The Display Solution of Mitsubishi Electric

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1. Introduction

Since the beginning of development, Diamond Vision has focused on high-quality displays, advanced display functions, and system technology to suit various markets. Recently, Mitsubishi Electric has developed a stream delivery function for high-definition visual contents, and the market is being expanded by adding value to the visual information system.

2. Display Technology of Diamond Vision

Since 1980 when Mitsubishi Electric introduced Diamond Vision, the world's first full-color large-screen display system, the company has been offering high-quality displays with advanced functions.

2.1 High-quality displays

(1) Luminous uniformity

Before each Diamond Vision is shipped, the luminance of all R (red), G (green) and B (blue) light emitting diode (LED) devices is adjusted to ensure uniform luminance over the entire screen.

(2) Color reproducibility (Color conversion technology)

Colors produced by uncorrected LEDs look unnatural because their color reproduction range differs from those specified by the National Television System Committee (NTSC), Phase Alternating Line (PAL) and other standards. Diamond Vision can be tuned close to NTSC or PAL by independently adjusting each individual color point corresponding to R, G, B, in addition to Y (yellow), C (cyan), M (magenta) and W (white) on the chromaticity diagram.

(3) Full digital processing

In the video signal processing circuit, interlace-progressive (I/P) conversion, image size conversion and color conversion are performed on direct digital signals. Initial video data can also be received as direct digital signal, enabling full-digital high-quality pictures at every stage through to the final display.

(4) High definition

For events or other indoor applications, various screen sizes need to be constructed by combining multiple display modules which are high definition, compact, and easily transportable. Mitsubishi Electric has developed and released product lines with pixel pitches of 6, 4 and 3 mm (Figure 1).

2.2 Advanced functions

(1) Digital screen controller

(a) Compatibility with Various Video Formats

The digital screen controller simultaneously accepts four video source inputs, each of which can be compatible with either conventional analog video signal, high-definition video signal, or video signal from a PC (DVI: Digital Visual Interface).

(b) Reduction in frame delay

During live display at events, a long frame delay causes a problem with lip sync (synchronization of audio to video). Therefore, we have selected an I/P conversion method without any frame delay, providing a system configuration having less delay.

(2) Automatic power consumption control

The average power consumption of the next image frame, to be displayed is continuously monitored; if it exceeds the preset value. Then the automatic power consumption controller reduces overall luminance.

(3) Image creation technology

Mitsubishi Electric has developed a proprietary rendering function that displays animations, still images, text, etc. on the screen.

(a) Image transition effect function

Figure 2 shows an example of an image transition effect. Currently, about 60 effect components are

Fig. 1 High resolution type of diamond vision for indoor use

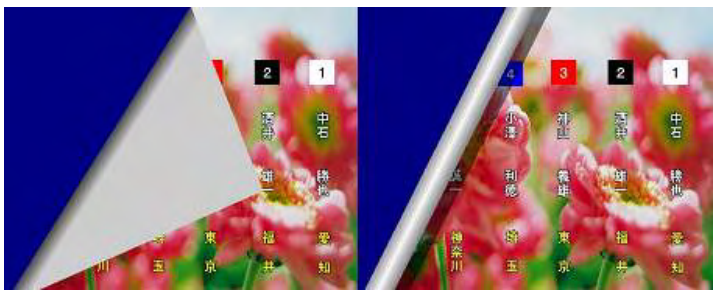

Fig. 2 An example of a transition effect

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available. With our rendering function, parameters of the transition effects are specified in scripts, allowing additional effects to be easily produced to meet the user's needs.

(b) Super-long display

Mitsubishi Electric offers a horizontally super-long screen for use in sports stadiums and grounds. Mitsubishi Electric offers a range of screens approximately one meter in height and over 100 meters in length. As shown in Figure 3, a PC image is divided into multiple strips having the same pixel counts. Each strip of display area is sequentially transmitted by the display controller to reproduce a horizontally super-long video image.

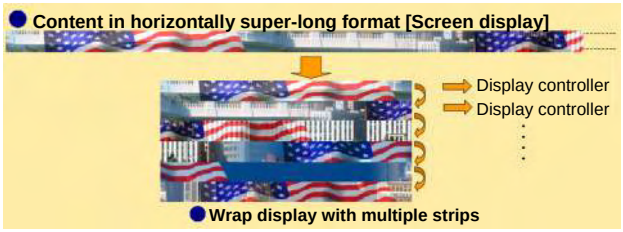

Fig. 3 Rendering function for super-long screen

3. Visual Contents Delivery System

As broadband networks have spread in recent years, the need has grown for a system that integrally controls multiple display units and delivers timely information over the Wide Area Network (WAN).

The features of Mitsubishi Electric's "High Definition Content Delivery System" are discussed in the following sections.

3.1 Hybrid delivery

This system supports the following three delivery methods. The most appropriate method can be selected depending on the application.

(1) Stored delivery method

This method is used for the images such as advertising or store promotion videos, which do not need frequent changes. These video images are delivered in advance when network traffic is low and stored as files in the display terminal.

(2) Stream delivery method

For immediate video images such as live coverage of an event and emergency broadcasting, input images are sequentially encoded, delivered in a stream, and displayed.

(3) Real time delivery

Video images of news and weather forecasts are generally created using text information. Such text information alone is delivered to each terminal as needed, and the image is created in real time by the terminal to display continually changing information without delay.

3.2 Distributed delivery method

With the conventional method, when high definition visual content was delivered to multiple terminals, the large file sizes made it difficult to deliver the data within a practical time.

To improve the system performance, the distributed delivery method has been developed as shown in Figure 4. With this method, when each terminal receives an image from the server, it re-delivers the image to other terminals, reducing the delivery time to just one-fifth upto one-tenth of the conventional method.

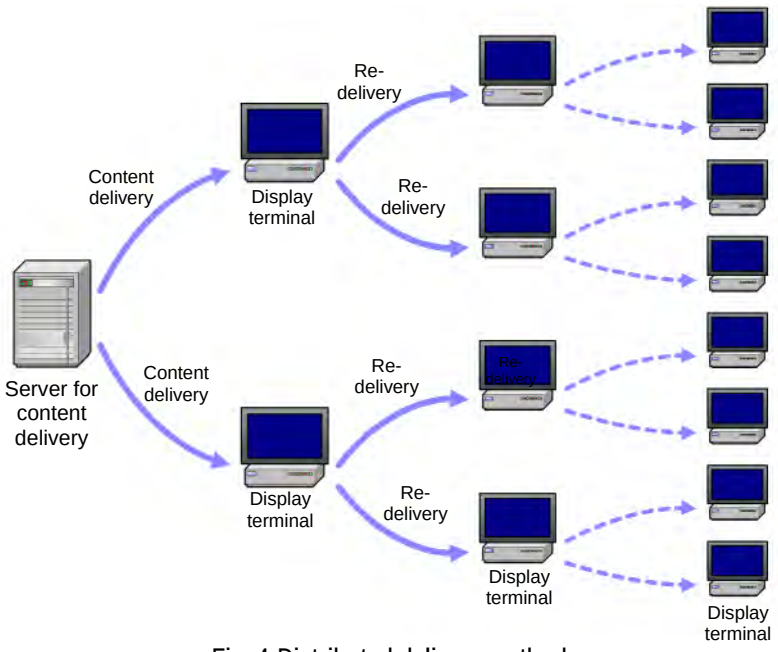

Fig. 4 Distributed delivery method

3.3 Example of system configuration

Figure 5 shows an example configuration of this system. The center system consists of a delivery control server, an editing terminal, a stream server and other devices. (The delivery control server performs overall system control, storage and delivery of contents, etc.; the editing terminal registers and edits contents; and the stream server performs the stream delivery of video images.) Concerning the display systems, Display terminals are connected over the network to the center system, and display the contents according to the schedule delivered from the center system.

Using the technologies introduced in this paper, Mitsubishi Electric will persistently provide better services in existing fields and develop new markets.

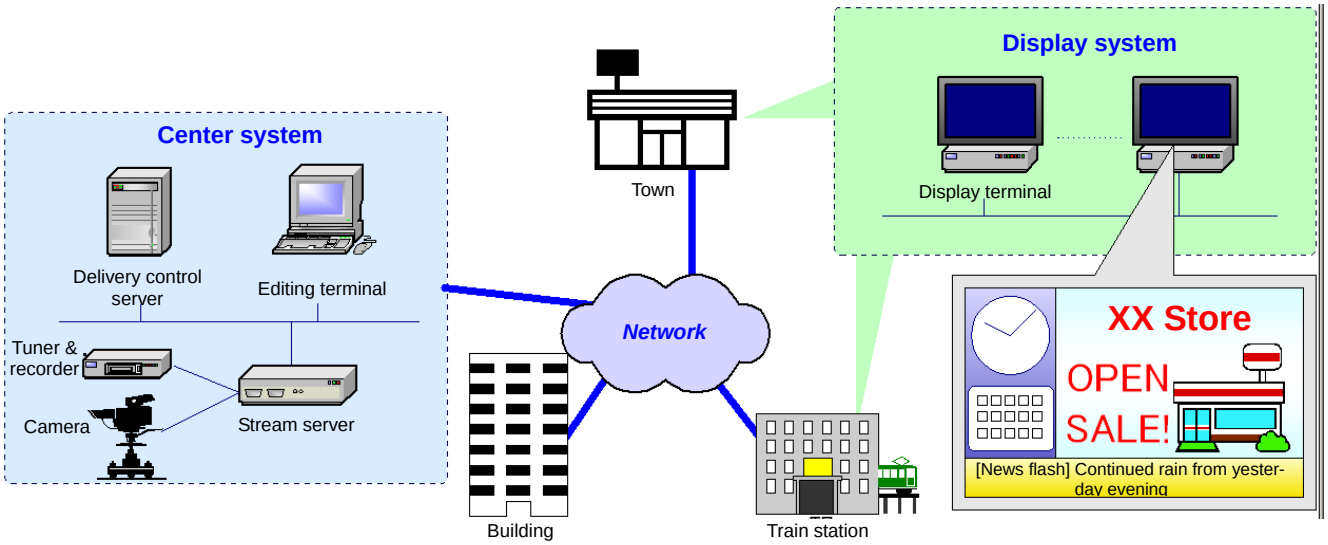

Fig. 5 Example of high-definition content delivery system