3D Reconstruction and Photoreal Digital Face Animation using Camera

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Image Sensor

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Camera
Image Sensor

- A device that converts an optical image to an electric signal
- Charge-Coupled Device (CCD) 1970 bell lab
- Complementary Metal–Oxide–Semiconductor (CMOS) 1969

http://en.wikipedia.org/wiki/Active_pixel_sensor
http://astro.kias.re.kr/~hshwang/ccd.htm
Color Sensor

- Bayer sensor 1976 – Demosaicking
- Foveon X3 sensor
- 3CCD

The Bayer arrangement of color filters on the pixel array of an image sensor. Each two-by-two cell contains two green, one blue, and one red filter.

SIGMA

Sigma Corporation Acquires Foveon. Click here for the press release.

Sigma Corporation announces two new cameras using the Foveon 14.1 Megapixel X3 sensor.

Check out the Sigma press releases for the SD15 and for the DP2!

https://www.youtube.com/watch?v=oa2DbQcKAEU
Multiple View Geometry in Computer Vision
Figure 1.1: An image of a scene
Figure 1.2: Back-projection of a point along the line of sight.
Figure 1.3: Reconstruction of three-dimensional point through triangulation.
Visual 3D Modeling from Images
- Projective Transformations
- Camera Calibration
- Epipolar Geometry
- Feature Points
- Correspondence Search
- RANSAC Algorithm
- 3D Reconstruction

**SIFT & ASIFT**
Photo Tourism

- http://phototour.cs.washington.edu/
Photosynth

- DeepZoom & HD View
- [http://photosynth.net/](http://photosynth.net/)
Building Rome on a cloudless day, Jan-Michael Frahm, Pierre Georgel, David Gallup, Tim Johnson, Rahul Raguram, Changchang Wu, Yi-Hung Jen, Enrique Dunn, Brian Clipp, Svetlana Lazebnik, Marc Pollefeys, ECCV 2010
Paul Debevec is Chief Visual Officer and leads the Graphics Laboratory at the University of Southern California's Institute for Creative Technologies, and is a Research Professor in the USC Computer Science Department. He earned degrees in Math and Computer Engineering at the University of Michigan in 1992 and a Ph.D. in Computer Science from UC Berkeley in 1996.

Debevec's Ph.D. thesis with Prof. Jitendra Malik presented Façade, an image-based modeling system for creating virtual cinematography of architectural scenes using new techniques for photogrammetry and image-based rendering. Using Façade he directed a photorealistic fly-around of the Berkeley campus for his 1997 film The Campanile Movie whose techniques were later used to create the Academy Award-winning virtual backgrounds in the "bullet time" shots in the 1999 film The Matrix.
The Digital Emily Project

Digital Emily

2008
Project Leader: Paul Debevec

In the Digital Emily project, Image Metrics and the University of Southern California’s Institute for Creative Technologies (USC ICT) animated a digital face using new results in 3D facial capture, character modeling, animation, and rendering. The project aimed to cross the “uncanny valley” that divides a synthetic-looking face from a real, animated, expressive person. The key technologies included a fast high-resolution digital face-scanning process using USC ICT’s Light Stage capture system and Image Metrics’ video-based facial-animation system. The project generated one of the first photorealistic digital faces to speak and move convincingly in a medium close-up.

Learn more about Digital Emily on the ICT Graphics Lab webpage.
The Digital Emily Project

The Digital Emily Project: Achieving a Photoreal Digital Actor

Oleg Alexander* Mike Rogers* William Lambeth* Jen-Yuan Chiang Wan-Chun Ma Chuan-Chang Wang Paul Debevec
USC Institute for Creative Technologies Image Metrics*

a collaboration between Image Metrics and the USC Institute for Creative Technologies Graphics Lab

Papers and Video:
IEEE CG&A July/August 2010 Article: DigitalEmily_IEEECGA_2010.pdf, 9 MB (Adobe Acrobat)
SIGGRAPH 2009 CAF Video: EmilyCAF09_1280x720_hi264.mov, 132 MB, (QuickTime)
TEDxUSC Talk, March 2009 (also on TED.com)
The Digital Emily Project

http://gl.ict.usc.edu/Research/DigitalEmily/
Image Metrics

https://www.youtube.com/watch?v=SwAV2fXoy6E  https://www.youtube.com/watch?v=d0MSVfAsTcM
https://www.youtube.com/watch?v=kCm_x0yeBnk  http://www.image-metrics.com/

ROBERT GEHORSAM
CEO IMAGE METRICS

www.themanly-man.com
Andy Serkis – Gollum in The Lord of the Rings

Brad Pitt – The Curious Case of Benjamin Button

Cch Pounder – Avatar

Gary Oldman – Hannibal

Photorealistic Digital Face

Paul Debevec:

**Animating a photoreal digital face**

TEDxUSC - 06:36 - Filmed Mar 2009

Computer graphics trailblazer Paul Debevec explains the scene-stealing technology behind Digital Emily, a digitally constructed human face so realistic it stands up to multiple takes.
Animating a Photoreal Digital Face

http://www.ted.com/talks/paul_debevec_animates_a_photo_real_digital_face
3D Face Reconstruction

Real-time face 3D model reconstruction

Researchers from the University of Washington prepared interesting presentation for the European Conference on Computer Vision (ECCV-2014). It is a real-time 3D face reconstruction from the video.

Using the video from YouTube, the program automatically builds highly detailed face 3D-model for each video frame.

This is a very impressive result, given the complexity of the problem, because the facial expressions of the human face is very complex. For emotion recognition, it is important to see the exact position of the eyes, bending eyebrows, wrinkles. The smallest error in reconstructed 3D-model is highly noticeable.
3D Figure Printer

(주)이오이스

DLSR 100대를 활용한 3D Photoscanning 및 3D Printing 기술 보유

1초만에 360도 동시 촬영이 가능한 고해상도의 Photoscanning

3D 리얼 피규어 360도 View가 가능한 3차원 3D 화보 3D 마케팅