Ein Baustein für das Digitale Weltmuseum - Erfassung und barrierefreie Wiedergabe von dreidimensionalen Abbildern relevanter Objekte

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KURZDARSTELLUNG: Digitale Medien werden in Ergänzung zu dinglichen Ausstellungen von Kunst, Kultur und Erbe genutzt, erfüllen jedoch kaum den Anspruch, das Original zu ersetzen. Durch die fortgeschrittene Technologieentwicklung in Scannverfahren und brillenlosen Wiedergabesystemen besteht nun die Möglichkeit der immersiven Bereitstellung von Dinglichem, ohne dass es tatsächlich verfügbar ist. Völlig ohne Rüstzeit und Brillen oder dergleichen können Objekte zum Greifen nah dreidimensional dargestellt werden. Diese Möglichkeit wird als Baustein für das *Digitale Weltmuseum* beschrieben und in einem anschaulichen Beispiel als Ergänzung zum Vortrag präsentiert.

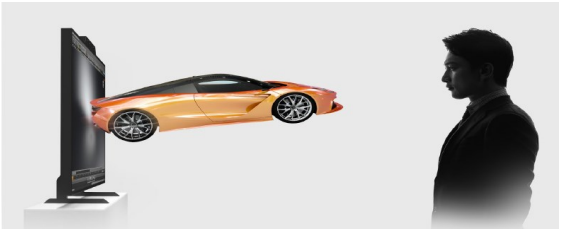
1. INTRODUCTION

„A picture paints a thousand words" (Frederick R. Barnard, 12/1921, in Printers Ink)

Ever since mankind has been fascinated by pictures, paintings and images. If we count the old cave paintings as pictures, pictures are as old as humanity itself. They are able to create emotions, feelings, tell stories, show ways of life, explain things and create demands. That's the reason why they are omnipresent in our daily life.

2. OUR MISSION

Even before timekeeping began, people felt the need to capture their world in images. Cave painting, oil colors, photography, moving image, color television, 4k. What next?
We're driving the display revolution ahead, today. Our solutions open the way to the next dimension of presentation - confusingly similar to reality and interactive when needed! We enable the barrier-free presentation of 3D content, not only to fascinate, but also to create added value in many application areas; as a plug 'n play solution or perfectly adapted to the individual needs of our customers.



3. HISTORY OF STEREOSCOPY

- Stereoscopy is as old as photography and film
- The earliest type of stereoscope was invented by Sir Charles Wheatstone in 1838
- in 1851 Queen Victoria visited the Great Exhibition in London and was so entranced by the Brewster stereoscopes on display that she precipitated an enthusiasm for three-dimensional photography that soon made it a popular form of entertainment world-wide
- Almost overnight a 3D industry developed and 250,000 stereoscopes were produced
- the mass production of stereo photography flourished alongside mono-photography

Abb. 2: ladies using "Stereo-grahopscope" viewer made in 1896

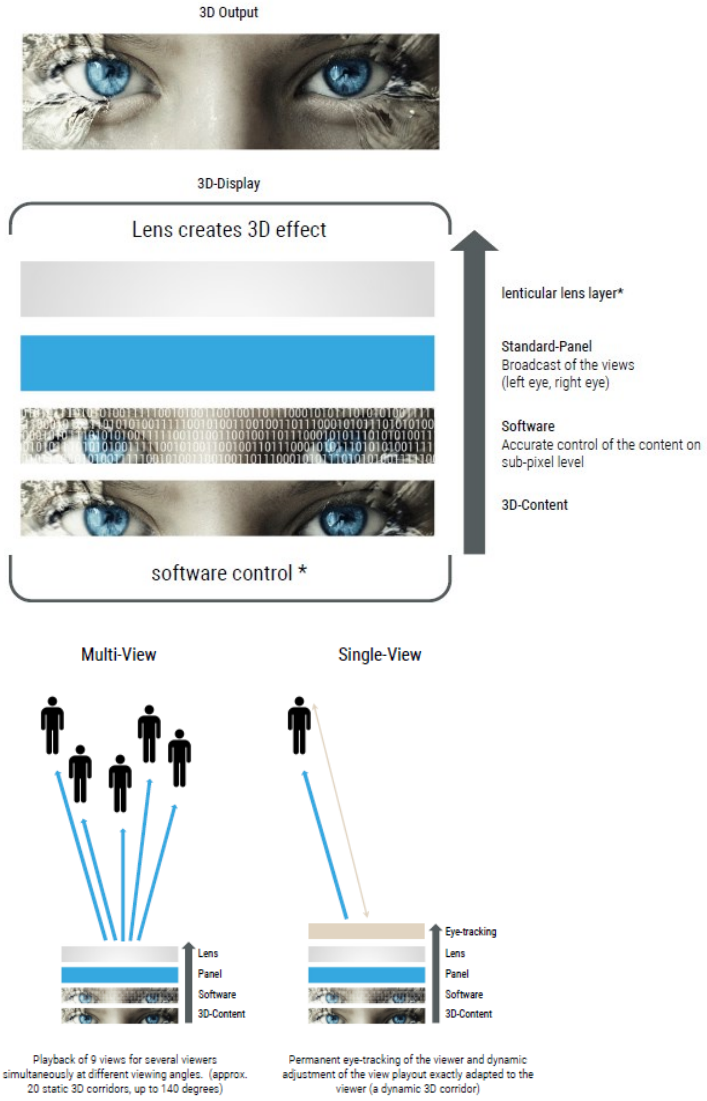
- around the turn of the 19th century the peak of stereo photography was reached and it went out of fashion as movies increased in popularity
- The discovery of anaglyphic 3D came in the 1850s as the result of experiments by the Frenchmen Joseph D'Almeida and Louis Du Hauron
- first 3-D anaglyphic motion pictures by William Friese-Greene went on show to the public in 1893

- These anaglyphic films designated as plasticons or plastigrams enjoyed great success during the 1920's
- In 1932, Edwin H. Land patented a process for producing polarized filters that eventually led to the development of full color 3-D movies - Polaroid J Sheet was introduced as a commercial product
- Birth of the dual-strip projection where two prints had to be synced up in projection. A silver screen was needed to correctly reflect the separate images.
- The "golden era" (1952–1954): unlike many people believe, practically all features of that time were projected dual-strip with Polaroid filters and not with Anaglyph - The decline in the theatrical 3D craze mainly happened due to synchronization problems of the dual projectors causing eye fatigue and the silver screen being very directional which made side seating to be unusable.
- Revival (1960–1984): the invention of the single strip format, which needed only one projector fitted with a special lens – synchronization was a problem of the past
- Rebirth of 3D (1985–2003): the IMAX age set new standards in 3D quality by emphasizing mathematical correctness of the 3D rendition and thus largely eliminated eye fatigue and pain
- Mainstream resurgence (2003–present): the digital age – single digital video projectors using either polarized 3D or active-shutter 3D systems

4. HISTORY OF AUTOSTEREOSCOPY

- The “barrier” technique was first proposed and demonstrated by the French painter G. A. Bois-Clair in 1692 – which involved dividing two or more pictures into “stripes” and aligning them behind a series of vertically aligned “opaque bars”.
- Photographic methods proposed around 1896 and first applied by Frederick E. Ives in 1903 and coined the "Parallax Stereogram“
- Since then parallax barrier viewing devices have been continuously improved but not changed in essence.
- 1908: Gabriel M. Lippmann proposed the use of a series of lenses at the picture surface instead of opaque barrier lines. The process utilized an array of small spherical lenses, also referred to as the integral method.
- In the late 1920's, several scientists, including Herbert Ives, began to consider simplifying Lippmann's integral (fly's-eye) lens array by incorporating a lenticular lens array. A big advantage was it was optically analogous to the parallax barrier screen, and could therefore draw on a wealth of barrier screen research.
- Lenticular techniques showed rapid progress in the 1960's as large corporations recognized its advertising potential.

5. TECHNOLOGY – BASIS



MULTIVIEW AS3D

FEATURES

- Content: spots, visualizations, interactive content All content must be produced in MultiView specifically.

- Database: 2D | 3D | Idea without Storyboard
- Application: 3D-in-the-Box Display 3D volume corresponds approximately to the display height for landscape displays and width for portrait displays.
- Number of viewers: arbitrary

SINGLEVIEW AS3D
FEATURES
- Professional, barrier-free display method for all types of stereoscopic data
- Content: Video and image content, visualizations, interactive content Content must be available in any stereo format or already contain 3D data from the application side.
- Database: Display of stereo content (Plug 'n Play) | Driver for various CAD applications and 3D engines (e.g.: UnrealEngine | Unity3D)
- Highest image quality and unlimited 3D volume through eye-tracking Three-dimensional capture of the eyes - real-time sub-pixel adjustment for L/R views so that each eye always sees the correct partial image
- Number of viewers: one person

6. JAVA GOLD FOR r.e.m. – A SHOW REAL

Project Mission:
- Exhibition of 400 objects of pure gold, handmade, hundreds of years ago, high detailed art/handcraft
- Presentation of the 20 most filigran / important / beautiful objects in AS3D
- No 3D data available yet

Challenge:
- Gold (Metal) can not be scanned by laser etc.
  →Photogrammetry to capture the geometrics
  →Digital Art to reconstruct the texture, surface color, gloss, reflection

Milestones:
- Taking 360 x 3 pictures in geometrically determined perspectives of each Object
- Capturing of the color texture with polarized and non-polarized filters (reflections of metal)
- Calculation of the geometry of each item by photogrammetry (360 x 3 pictures of each Object)
- Creation of a grey scale map for the reflections
- Creation of normal maps for the not included micro details of the scan
- Correction of multiple color textures of each Object (different gold types)
- Development of the gold materials with textures and maps in 3D animation software
- Layout, design and animation (movement)
- Production, rendering and provision of 4 spots with 5 objects according the storyboard