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Development of MPEG-2 Video Multiplexing Technology for Variety of HDTV Program Production

NTT has developed video multiplexing technology capable of transmitting two bi-directional channels of HDTV^{*1} MPEG-2^{*2} video over ATM^{*3} lines. This technology controls the effects of cell delay jitter that can affect video quality during ATM transmissions. It also enables the multiplex transmission of two channels of HDTV MPEG-2 video in a portable and compact format, a world's first, through optimal hardware/software design.

These features make it possible for a broadcasting station or program-production company to transmit two channels of live, high-definition video in real time from the field or elsewhere, enabling the production of HDTV programs using various video materials.

<Development Background>

NTT Cyber Space Laboratories has been developing a low-cost PC board capable of multiplex transmission of live MPEG-2 video in anticipation of the coming HDTV era. This technology adopts a new mechanism that aims to achieve even faster transmission processing and to raise transmission quality by controlling the effects of signal jitter. This MPEG-2 video multiplexing technology is introduced here.

<Technical Features>

1) Processing speed making full use of ATM-circuit potential

Implements transmission processing in dedicated hardware to achieve processing speeds that enable two bi-directional channels of HDTV MPEG-2 video at the maximum rate (135 Mbps) of OC-3 circuits^{*4}, the most common type of ATM circuit. Supports the multiplex transmission of video materials for broadcast use transmitted at the usual 60 Mbps.

2) Superb transmission quality conforming to MPEG-2 standards

When sending video over ATM lines, various network effects combine to generate subtle disparities as the cell arrival interval widens or narrows compared to cell input time. If such disparities are not corrected, color offsets and video flicker will occur preventing the video materials in question from being used for broadcasting purposes. The proposed technology adopts a new mechanism that compensates for the effects of ATM cell delay jitter using the common clock of the ATM network, and consequently provides superb transmission quality conforming to MPEG-2 standards.

- 3) Compact configuration through optimal hardware/software design Achieves a compact 1U half-rack size (W210 x H43.6 x D459.3 mm) and excellent cost performance by implementing MPEG-2 transmission in hardware to achieve high speeds and complex protocol processing in software through optimal-design techniques. This provides a large space-saving effect making it easy to set up the equipment even at a news gathering site outside the broadcasting station.

<Future Plans>

Studies are also on the way at NTT Cyber Space Laboratories on the application of video multiplexing technology to the IP network in addition to ATM lines. For the future, we plan to deal with the expected demand of multiplex transmission through the use of standard equipment above OC-3 (e.g.OC-12) and the development of next-generation multiplexing technology having a multiplexing level of eight or higher.

<Terminology>

***1: HDTV (High Definition Television)**

A broadcasting system featuring greatly improved picture and sound quality compared to conventional television by increasing the number of scanning lines, widening the screen, and digitizing audio.

***2: MPEG-2 (Moving Picture Experts Group-2)**

Within MPEG, an international standard for the compression of moving pictures, MPEG-2 is a standard coding system for high-quality video such as in standard television and HDTV. It can also be applied to DVD and digital television broadcasting.

MPEG-2 stipulates that time information buried in transmitted data must arrive in a highly precise manner within ± 0.5 microseconds.

***3: ATM (Asynchronous Transfer mode)**

This technology breaks down any type of information such as audio, data, or video into 53-byte cells for transmission over the network. ATM is not dependent on transfer rate; it can integrate and handle all kinds of media and can communicate at high speeds. It can also provide a common network clock for each ATM terminal.

***4: OC (optical carrier)**

A series of transmission rates in an optical synchronous transmission network standardized by ANSI (American National Standards Institute). The basic transmission rate of 52 Mbps is called OC-1 (optical carrier-level 1) with higher rates of n times 52 Mbps referred to as OC-n. OC-3 therefore corresponds to a rate of 155 Mbps (a maximum rate in actual execution of 135 Mbps after subtracting headers and the like) and OC-12 to 622 Mbps.

- [Attachment \[Prototype Specifications\]](#)
- [Multiplexing Services \(1/3\)](#)
- [Multiplexing Services \(2/3\)](#)
- [Multiplexing Services \(3/3\)](#)

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