Audio-to-Video Delay Correction Technology Introduction

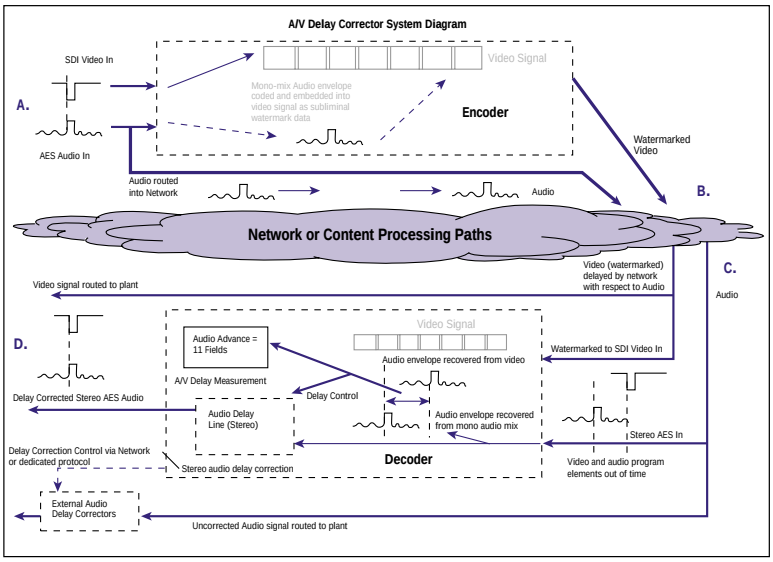

FIGURE 1

Synchronized audio and video programming enter the encoder at point A. The program audio envelope is coded and embedded into the video signal as subliminal watermark data. **B.** The watermarked video and program audio are routed to the normal distribution network. **C.** The program video and audio leave the network with video delayed relative to the audio, i.e. audio-to-video delay. At this point the program audio and video are applied to the decoder/corrector which detects and decodes the audio envelope from the watermarked video. **D.** The timing shift between the recovered audio reference and the original audio signal is measured and used to control an audio delay block which continually re-times the audio to the video signal.

Separation of audio and video processing and inherent delays within the video path create an advance on the audio which is unacceptable to the human brain. Current techniques for correcting this have included insertion of a fixed delay in the audio path, often set to ensure that the audio is always late with respect to the video.

Over the last few years, the increasing application of digital processing in studios and post-production environments has introduced greater latency in the video path. This in turn has caused increasing problems in maintaining audio to video synchronization. In a single channel environment, this has proved difficult to manage. Today's multi-channel environments have created a real demand for an automatic solution that to date has not been available.

A/V DELAY IN THE DTV ENVIRONMENT

While current methods for controlling audio-to-video timing errors can correct delays introduced by the broadcast plant's video frame synchronizer, the same can not be said for variable audio-to-video delay errors introduced upstream from the broadcast plant. Cumulative differences created by concatenated equipment in the video program chain, different signal paths for video and audio signals, excessive video processing and improperly functioning time-code can all create sudden shifts or gradual variations in the relative timing of the audio and video signal. However, recent developments by Tektronix in digital watermarking technology offer an entirely new approach to controlling variations in audio-to-video delay timing.

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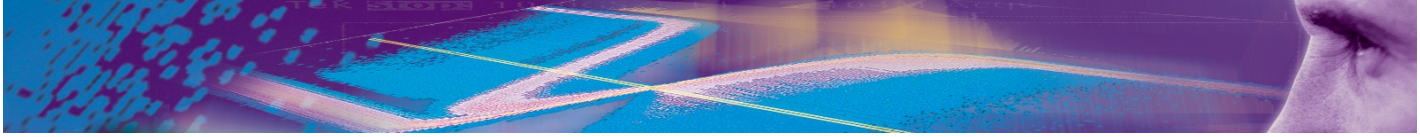

DIGITAL WATERMARKING OFFERS NEW SOLUTION

Digital watermarking is a well-known buzzword for a technology that is most often associated with the identification and copyright protection of intellectual property over the Internet. Originally developed in the mid-90s to protect still images, it is now being applied to other digital media ranging from web music, DVD and digital television broadcasts. Basic digital watermarking technology uses an arrangement of very low-level "patterns", representing digital bits, to encode extremely low-level ID information. This pattern embedded within a video signal creates a "fingerprint" that's invisible to the viewer but easily decoded by the copyright owner for positive proof of ownership.

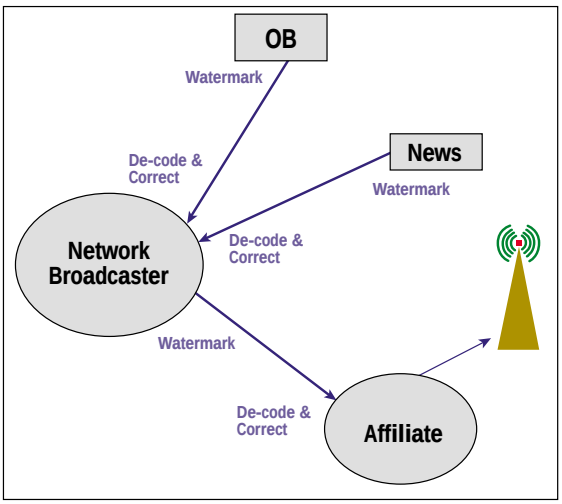

FIGURE 2
Typical Broadcast Network Installation.

NEW APPROACH TO AN OLD PROBLEM

Digital video watermarking actually has a number of applications, including an entirely new approach to monitoring and correcting audio-to-video delay errors. The solution (see Figure 1) involves using digital watermarking technology to record the desired audio-to-video timing relationship by encoding the program video signal with an audio reference code derived from the audio program's natural envelope "signature". At any point downstream the digital watermark can be detected in the program video and the audio timing reference recovered and compared to the program audio signal. Any time shift between the watermarked audio timing reference and the original audio signal is an indication that an audio- to-video delay error has occurred. Further, the timing error can be continually measured and used to control an audio delay circuit to ensure constant and proper alignment of the program audio and video signals as referenced at the point of original watermarking. Not only can this technique provide real-time, fully automated correction of audio-to-video delay but it can do so in-service because, unlike current methods for measuring A/V delay, there are no interfering audio test "chirps" or video test signals required that disrupt the actual program material.

In the typical broadcast network scenario (Figure 2), watermark encoders are used at the point of program origination (such as an outside broadcast or news event) to "time stamp" the video program with an audio time reference. At the network central facility a decoder is used on incoming programs to decode the audio time stamp within the watermarked video and control an audio delay circuit. The watermarked video continues throughout the plant until final master control output, where the watermarked video is again decoded and audio-to-video delay corrected before final transmission.

For further information, contact Tektronix:

Worldwide Web: for the most up-to-date product information visit our web site at: www.tektronix.com/Measurement/video_audio/

ASEAN Countries (65) 356-3900; Australia & New Zealand 61 (2) 9888-0100; Austria, Central Eastern Europe, Greece, Turkey, Malta,& Cyprus +43 2236 8092 0; Belgium +32 (2) 715 89 70; Brazil and South America 55 (11) 3741-8360; Canada 1 (800) 661-5625; Denmark +45 (44) 850 700; Finland +358 (9) 4783 400; France & North Africa +33 1 69 86 81 81; Germany + 49 (221) 94 77 400; Hong Kong (852) 2585-6688; India (91) 80-2275577; Italy +39 (2) 25086 501; Japan (Sony/Tektronix Corporation) 81 (3) 3448-3111; Mexico, Central America, & Caribbean 52 (5) 666-6333; The Netherlands +31 23 56 95555; Norway +47 22 07 07 00; People's Republic of China 86 (10) 6235 1230; Republic of Korea 82 (2) 528-5299; South Africa (27 11)651-5222; Spain & Portugal +34 91 372 6000; Sweden +46 8 477 65 00; Switzerland +41 (41) 729 36 40; Taiwan 886 (2) 2722-9622; United Kingdom & Eire +44 (0)1344 392000; USA 1 (800) 426-2200.

From other areas, contact: Tektronix, Inc. Export Sales, P.O. Box 500, M/S 50-255, Beaverton, Oregon 97077-0001, USA 1 (503) 627-6877.

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