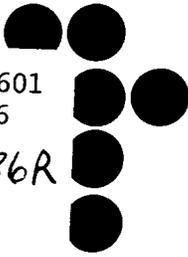


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VIDEOCASSETTE COPY PROTECTION

John Ryan, Macrovision
Barry Schwab, CBS/Fox Video

December 4th, 1986

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
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Genga Arulampalam, Rapporteur

VIDEOCASSETTE COPY PROTECTION

In his opening remarks, the moderator re-phrased the topic as "copy protection, can it work?" He further identified four parameters that must be satisfied to effectively "copy-proof" a recording:

- playable on standard tape-recorder
- not copyable on normal tape-recorder
- signal playable on standard TV set
- copy protection mechanism should not be easily, legally reversible.

Barry Schwab - CBS/Fox Video

Schwab noted at the start of his presentation that there are many possible reasons for concern in the area of copy protection. He added that one's reaction/response is dependent on the type and extent of personal set-back suffered as a result of such copy protection. From CBS's point of view, he stated that they felt they were facing significant revenue losses due to illegal videocassette copying, particularly because of escalating costs.

He used a hypothetical example to illustrate his point. For instance if the videocassette rights are bought for \$12 million and the recorded videocassettes are sold to retailers for \$60 each, then the resultant profit on each tape would be \$50 (cost of production \$10). After selling the break-even number of cassettes (about 300,000 copies) a royalty fee is often due to the film producer on each additional cassette sold (approximately \$25 per cassette), thus reducing CBS/Fox's profit margin. Therefore, though "no one is going broke selling movies," there

is, he said, a need to be concerned, because, apart from the moral issue, there is the revenue from the sale of these tapes that goes toward keeping the wheels of movie production and duplication turning.

Schwab then referred to two types of systems, the unilateral and the bilateral. The unilateral system is the type developed by Macrovision which involves just the coding of the signal on the tape. CBS/Fox, he said, is working on a bilateral system that has tape coding and also requires the video recorder to have a sensor to look for the signal. He pointed out that there are about 30 million videocassette recorders (VCR) in the country at present, and while none of them are capable yet of using the bilateral system the Macrovision unilateral system can be used on these machines effectively. In the longer term however, the bilateral system, if implemented, could better differentiate between legitimate and illegitimate copying.

Finally, he said that a couple of years ago many people thought the problem had been resolved in a Supreme Court decision involving Sony (Betamax) and Warner Bros, MCA/Universal, and Walt Disney. However, the only thing that was resolved was the legality of taping-for-time-shift off broadcast TV. None of the other issues like cable TV, pay TV, and VCR tape-to-tape copying was touched on, and he believed, based on past history and the Copyright Act, that all of these are clearly illegal.

John Ryan - Macrovision

Ryan began by clarifying the difference between scrambling systems and copy proofing systems. The Scrambling system requires a decoder (descrambler) at the receiving end to make the picture signal viewable. However, in a copyproof system the coding does not affect the normal viewing of the picture but distorts the signal that is copied, significantly reducing its quality. Therefore a decoder is not required in a copyproofing system.

He then defined the unilateral system and bilateral systems as did Schwab. He added that the unilateral system must work in the environment of all existing VCRs (about 30 million), and TV sets (about 180 million), and may become less and less effective if VCR manufacturers choose to make design changes to defeat it. As such, it is probably a somewhat short-term solution. On the other hand, the bilateral system requires the cooperation, voluntary or involuntary (by legislation), of VCR manufacturers to include special circuits in the new VCRs. Initially it would have low effectiveness but will become more effective as the older VCRs are phased out.

Discussing further the unilateral system, Ryan noted that the VCR had a 'record system' as well as a 'playback system.' As such, an effective unilateral copyproofing system should be designed such that the modified video signal appears normal to the 'playback system,' and the TV set, and interferes only with the 'record system.' He also added that such a copyproofing system should ideally exploit a fundamental property

of the VCR recording system rather than just a design peculiarity as was done in the development of the "Copyguard" system a few years back. Because of this, "Copyguard" had playability problems and not much effectiveness. The result was that the system did not develop widespread usage.

In developing the Macrovision process, Ryan stated that they researched to find a fundamental difference between the method of signal processing in the TV set, and the VCR. The VCR manufacturers, he said, had designed the VCR with very little fundamental operating variance from that of the TV set. However, they discovered that the automatic gain control (AGC) systems in the VCR and the TV set were fundamentally different. The VCR's AGC operated on base-band video, and video from the tuner, while the TV set's AGC operates on a radio frequency. The AGC system for the tuner section of the VCR is similar to the AGC found in the TV set, but in addition the VCR has a "Main AGC" system that processes the base-band. It is this Main AGC system that the Macrovision process exploits, by introducing, during certain lines of the vertical integral, a series of pseudo-sync pulses followed by transitions that go way up to white and beyond. The VCR is therefore triggered into measuring the video level by the trailing edge of these pseudo-sync pulses instead of measuring the energy in the sync, thus significantly reducing the strength of the recorded signal. The net result being that about 75% of the time the signal is not viewable. He then showed samples of the resultant pictures that are substantially distorted. The pulses are also amplitude modulated at a cyclical rate to further reduce the quality of unauthorized copying. For legitimate

copying the standard recording machines, he said, can be easily modified using a small circuit board as done by Panasonic.

Ryan then defined two important features of any anticopying system: playability, and effectiveness. Playability is the percentage of VCR/TV set combinations which generate acceptable pictures from the encoded videocassette. Effectiveness is the percentage of illegal copies which generate unacceptable pictures. An ideal anticopying system effectiveness-playability curve is shown in exhibit A together with the Macrovision operating point. The Macrovision process, he said, has been in use for about 12 months and there are in the region of 10-15 million cassettes out in the market. The playability problems they had found in practice are as follows:

- real playability problems (taken care of two months ago)
- problems caused by 'dubbing hookups'
- manufacturer's start-up problems
- ordinary manufacturing defects
- illegal copies
- attempts to discredit the process

The process, he said, is now being used by most of the movie producing companies - Universal, CBS/Fox, MGM, Disney, HBO, Warner, etc. Also, the processing electronics has now been installed in almost all the major duplicating houses and a number of the smaller ones too. The problem, he added, is not just faced by the large Hollywood companies but also many small video producers, and they too need copy protection to safeguard their businesses.

In closing, Ryan stated that Macrovision believes that the copyright owner has the right to protect his investment from

any unauthorized replication, and that the consumer has the right to the best quality product, both of which the Macrovision process provides.

Barry Schwab - CBS/Fox Video

Schwab then played a tape that was produced for the Senate Judiciary Committee hearing in October 1986. The tape had three parts:

- playback of bilateral encoded original (legitimate copy)
- playback of an unauthorized copy on a standard machine
- playback of a legitimate copy (i.e. copy of unencoded tape) made on a machine that has a detector.

The first and third parts produced normal playback. The third part did not have any false triggers. The second part had finite interruptions lasting about 16 seconds each. The interruptions were on a random basis to prevent/delay anyone attempting to "break the code." A typical movie, he said, would have 700-800 such interruptions. He made no claim that this was the only system that should or will work. CBS/Fox made this tape purely for demonstration and hopes to patent the technology within the next few months.

However, they do not plan to make money by licensing the technology to manufacturers. Schwab did not reveal the precise technology because it was pending patent registration but he conceded that it had the code signal mixed with the legitimate signal in the picture area.

Speakers' Comments and Responses to Questions

Referring to the bilateral system, a member of the audience asked what would prevent a manufacturer from introducing a PC board such that it could be easily removed when making unauthorized copies. Schwab responded that this was one of the key reasons for patenting the process and licensing it to manufacturers, so that CBS/Fox could maintain some degree of control over the process and supervise the manufacturers integrity.

Answering the question of comparative economics related to the unilateral and bilateral systems, Schwab said that the bilateral system is minimally more expensive (by a few cents). However, he assessed the overall additional cost to be less than 25 cents. While the specific encoding cost would depend on the method, he said it would still be minimal.

Considering the lead time required for the bilateral system Schwab was asked whether the system was ready for implementation. Schwab stated that the system was not yet perfected and was due to be ready by Summer 1987. However, he added that the earliest he would expect the legislation to be completed was January 1988.

Responding to a question as to why movie rights are so expensive Schwab said that people owning those rights "know how to do their math!" It is effectively a demand based price.

MACROVISION ANTICOPYING PROCESS

