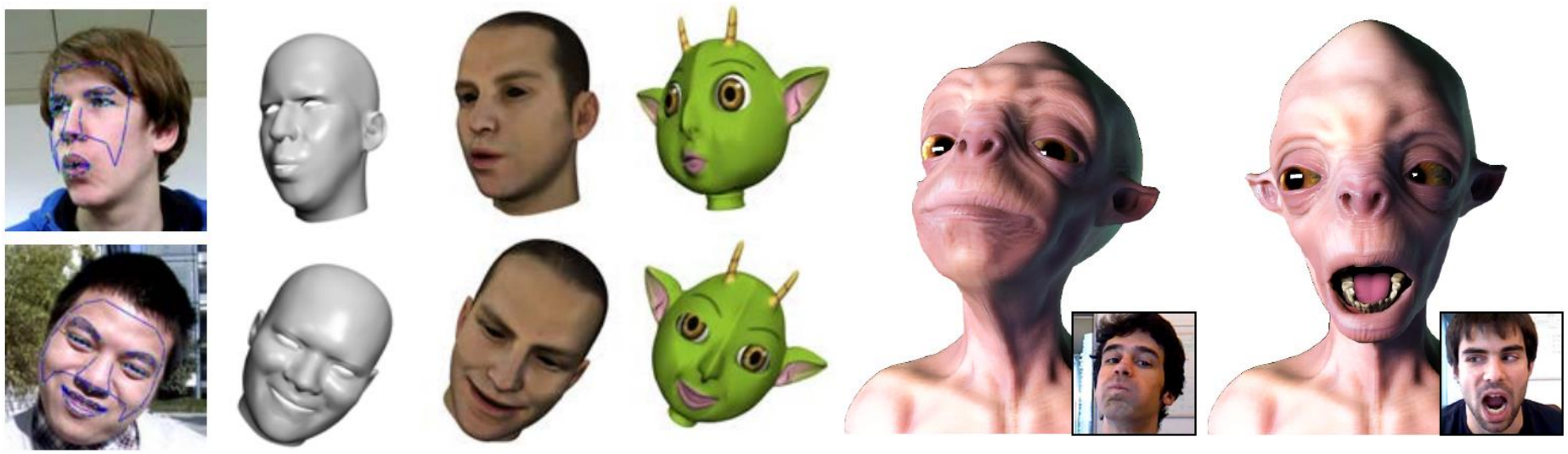




Supervisor: Pablo

Facial performance capture II

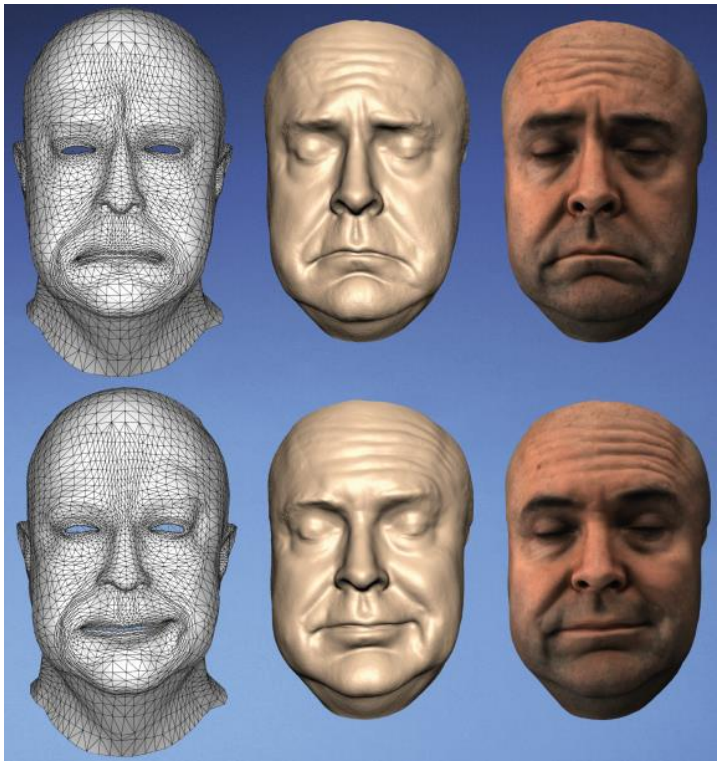
- 3D Shape Regression for Real-time Facial Animation
  (*Cao et al.*, SIGGRAPH 2013)
- Online Modeling For Realtime Facial Animation
  (*Bouaziz et al.*, SIGGRAPH 2013)



Supervisor: Pablo

Facial performance capture III

- Sparse Localized Deformation Components (*Neumann et al.*, SIGGRAPH Asia 2013)
- Facial Performance Enhancement using Dynamic Shape Space Analysis (*Bermano et al.*, TOG 2014, to appear)

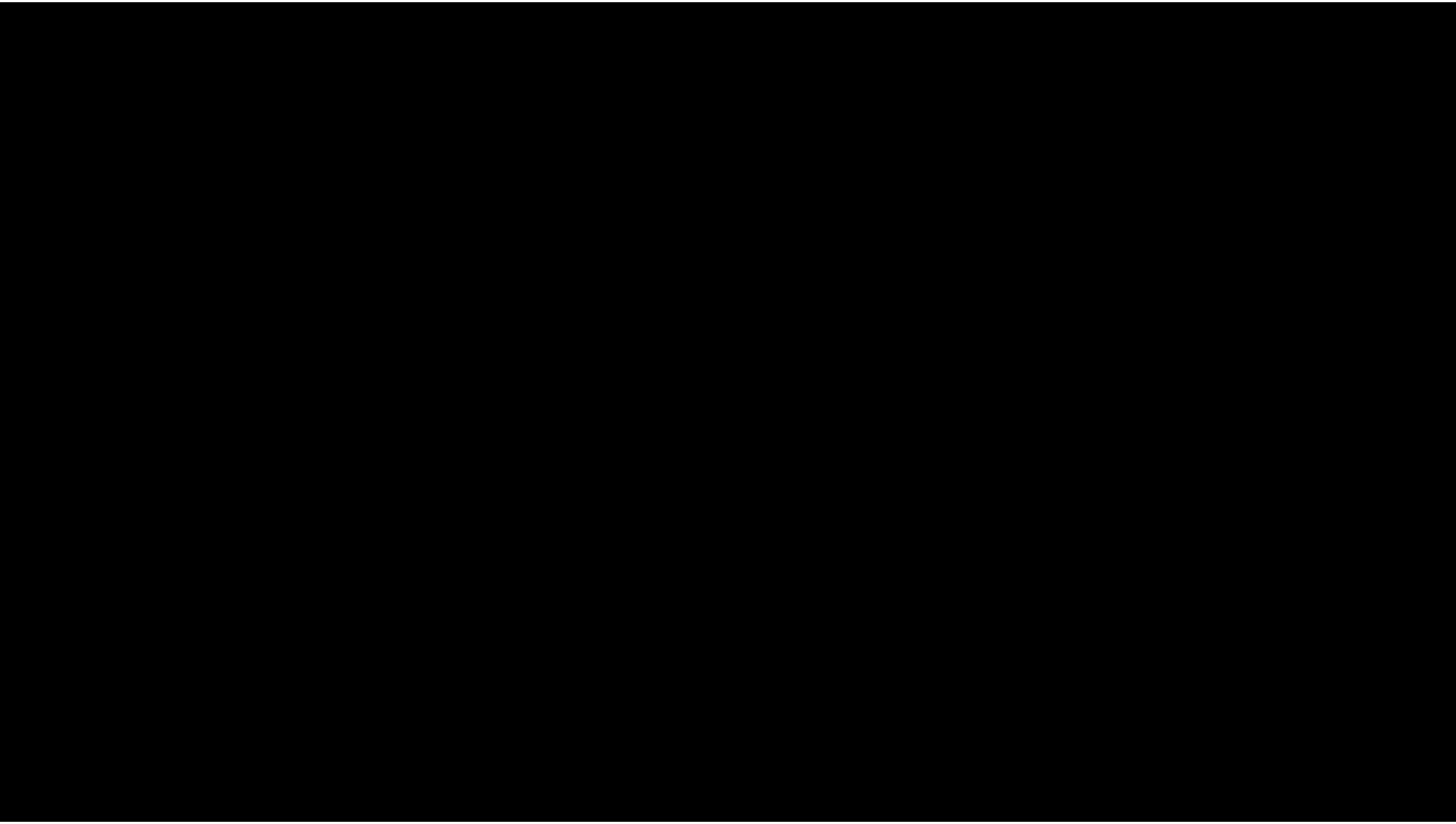


Supervisor: Levi

Summary

- Topic assignment:
  - Send a list of 3 topics (in order of preference) until **Monday, 21 April 2014**
  - Slots are filled in first-come, first-served fashion
  - We will try to accommodate wishes as much as possible
  - Topics will be assigned on **Tuesday, 22 April 2014**
- First topic presentation: **Thursday, 8 May 2014**
- Next week:
  - “How to read an academic paper”
  - “How to give a good talk”
- Questions?

Applications: The Foundry Showreel



http://www.thefoundry.co.uk/about-us/showreels/