



8K High Resolution Camera System

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ABSTRACT

8K Resolution camera system an system imaging system incorporates electronics in conjunction with imaging optics. A digital camera is an imaging system that includes image sensors and processors, each of which is a subsystem of the imaging system. This seminar focuses on high resolution camera systems with a resolution of 8K (7680X4320), i.e,33 million pixels. An overview of two such camera systems is discussed. One of the systems uses four sensor imaging method using four 8 megapixel sensors. This system serves as a better practical camera system as it is close packed. The other system uses three 33 megapixel sensors to achieve the desired resolutions. The high resolution camera system has to deliver a desirable response while taking into account the size constraints.

Keywords: Resolution, camera system, conjunction, optics, sensors, processors, pixels, fours sensor imaging method, four 8 megapixel sensors, 33 megapixel sensors, size constraints.

INTRODUCTION

An 8K high resolution camera system refers to a camera setup capable of capturing images or videos at a resolution of approximately 8000 pixels horizontally. This level of resolution provides incredibly detailed images with high clarity and sharpness, making it ideal for applications where image quality is paramount, such as professional film making, broadcasting and scientific imaging.

The 8K resolution offers four times the pixel count of 4K and sixteen times that of full HD (1080p), resulting in extremely detailed images with rich colors and lifelike details. This level of resolution is especially beneficial for larges screen displays or high density screens where the increased pixel count helps prevent pixilation and maintains image quality.

In this study, utilizing this methodology, we empirically examine the psychological effects of viewing 2K, 4K and 8K images at a viewing distances of 1.5H (H: screen height) (1.5 times greater than the screen height). The extra high quality 8K format enables a realistic television experience, and will be combined with special tools such as video editing system to realize effectives remote collaboration for business workspace. We evaluate the familiar impressions for the images and demonstrate the advantages of 8K over 4K and 2K systems in terms of the QOE. Moreover we examine the effect of the viewing distance on familiar impressions to verify the effective area for 8K UHDTV viewing.

The viewing distances of 0.7H, 1.5H, and 3.0H were employed, providing field of views(FOVs) of approximately 100 degree, 60 degree, and 30 degree respectively. Through these investigations, we establish that 8K UHDTV can enhances the effect of familiar impressions, and the effects can be delivered at various viewing distances, which includes the everyday viewing styles.

To fully utilize the benefits of an 8K camera system, other components of the workflow, such as lenses, storage, and processing power, must also be capable of handling the high resolution files. Additionally, factors such as lighting, composition and camera movement remain crucial

for capturing compelling visuals, regardless of the resolution.

While current transfer offers high definition quality video, live streaming application will soon shift to providing cinema quality to business.

2. LITERATURE SURVEY

Perceptual Quality Assessment of HEVC and VCC Standard for 8K video

Authors: Charles Bonneau, Jerome Fournier

Abstract: This paper [1] provides evaluated the VCC compression performance over its predecessor HEVC for 8K video resolution. Subjective

and objective quality assessment have been conducted on a selection of 8K video sequences in RA configuration.

8K Imaging Technology and its Medical applications

Authors: Kenkichi Tanioka

Abstract: This paper [2] provides an overview of 8K imaging technology development for next generation ultra high presence television and described the application of this technology to endoscopy surgery. It was confirmed that an experimental 8K endoscope clearly depicts details

that are difficult to see using conventional 2K HD endoscope, including thin blood vessels and the borders of body organs.

Quality of 8K Ultra High Definition Television viewing Experience

Authors: Yoshiki Shishikui

Abstract: This paper [3] provides an overview of the psychological effects included by 8K UHDTV images were investigated through subjective evaluation experiments and analysis of the familiar impressions in everyday television viewing experience. In addition it verified whether the 8K UHDTV design concept aimed at realizing the ultimate 2D image was verified.

An 8K Ultra High Definition Camera System for Sports Broadcasting

Authors: Sheng Huang, Xingyi Yang

Abstract: This paper [4] discussed the development of an 8K ultra high definition camera system specifically for sports broadcasting applications.

Development of 8K Ultra High Definition Camera for Next Generation Broadcasting

Authors: Munchuri Kim, jongwon Kim

Abstract: This paper [5] provides an overview of the development process of an 8K Ultra high definition camera system, highlighting the challenges and solutions encountered.

3. WORKING PRINCIPLE

The working principle of 8k high resolution camera system revolves around capturing images or videos with an extremely high level of details. It typically involves using sensors capable of recording at least 8000 horizontal pixels, resulting in sharper more detailed images. These systems often incorporates advanced optics, image processing algorithms and efficient compression techniques to manage the large amount of data generated by such high resolution recordings.

4. TECHNOLOGYS

Image sensor: The heart of any camera system, an 8K camera uses a sensor capable of capturing images with a resolution of 7680 X 4320 pixels, which is about four times the resolution of 4K and sixteen times that of full HD(1080p).

Optics: High quality lenses are essential to resolve the level of detail that an 8K sensor can capture. These lenses are designed to minimize distortion, aberrations, and other optical imperfections.

Image processor: To handle the massive amount of data generated by an 8K sensor these cameras use cameras use advanced image processors. These processor are crucial for tasks such as image decoding, noise reduction, and color processing.

Storage: With the large file sizes of 8K footage, high speed, high capacity storage solutions are necessary. This typically means using fast SSDs or high performance RAID arrays.

Connectivity: 8K cameras often features high speed interfaces like HDMI 2.1 and Display port 1.4, which can be handle the immense data throughput required for 8K video. Some cameras also offer options for streaming or transferring footage wirelessly.

Workflow: Editing and processing 8K footage require powerful l computers with specialized hardware like high end GPUs. Post production workflow need to be optimized for handling the massive file sizes and processing demands of 8K content.

Display: To fully appreciate the detail of 8 K content, a compatible display is necessary. 8K TVs or monitors provides the resolution needed to showcase the stunning visuals captured by these cameras.

Future potential: While 8K content is not yet mainstream , it offers benefits for the future proofing content. With the advancement in display technology and increasing consumer demand for higher resolutions.

ADVANTAGES

1. Higher image definition quality.
2. More detailed picture.
3. Faster action.
4. Larger projection surface visibility.
5. High dynamic range.
6. High resolutions.

APPLICATIONS

1. Film Production.
2. Broadcasting.
3. Surveillance.
4. Industrial Inspection.
5. Medical Imaging.

CONCLUSION

The conclusion of an 8K high resolution camera system would likely emphasize its ability to capture incredibly detailed images and videos, offering unparalleled clarity and sharpness. Additionally, it would highlight the potential for future proofing content creation, as 8K resolution becomes more mainstream. However, factors such as storage requirement, processing power, and compatibility with existing workflow would need consideration for its widespread adoption. Overall, the conclusion would likely emphasize the impressive capabilities of 8K technology while acknowledging the challenges and considerations involved in its implementation.

REFERENCES

- [1] K. Tanikoa, "A highly sensitive pickup tube using avalanche multiplication in amorphous selenium photo conductive target and applications" Proceedings SPIE 12025, Ultra High Definition System V, 1202506, 2023
- [2] Charles Bonneau, Wassim Hamindouche, Jean Francois Travers et al. Perceptual, "Quality Assessment of HEVC and VCC Standards for 8K Video". IEEE Transactions on Broadcasting, 68(1), pp.246-253,2022
- [3] Kenkichi TANIOKA, " 8K Imaging Technology and Its Medical Application," Journal of the Imaging Society of Japan Vol. 61 No. 627-635 ,2022
- [4] Hiromasa Yamashita Eiji Kobayashi, " Mechanism and design of a novel 8K ultra high definition video microscope for microsurgery" Heliyon, Vol. 07,2021
- [5] H. Shimamoto et al, "Compact 120 Frames /Sec UHD TV2 Camera with 35mm PL Mount Lens," SMPTE Motion Imaging J., Vol.123, No.4, pp. 21-28,2020
- [6] R. Funatsu et al, "Single Chip Color Imaging for UHDTV Camera Using a 33M –pixel CMOS Image Sensor," Proceedings of SPIE, Vol. 7875, pp. 787502.1- 787502.11,2019
- [7] Watable et al, "A 33Mpixel 120fps CMOS image sensor column-parallel pipelined cyclic ADCs,"IEEE International Solid state circuits Conference ,San Francisco, pp. 388-390, 2019
- [8] Sakaida et al, "The Super Hi-vision Codec," 2019 IEEE International Conference on Image processing, San Antonio, TX , pp.768-879 2019
- [9] Rastislav Lukac, "single-Sensor Digital Color Imaging Fundamentals in single-Sensor Imaging," Taylor & Francis Group, LCC ,Boca Raton

Florida,2018

[10] S. A. Stough and W. A. Hill,“High-Performance electro-optics Camera Prototype,” Soc. Motion Picture Television Eng. J., Vol. 110, pp .140

-146, 2018