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Computer Graphics (Literature Review - 2)

Primary Paper: Cinema 3D: Large Scale Automultiscopic Display BibTex:

article{Efrat:2016:CLS:2897824.2925921,
author = {Efrat, Netalee and Didyk, Piotr and Foshey, Mike and Matusik, Wojciech and Levin, Anat},
title = {Cinema 3D: Large Scale Automultiscopic Display}, journal = {ACM Trans. Graph.},
issue_date = {July 2016}, volume = {35}, number = {4}, month = jul, year = {2016}, issn = {0730-0301}, pages = {59:1--59:12}, articleno = {59}, numpages = {12},
url = {http://doi.acm.org/10.1145/2897824.2925921},
doi = {10.1145/2897824.2925921}, acmid = {2925921}, publisher = {ACM}, address = {New York, NY, USA},
keywords = {automultiscopic 3D displays, parallax barriers}, }

Secondary Paper: 3D TV: A Scalable System for Real-Time Acquisition, Transmission, and Autostereoscopic Display of Dynamic Scenes BibTex:

@article{Matusik:2004:TSS:1015706.1015805,
author = {Matusik, Wojciech and Pfister, Hanspeter},
title = {3D TV: A Scalable System for Real-time Acquisition, Transmission, and Autostereoscopic Display of Dynamic Scenes}, journal = {ACM Trans. Graph.}, issue_date = {August 2004}, volume = {23}, number = {3}, month = aug, year = {2004}, issn = {0730-0301}, pages = {814--824}, numpages = {11},
url = {http://doi.acm.org/10.1145/1015706.1015805},
doi = {10.1145/1015706.1015805}, acmid = {1015805}, publisher = {ACM},
address = {New York, NY, USA},
keywords = {Autostereoscopic displays, camera arrays, image-based rendering, lightfields, multiview displays, projector arrays} }

@inproceedings{Matusik:2004:TSS:1186562.1015805,
author = {Matusik, Wojciech and Pfister, Hanspeter},
title = {3D TV: A Scalable System for Real-time Acquisition, Transmission, and Autostereoscopic Display of Dynamic Scenes},
booktitle = {ACM SIGGRAPH 2004 Papers},
series = {SIGGRAPH '04},
year = {2004},
location = {Los Angeles, California},
pages = {814--824}, numpages = {11},
url = {http://doi.acm.org/10.1145/1186562.1015805},
doi = {10.1145/1186562.1015805}, acmid = {1015805}, publisher = {ACM}, address = {New York, NY, USA},

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}

The primary paper chosen is Cinema 3D: Large Scale Automultiscopic Display. The second paper chosen is 3D TV: A Scalable System for Real-Time Acquisition, Transmission, and Autostereoscopic Display of Dynamic Scenes.

The second paper I choose is **3D TV**: A Scalable System for Real-Time Acquisition, Transmission, and Autostereoscopic Display of Dynamic Scenes. This paper introduces us to the introduction of 3D –TV with the implementation of 3D prototype and production of dynamic 3D scenes. 3D is derived from the binocular parallax and motion parallax which mean seeing a different image of same object with each eye.

The hunt towards 3D TV research began in 1964 Tokyo Olympic games majorly focusing on HDTV. They made a fully developed system consists of several PCs, screens, multi-projector system which produced enough viewpoints and pixels per view. There came many technologies involving the media compression and transmission but all of them failed at scalability of number of views. The production of high quality scenes became difficult because of different variation in the scenes. Later came the Holography techniques in which uses moving screens, lenses to produce the interactive holograms but this failed in real-time. The introduction Parallax displays paved the way to better 3D hologram which uses parallax barriers in front of LCDs. They explained the architecture of 3D TV in the later part which have acquisition, transmission, display phases with some encoders and decoders embedded in it. There are different phases in a 3D TV such as 1) Acquisition – This is the Phase in which the multiple number of cameras record the scene which are individually connected to card (called as PCs with high end hardware configuration). This process is also known as camera sync.2) Transmission phase – In this phase it undergoes compression and transmission processes using temporal encoding of individual streams. This procedure has many advantages like they can be introduced in a normal 2D TV and the compressed 3D video bits can be transmitted in a separate 3D- channel. They also encoded multiple 3D TV compression algorithms to support the 3D feature in a channel. They also introduced a more realistic broadband network called gigabit Ethernet which provides a top notch connectivity between encoders and consumers. This paved the way to a higher quality display implementation.3) Decoder and consumer Processing – this is responsible for receiver side rendering. This deals with the customer's views, positions and orientation view. This goes some sequence of procedures like video decoding, Pixel selection, Pixel routing, Buffer, output image. These decoders receive the compressed data and then it decodes it into a frame buffer. This data is sent over Ethernet to the consumer. The consumer follows a sequence of operations like block decompression then on to linear combination and then to the output.

The later part explains the 3D display of consumer with rear and front projection screens. In conclusion part, they explained their journey and future work. Their work has been inexpensive due to the low cost of cameras, projectors and very fast in computation. They also explained few improvements to 3D can be done in future such as improvement in the quality of rear and front projection screens and displaying images for different areas in various view-zones can be improved. Also they believe that color reproduction standards improvement leads to high quality images. They also stated few problems like positioning, focus which could be difficult for future researchers.

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Primary Paper:

I chose this article because I am very much interested in the field of 3D cinema display. Now a day's 3D movies are around each corner of the world. It is a much fun and realistic view of cinema when every movement can be felt naturalistic. But the viewers feel very inconvenient wearing 3D glasses for very long two hours. So here comes the technology, Auto-multiscopic displays which present the multiple images without the need of eyewear. The basic construction of these displays have two limitations 1) viewers have to be at a particular distance to get good experience 2) The display have cover all huge area to accommodate each viewer. This paper describes about how Auto- multiscoping displays overcome these limitations.

In the later part of the paper it tells us how it overcomes the limitations stated above. Auto-multiscoping displays solved the problem by removing the natural structures prevailing in cinemas. The construction of crossed-slits cameras in 2003 which uses two slit scheme made equal –parallax at all screen distances. Late back in 20th century, they were Parallax barriers which enabled similar tech as automultiscoping displays but they only work limited distance which is a major drawback. This drawback made them discover auto-multiscoping displays which advanced with the inclined cinema made viewers to observe the screen from different angles. But in recent years they came up with advancement in Parallax barrier with horizontal view for viewers located at different positions using eye tracking technology. In 2012 they introduced multi layers and time multiplexing in parallax barriers with advancement of image quality, higher angular range but still they cannot overcome distance range.

The journey of auto-multiscoping display started from late 1940s. With the advancements in each year by different techs made it possible to overcome the drawbacks of parallax barriers. There are two major properties to be implemented for the fully –upgrade version of auto-multiscoping displays 1) Different seating rows have different height where viewers see the display at different angles 2) Seats in each row are placed at a fixed location. To implement these properties, they introduced horizontal and vertical barriers such Horizontal and Vertical barriers which lie behind the screen. With the help of display geometry, Rays to viewer are filtered through vertical and horizontal barriers such that rays are certain angled for a specific row. The closer viewer get a specific range of rays and longer viewer get another range of rays from the barriers.

As I mentioned earlier that slanted screens in auto-multiscoping displays plays a major role, they gave a specific formula at which the screen should be angle with the vertical and horizontal barriers to get the viewer a higher quality 3D cinema. Later here they came up with the formulas for vertical and horizontal resolution as viewer can get maximum number of images. In order to overcome the focusing variations they also came with introducing Lenslets in both vertical and horizontal barriers. In the later part of paper, they explained about different display configurations and angular positions. The synthetic results in next part showed the statistics of where the screen be placed, image size, angular resolution and several other parameters. They majorly focused on the fact that seat rows are fixed and slope in the arrangement of rows. They also showcased the angular image from which each pixel originates. In the conclusion part, they explained about different stages they overcome to build this cutting edge auto-multiscoping displays.

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