R&D

Driving Method for Super Hi-Vision (SHV) Plasma Display Panels

NHK Science & Technology Research Laboratories is developing a large-screen plasma display panel (PDP) so that viewers can enjoy Super Hi-Vision (SHV) programs in diverse viewing circumstances. A PDP is a self-emissive direct-view device having good display characteristics, whereas SHV has 4,320 scanning lines, which is four times the number of the current Hi-Vision system, and it requires a higher scanning speed than current Hi-Vision PDPs have. We are developing a new driving method for SHV PDP.

Driving scheme for PDPs

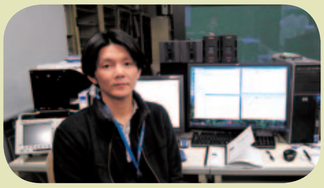
In a PDP's driving scheme, a pixel grayscale can be represented in terms of the number of light emissions, rather than in terms of the light emission intensity. A single image is divided into multiple subfields* (SFs) with various number of light emissions, and the grayscale pixel values are determined by the summation of the number of light emissions of each SF. When eight SFs are used, as shown in Figure 1, they can express grayscale values from 0 to 255. If a pixel emits light during SF 1 (1 light emission), SF 2 (2 emissions), SF 3 (4 emissions), SF 5 (16 emissions), and SF 8 (128 emissions), the total value is 1 + 2 + 4 + 16 + 128 = 151, representing a grayscale value of 151.

In this scheme, light-emitting pixels are selected by a single scanning line (address). Since the address time is proportional to the number of scanning lines, and SHV has four times as many scanning lines as Hi-Vision, it is necessary to reduce the processing time for addressing. We have proposed a new driving method to shorten the address time by employing multi-line simultaneous scanning method.

Technique of simultaneous scanning of multiple lines

In multi-line simultaneous scanning method, multiple lines in a vertical sequence are scanned at a time (Figure 2). For example, scanning simultaneously two vertically consecutive lines cuts the address time in half. However, because it yields identical number of light emissions over multiple vertically aligned pixels, it can potentially degrade the display's image quality.

To solve this problem, we exploited the fact that a human's visual frequency sensitivity is lower for a low-contrast image, and decided to employ simultaneous scanning of multiple lines only on SFs with a smaller number of light emissions. This resulted in a suppression of the image quality degradation and reduced the address time. We are now making progress on a PDP for SHV based on this method.



Takenobu Usui,
Display & Functional Devices Research Division

* Subfield: image generated by dividing a single frame by each number of light emissions.

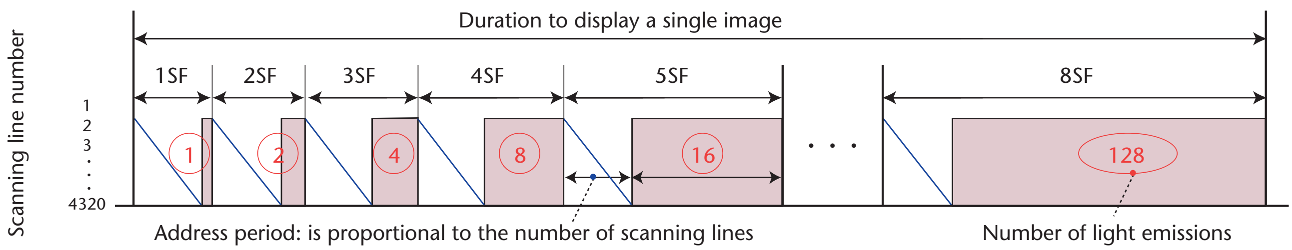


Figure 1: PDP driving scheme

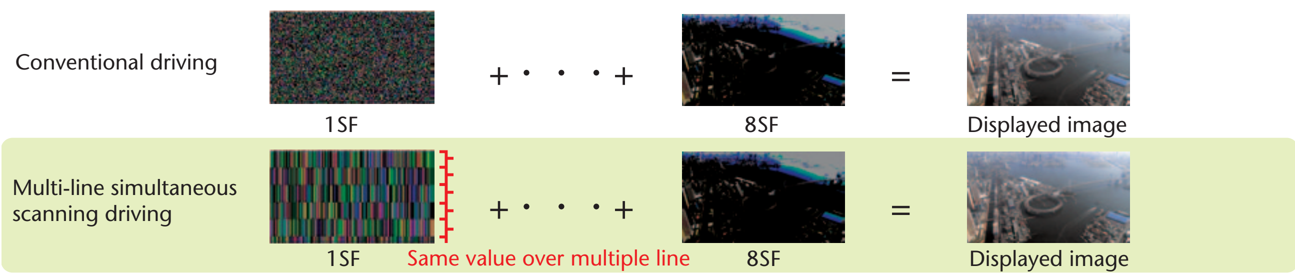


Figure 2: Multi-line simultaneous scanning method

Technology to Enhance Reliability of Wireless LAN Video Transmissions

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The spread of high-speed wireless IP communications has enabled easy video transmissions using portable terminals and wireless LAN. However, the quality video transmitted from moving wireless terminals are sometimes affected by obstructions, which can cause communication interruptions or decreased transmission capacity. For this reason, the Science & Technology Research Laboratories is conducting studies to enhance video transmission reliability over wireless IP communications. This article describes a technology to prevent video distortion due to wireless LAN interruptions.

Video distortion from an interruption occurs when data do not arrive in time for display at the receiver. Video quality will not be affected if the interruption in communication is short enough and video data can be retransmitted to the terminal on time for display. Therefore, to reduce the duration of the interruption and prevent video distortion, we constructed a transmission device that secures multiple wireless LAN paths and makes it possible to switch to one path of another path when the transmission is interrupted (Figure).

The time it takes for data lost to interruptions to be retransmitted varies with the length of interruption, wireless LAN transmission speed, and video rate. Our examination shows that the upper limit for an interruption in transmission (allowable interruption time) for which it is still possible to deliver all of the video data before display time, including the retransmitted data, can be calculated in advance in order to control the detection and switching of the wireless LAN path.

Interruptions are detected by sending actual test data across every LAN path and measuring their arrival times and ratios. Although a shorter test data transmission interval can detect an interruption earlier, it also causes a decrease in the video data transmission capacity or makes a transmission unstable because of frequent path switching in response to slight variations in the transmission paths. Our newly developed transmission device is capable of setting up appropriate test data transmission based on the aforementioned conditions, switching the wireless LAN paths within the allowable interruption time without reducing the video data transmission capacity.

Our future work will be to enhance the reliability of video transmissions using wireless IP communications through the use of technology to adaptively adjust the video rate to transmission capacity variations and a more accurate way to measure the path status.

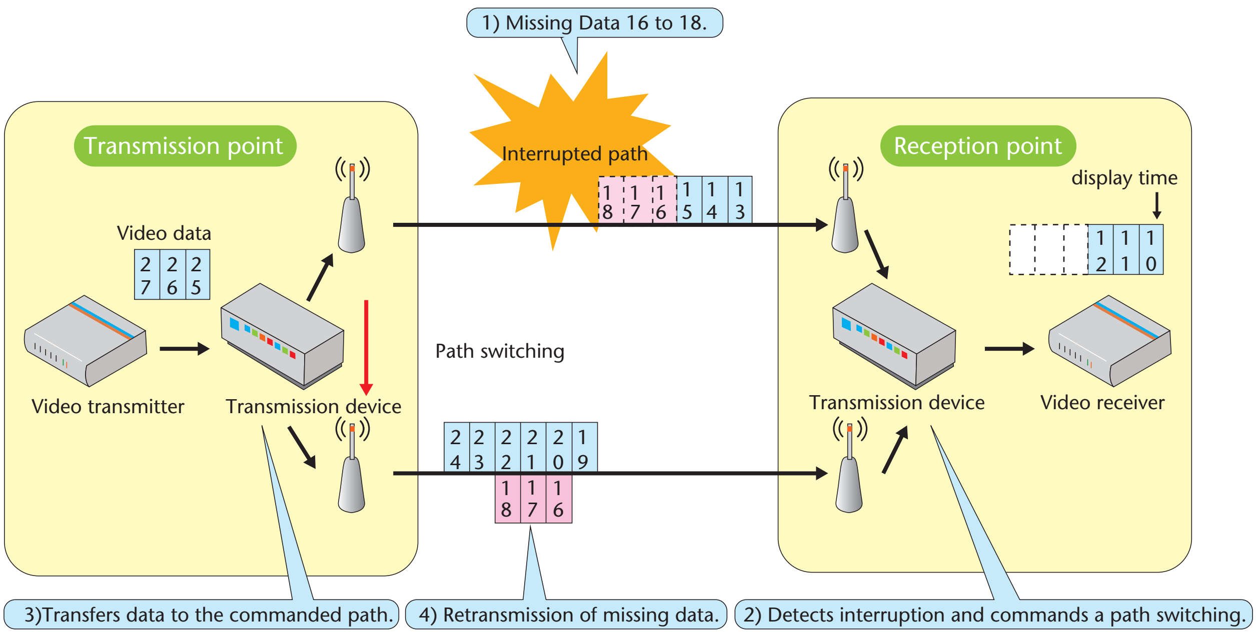


Figure: Enhancing reliability for video transmission over wireless LAN

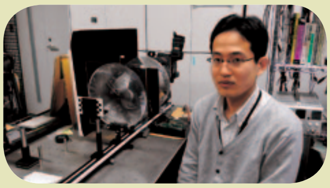
Technique to Expand Horizontal Viewing Zone on Integral 3D Television

The Science & Technology Research Laboratories are researching an integral three-dimensional (3D) television that displays natural autostereoscopic video by reproducing an image on a television screen in the exact way we see an object with our eyes. An integral 3D TV system consists of a camera, display, and an array of micro-lenses (elemental lenses). During shooting, the optical rays from an object form elemental images in going through the lens array. To reconstruct an optical image of the object, these captured elemental images are projected back through the lens array onto the screen to reproduce optical rays equivalent to those from the object.

In this integral 3D TV, the horizontal and vertical viewing zones where a 3D image can be viewed are determined by the angles between the center of each elemental lens and the right and left edges and top and bottom edges of the elemental images that correspond to the individual lenses. The conventional technique uses a circular elemental image, which forms a symmetrical viewing zone horizontally and vertically (Figure 1).

It is assumed that the viewers watching 3D TV together will be positioned side-by-side. This prompted us to expand the horizontal viewing zone compared with that of the vertical one by constructing a technique to prioritize the horizontal direction.

Widening the horizontal viewing zone makes it necessary to utilize elemental images that are longer in the horizontal direction than in the vertical. Therefore, we arranged a rectangular elemental with a longer width and shorter height and slanted the lens array to prevent overlapping of multiple elemental images (Figure 2). These adjustments expanded the horizontal viewing zone compared with that of the conventional technique; alternatively, the vertical viewing zone narrowed (Figure 3). The adjustment also allows elemental images to be aligned without gaps, which results in a more efficient use of the pixels in the video system in comparison with circular elemental images.



Masato Miura, Advanced Television Systems Research Division

We will enhance the 3D image quality by increasing the pixel count in the video system, and we will examine the video quality that would be needed for a three-dimensional television system.

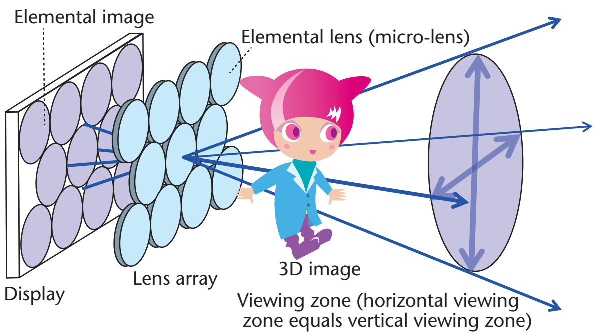


Figure 1: Viewing zone of conventional integral 3D TV

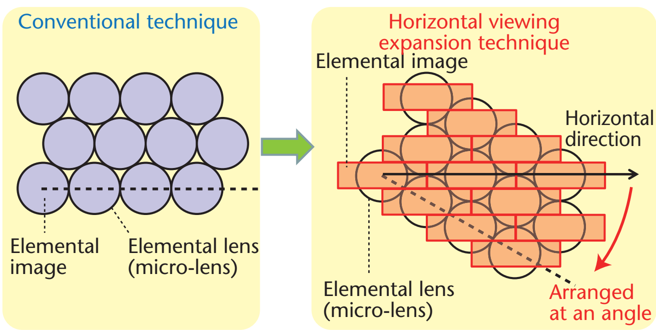


Figure 2: Elemental lens and elemental image arrangement

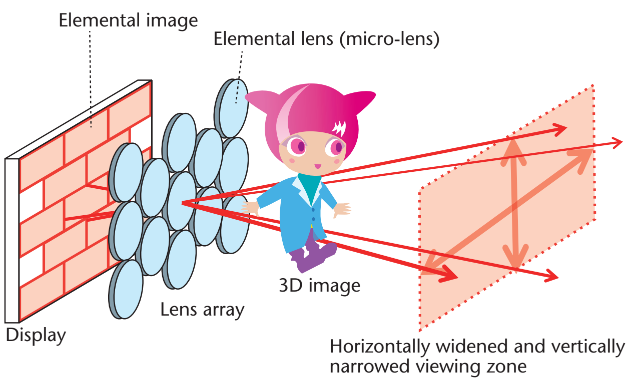


Figure 3: Viewing zone of new integral 3D TV with expanded horizontal viewing zone