sauce

Horizon2020-780470

Light Fields for Movie Productions

Smart Assets for re-Use in Creative Environments

SAUCE is a three-year EU Research and Innovation project between **9 partners** to create a step-change in allowing creative industry companies to re-use existing digital assets for future productions.

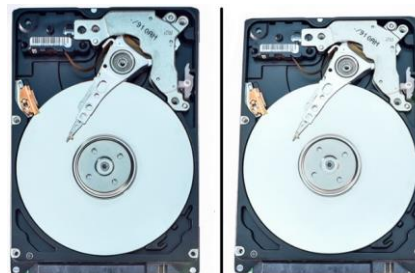# Smart Assets for re-Use in Creative Environments

- The Project (Horizon2020, 01.01.18 — 31.12.20):
  - Substantially increase the value of (digital) assets by making them "smarter"
    - Annotation and/or content-based smart search
    - Repurposing, asset transformation
    - Making assets smarter and more flexible in themselves
  - Bring together technology, academia and the creative industry
    - Academic partners: Barcelona, Brno, Dublin, Saarbrücken
    - Creative partners: Double Negative, Disney, Filmakademie, Foundry, Ikinema
- Why Light Fields?
  - One way of making assets smarter and more flexible is to capture more information!
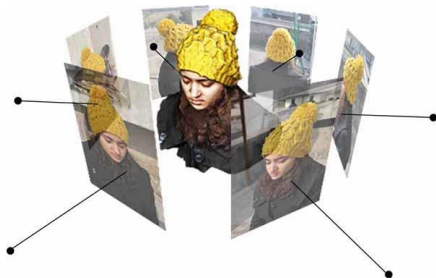   - Light fields start to enter the stage of computational cinematography

Motivation

Software Refocus

Perspective Change

3D-Rekonstruction

Depth of Field Experiences

Smart Assets for re-Use in Creative Environments

- Technical specification
  - 64 camera matrix (e.g. 8x8 configuration)
  - Sensors: Sony IMX249 (in FLIR Blackfly 2.3MP)
    - 13.4mm diagonal, 5.86µm^2 pixel size, 1920×1200 resolution (16:10), 41 fps
  - Lenses: Kowa LM12HC
    - f = 12.5 mm, aperture f/1.4, horizontal viewing angle ~48°
  - Processing:
    - 64×NUC i56260U with 256GB SSD each (~200GB usable cache)
    - 2×XEON E5-2697v4 with 256GB RAM and 60TB HDD
    - 384TB CEPH storage cluster
  - Custom Design:
    - Genlock: Controllable per camera, granularity 10µs
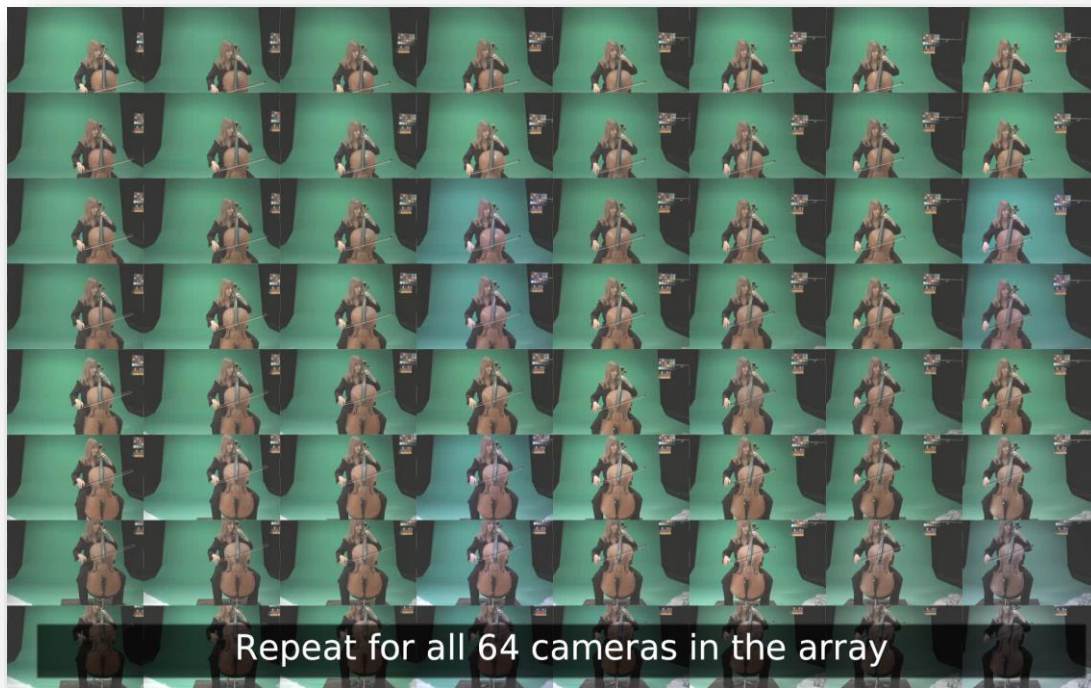   - Array mechanics: Aluminium frame, 60×60cm … 4×1m

Light Field Capture

Light Field Processing Pipeline

Pipeline to create sparse, rectified light fields
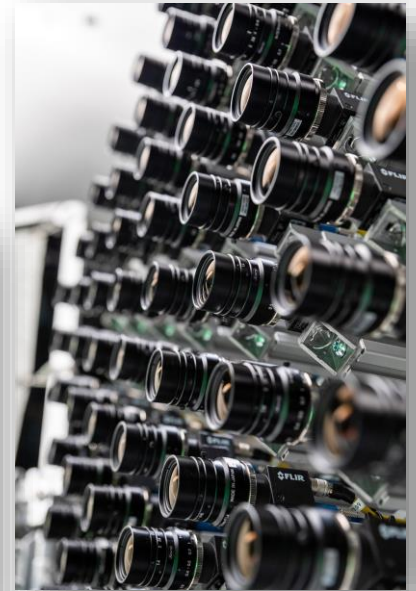

Repeat for all 64 cameras in the array

The Unfolding Production

Goals

- Explore challenges and opportunities
  arising when using lightfields for movie productions

- Concept developed with professional DoP
  Matthias Bolliger

- Starring the cellist Isabel Gehweiler

- "Real world" postproduction at Filmakademie
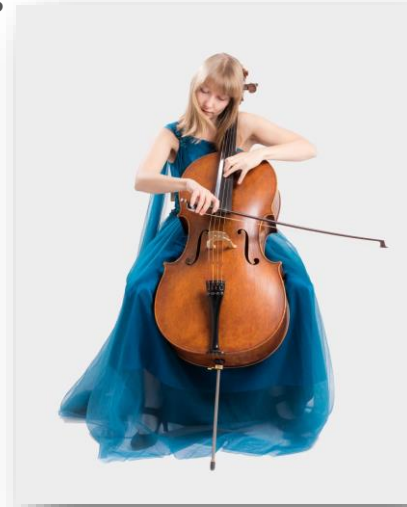
© 2016-2019 Isabel Gehweiler

The Unfolding Production

Planning & PreViz

- Starting with a CG PreViz in Blender

- It is all about enriching possibilities in postproduction

- Which effects are possible & achievable
  - Focus and depth of field can be adjusted
  - Animated Tilt-Shift lens effects
  - Slight shifting of the perspective possible
  - Greenscreen becomes potentially unnecessary
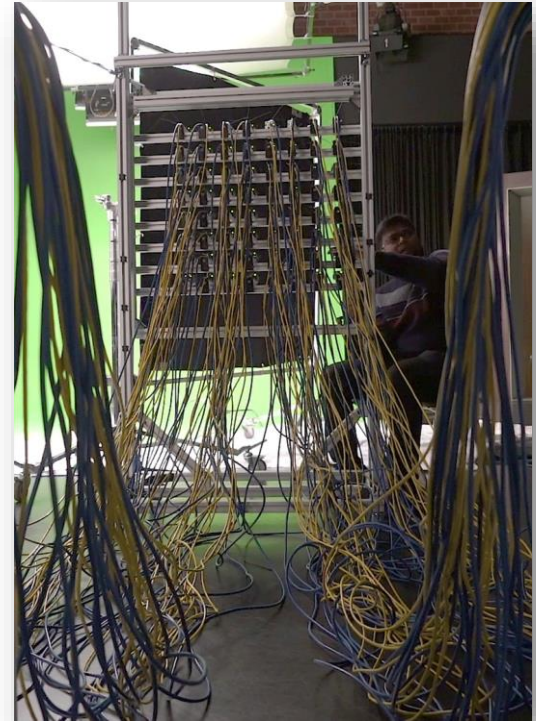
The Unfolding Production

The Unfolding Production

Immediate challenges

Data storage and management of processing
- 9 Terabytes of captured raw data
(total length 21 minutes!)
- Post processing algorithms and tools yet in development
(e.g. Nuke, Gaffer)

Cameras limitations
- Rig size, setup and calibration
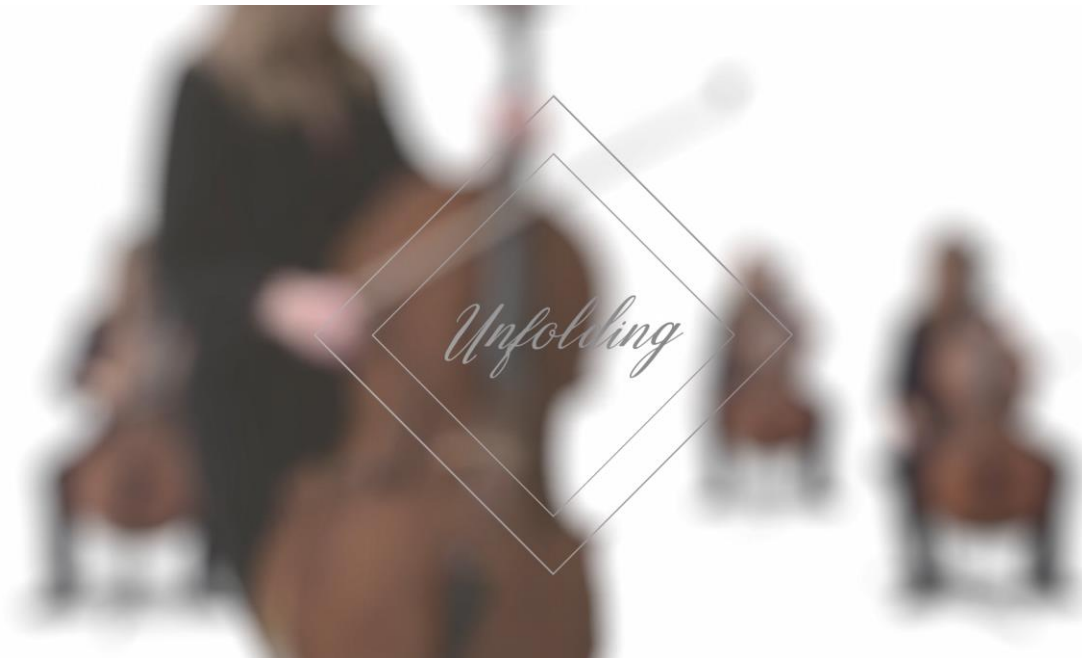- Visual quality of industrial cameras

The Unfolding Production

Postproduction – 1st approach

- What can be achieved with existing standard software?

- Serves as basis for quality and workflow comparison

- Multi view Stereo pipeline to generate depth

- Everything based on depth maps & chroma keying

- Used The Foundry's NUKE (with Cara VR / Ocula)

The Unfolding Production

The Unfolding Production

Evaluation Nuke pipeline

- Lot of manual work
- hard to match "real" lenses effects
- hard to control
- limited freedom in creative choices

All "faked"

- Depth controlled 2D blur to simulate DoF
- No physical correctness
- Dependent on quality of depth maps
- Suffers artefacts
- Does not utilize the potential of LF data

Light Field Tools: an Outlook

- Directly calculate (physically correct) blurring by blending and interpolating the light field

Further Research for LF Processing

Utilize the Lightfield to extract more information

- better depth maps
- 3D reconstruction
- derive surface characteristics (material, shading)
- control of motion artefacts in post (motion blur)
- resolution improvement (spacial temporal resolution)

Frame Rate: 120

Shutter Angle: 360°

2016 Lytro

Display Devices

View material on applicable devices

- Classic 2D displays

- (auto)stereoscopic displays

- Lightfield displays

- VR/AR headsets

European Commission | Horizon 2020
European Union funding
for Research & Innovation

Information

More Information

www.sauceproject.eu

Saarland Informatics Campus
saarland-informatics-campus.de

Research at Animationsinstitut
research.animationsinstitut.de

Any Questions?

2019 3sat nano, Die Kamera der Zukunft.