

# Live Motion Capture for Higher Education

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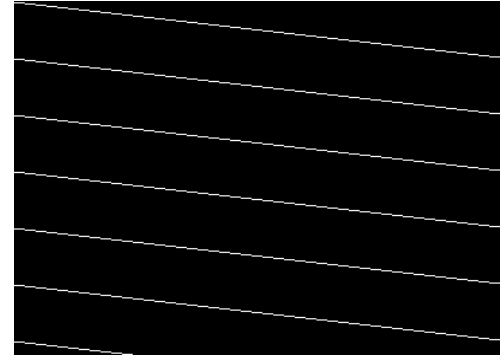
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# Agenda

- Motivation & Background
- Motion Capture
- Live Motion Capture
  - Markerless Motion Capture
- Experiments
- Next steps

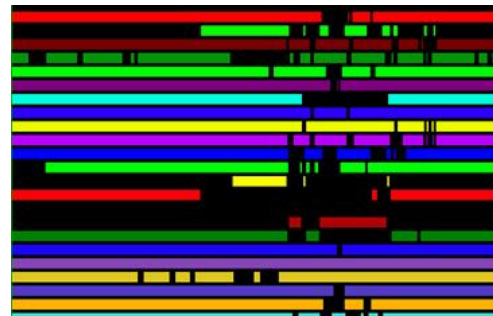
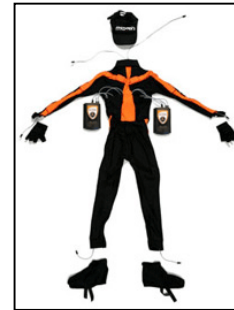
# Motivation

- Motion Capture
  - Relevant and interesting topic in Higher Education
  - Creation of own 3D educational films and 3D trick films
- Live Motion Capture
  - Evaluation of movement detection
  - Innovative human-computer-interaction in virtual 3D environments



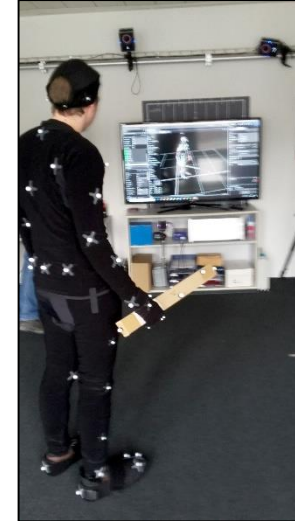
# Motion Capture

- Fields of application
  - Medicine (gait and movement analysis in orthopaedics, ...)
  - Sport (biomechanics, training optimizing: golf, tennis, swimming, cycling, skiing, ...)
  - Entertainment business (video games, film, music video, promotional clips, ...)
  - Etc.
- Kinds of motion capture
  - Mechanical (for example exoskeleton)
  - Magnetic
  - Optical
    - Active
    - Passive
  - (and more)
- Disadvantages (until recently)
  - Elaborate post processing
  - Limitation through markers



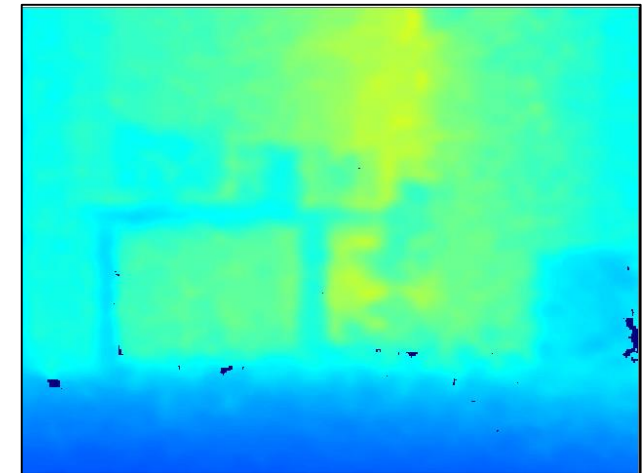
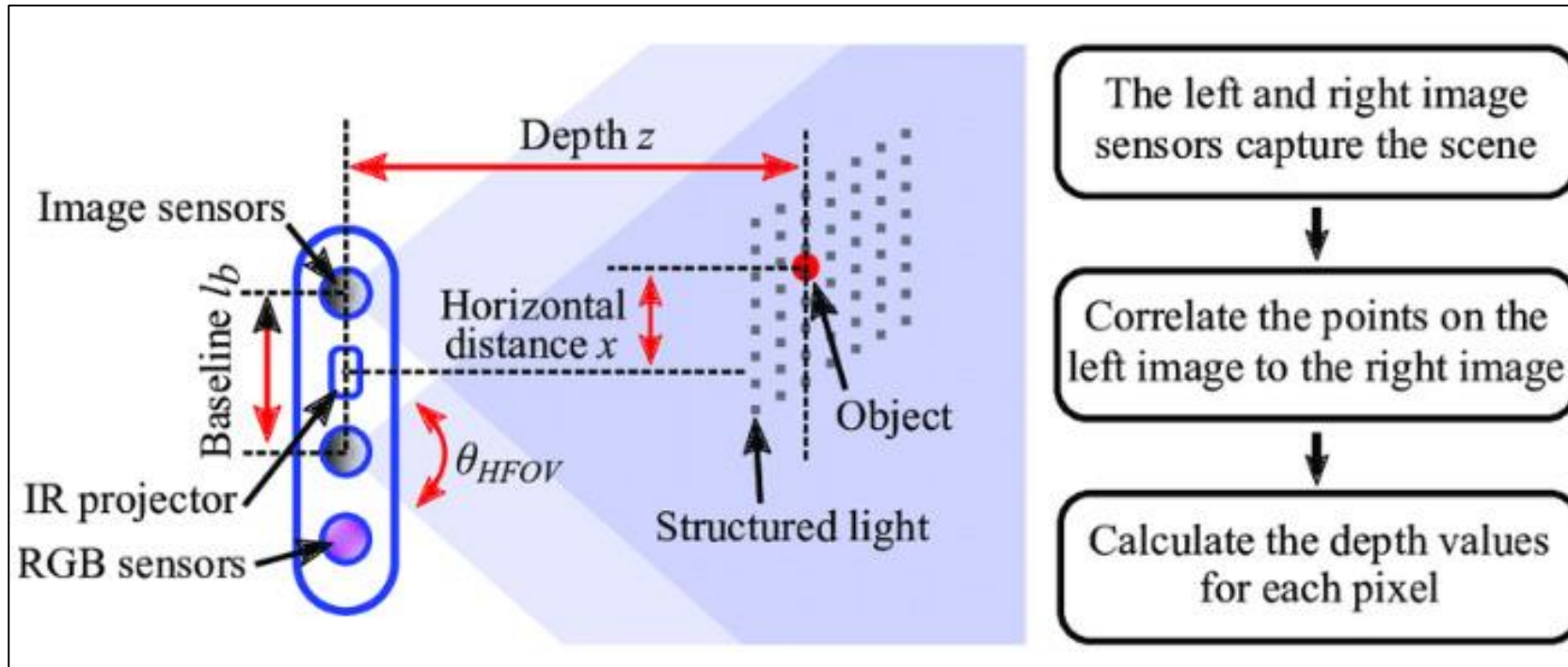
# Live Motion Capture

- With markers:
  - Improved hardware and algorithms
- Without markers:
  - Live tracking with the Kinect®
  - Live tracking with a depth perception video camera
  - VR tracker (3D applications)
    - Example: tracking of a teacher in a virtual classroom





# Depth Perception Video Camera: Fundamental Functionality



*False colour of the depth stream*

Source: [1]

Other possibility: 'Time-of-Flight' [2]; used for example in Lidar sensors

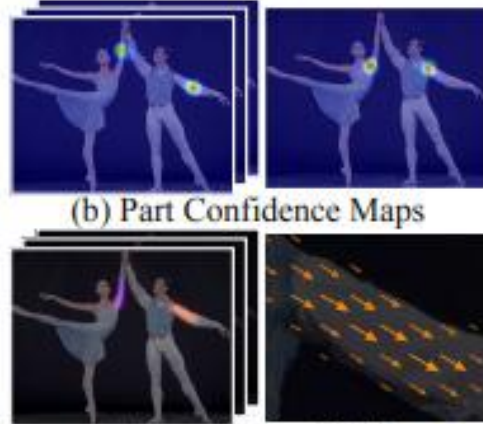
## Detection of persons

- Confidence Map
- Part affinity field (extraction of parts of the body)
- Machine Learning

# Identification of persons



(a) Input Image



(b) Part Confidence Maps

(c) Part Affinity Fields



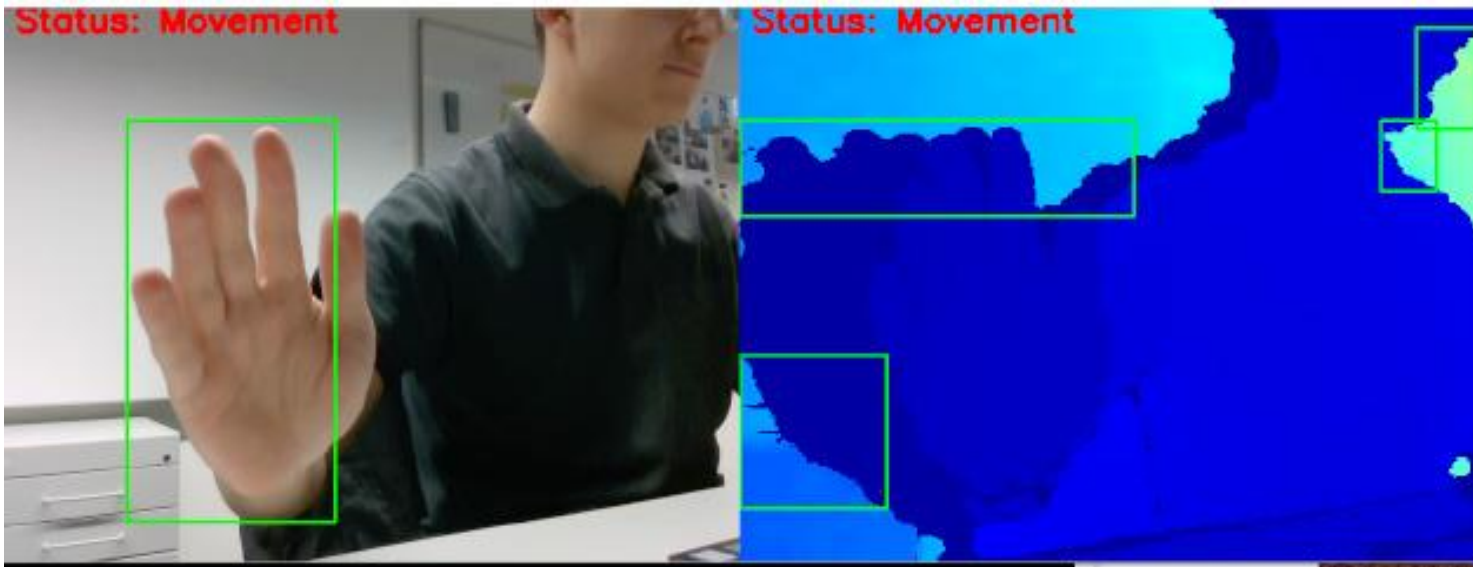
(d) Bipartite Matching



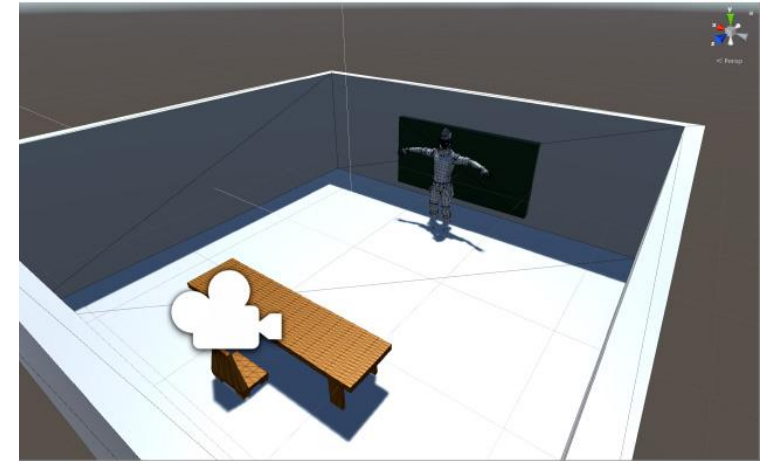
(e) Parsing Results



# Experiments



- Very promising results
- Transfer of the lecture's movement into a virtual classroom



## Results and Future Work

- Result:
  - Promising live motion capturing via depth video camera
- Further (planned) topics:
  - 3D e-learning
  - Live generating of trick films
  - Evaluation of the locomotion of the avatars in 3D applications
  - Using VR tracker for live motion capture in 3D applications
    - Minimizing kinetosis?

# Concluding Remarks

- Acknowledgments

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- Thanks to
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- References

- [1] Shuantu Liu, Dedong Gao, Wang Peng, Xifeng Guo, Jing Xu, Du-Xin Liu: ‘A Depth-Based Weighted Point Cloud Registration for Indoor Scene’ in Sensors 18(11):3608, October 2018
- [2] Sebastian Schuon, Christian Theobalt, James Davis, Sebastian Thrun: ‘High-Quality Scanning Using Time-of-Flight Depth Superresolution’, 2008 IEEE Computer Society Conference on Computer Vision and Pattern Recognition Workshops, Anchorage, AK, USA, 23- 28 June 2008
- [3] Zhe Cao, Thomas Simon, Shih-En Wei, Yaser Sheikh: ‘Realtime Multi-Person 2D Pose Estimation using Part Affinity Fields’, arXiv:1611.08050

# Thank you for your attention

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