Institute for Computer Graphics and Vision
Graz University of Technology

A Free-Viewpoint Virtual Mirror with Marker-Less User Interaction

Straka M., Hauswiesner S., Rüther M. and Bischof H.
{straka, hauswiesner, ruether, bischof}@icg.tugraz.at

Abstract

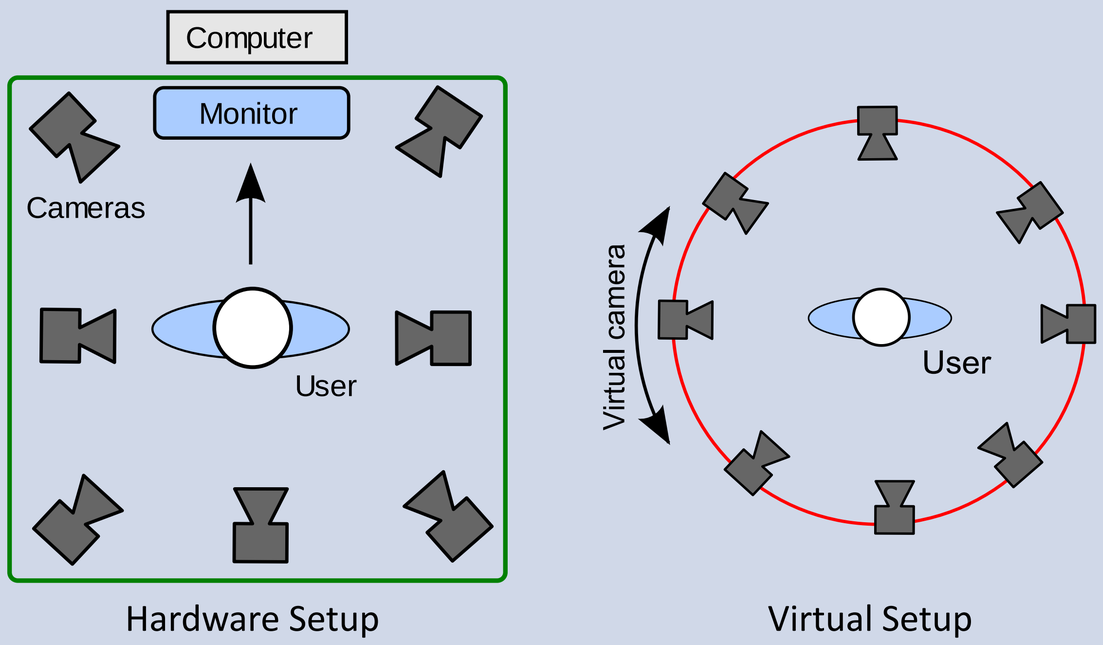
We present a Virtual Mirror system which is able to simulate a physically correct full-body mirror on a monitor. In addition, users can freely rotate the mirror image which allows them to look at themselves from the side or from the back, for example. This is achieved through a multiple camera system and visual hull based rendering. A real-time 3D reconstruction and rendering pipeline enables us to create a virtual mirror image at 15 frames per second on a single computer.

Motivation & Novelty

- Often a virtual mirror effect is achieved by displaying a mirrored camera image → This is not a true mirror image
- We present a **virtual-mirror** system that shows an **optically correct** mirror image of the user on a large monitor
- Additionally, the user can **freely rotate** the mirror image to get a **360° view** of her/himself
- User interactions by **markerless**ly recognized **hand gestures**

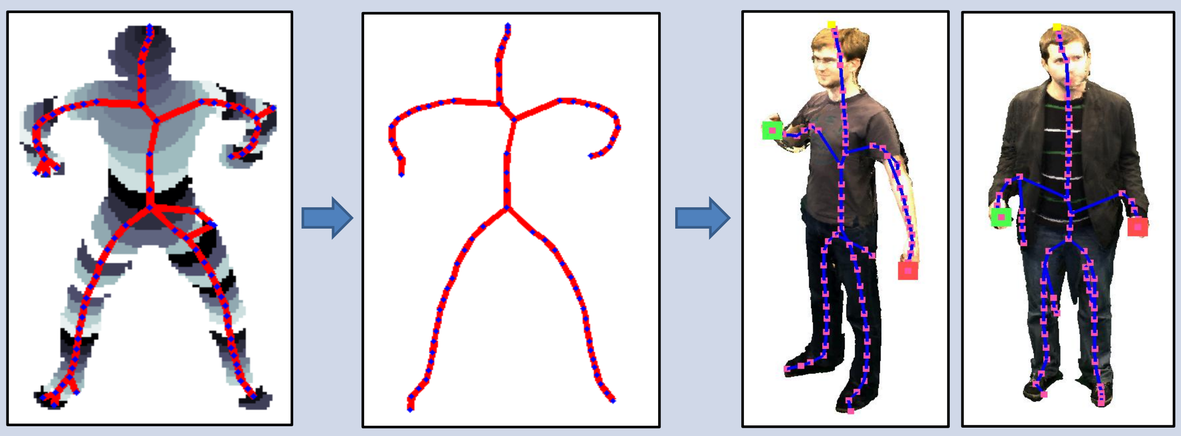
Image Recording and Virtual Viewpoints

Our system consists of **ten** synchronized color **cameras**, which we can use to synthesize an **arbitrary number of virtual cameras** in order to create a virtual mirror image [1].



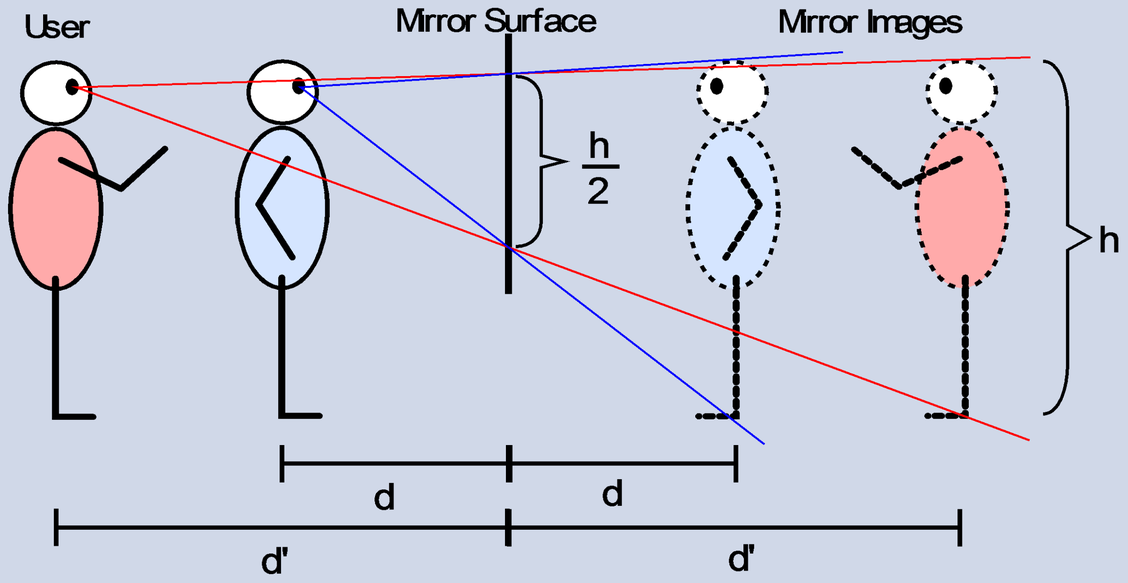
User Interaction using a Skeletal Graph

From a **voxel model** of the user we extract a **skeletal graph** [2] in order to **detect hands**.



Mirror Simulation

Placement of the **virtual mirror camera** is updated every frame based on the head position [3]



Position of Camera: $c_{Mirror} = c_{Head} - 2 \cdot d \cdot \vec{n}_{Mirror}$

Focal length: $f = 2 \cdot d$

Results & Conclusion

- Our system **simulates a physical mirror** at interactive frame rates (15fps)
- **Real-Time** through fast CPU + GPU implementation
- **Realsitic rendering** through Image Based Visual Hull[1]
- **Natural Interaction** with the system through gestures

References

[1] S. Hauswiesner, M. Straka and G. Reitmayr. Coherent image-based rendering of real-world objects. In Proc. of Interactive 3D Graphics, (2011).
[2] Rodriguez, A., Ehlenberger, D., Hof, P., Wearne, S.L.: Three-dimensional neuron tracing by voxel scooping. Journal of Neuroscience Methods 184(1), (2009)
[3] M. Straka, S. Hauswiesner, M. Rüther and H. Bischof: A Free-Viewpoint Virtual Mirror with Marker-Less User Interaction. Proceedings of the 17th Scandinavian Conference on Image Analysis, (2011)

Acknowledgements

This work was supported by the Austrian Research Promotion Agency (FFG) under the BRIDGE program, project #822702 (NARKISSOS).

ICVSS 2011
Sicily ~ 11-16 July
International Computer Vision Summer School

Watch our video at:
http://www.youtube.com/watch?v=eIlUlMHW7ak