

Title : Method and apparatus for programmable control of a recording apparatus.

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The invention relates to a method and apparatus for programmable control of a recording apparatus, particularly a magnetic video recorder for recording television signals.

10 Systems for programming the time and duration of recording of television broadcasts, which systems are currently employed in video recorders, enable control of the selection of the broadcast channel, the time of initiation of recording, and the duration of recording. However, the time of starting of an actual broadcast and the duration of said broadcast are variable, due to failure of broadcasting networks to
15 adhere to broadcast schedules, and in particular due to commercial segments of variable duration prior to the broadcast which is sought to be recorded, as well as interruptions, e.g. commercial interruptions, during said broadcast, on certain networks.

Therefore, when the user programs his recorder to select the
20 channel, starting time, and duration of recording, in accordance with published broadcast schedules, the recording may begin before the desired signal is broadcast, wherewith the initial part of the recording contains the end of the preceding broadcast program material, or (most often) contains the preceding commercial segment; or the recording may
25 begin after the start of broadcasting of the desired signal, wherewith the recording omits the initial part of said broadcast.

Another disadvantage of the customary system is that the said preceding commercial segment or end of the preceding broadcast program may take up important space on the recording medium (e.g.
30 magnetic tape) such that insufficient space remains to record the lattermost part of the desired broadcast.

A number of solutions to this problem have been proposed.

According to one of these, all broadcast video signals other than those of the commercial segments are encoded. A decoder at the input of the tuner of the recorder prevents initiation or continuation of recording unless and until the code signal is present in the video signal.

5 The disadvantage of this solution is that it imposes the inconvenience of requiring encoding of the video signal during the entire broadcast. Moreover, the encoding does not indicate the start or end of a desired broadcast signal but only the presence or absence of such a broadcast signal. Accordingly, if the preceding broadcast is extended
10 beyond the scheduled time for the start of the recording, the recorder will begin recording because the system detects an encoded broadcast. (Apparently the encoding currently employed does not contain discriminating identification of the given broadcast.)

 According to another solution, the audio signal is utilized to carry
15 information as to the start and end of a broadcast, and Interruptions during the broadcast. This system enables timely starting and stopping of recording, but it is not very flexible, and is not adaptable to changes in the transmission process. It allows encoding according to the type of broadcast but not particular encoding for each broadcast (which would
20 be difficult to manage).

 The invention aims to avoid these disadvantages by means of a method and apparatus which enables recording of a television broadcast from beginning to end, with accurate timing, and with non-recording of Interruptions. It further enables identification of a
25 particular broadcast.

 Some existing encoding systems digitally encode the audio band; others encode the entire television signal. These systems employ a defined pattern of digital signals which can be used for carrying audio and video signals as well as data.

30 E.g., for some time some television networks have transmitted part of their programming, particularly cinematic programming, with stereophonic sound. The system used for such broadcasts is known as

NICAM. NICAM allows signals to be transmitted corresponding to digital codes in the two stereophonic sound tracks, whereafter reception the digital codes are regenerated.

Another system, digital video broadcasting (DVB), is a new standard for digital broadcasting of audiovisual signals. Currently it is in operation in certain satellite-mediated systems, but is planned for operation also with cable and with standard terrestrial broadcasting. It has the advantage of providing audio and video of unprecedentedly high quality, and enabling a plurality of programs to be received via a single link. DVB can also facilitate interactive services (e.g. voting, program selection, games, etc.).

Technically, DVB has two parts -- an MPEG encoder, and a signal processing and transmission apparatus. The MPEG encoder is present at the head of the transmission arrangement under the DVB system; it accomplishes digitalization and compression of the audio, video, and data information.

The object of the present invention is to adapt such a system, i.e. a system employing digital coding (at least for the audio signal), for transmitting operating commands to a recording apparatus, particularly a magnetic video recorder, at a precise instant.

This object is achieved according to the invention by the following process steps:

-- generation of a binary code, including, in particular, data representing the

start time, suspend time (pause time), resume time, and end, of the broadcast which is to be recorded;

-- modulation of a signal, corresponding to said code;

-- transmission of the modulated code i.e. modulated encoded signal to at least one channel (right or left) in lieu of the customary audio signal ;

-- transmission of the combined signal to the audio input of the encoding system of the digital or analog "transmission system" [(e.g. DVB)] employed, whereby the signal is processed and sent to the broadcast transmitter;

5 -- reception and separation-out of the signal carrying the code and the signal carrying the audio;

-- demodulation to restore the broadcasted code

-- transmission of the data to the programming system of the recording apparatus; and

10 execution of the commands transmitted.

According to the invention, the binary code also includes data identifying the broadcast.

15 In order to prevent the signal representing the binary code from being audible, preferably the code is divided into two parts, each transmitted on a respective channel (right and left). Preferably the bits are divided in an interlaced manner in the two parts.

According to one embodiment of the invention the "transmission system" employed is the DVB system.

20 According to another embodiment of the invention the "transmission system" employed is the NICAM system.

The invention also relates to a programmable control device for carrying out the described method ; characterized in that it is comprised of :

25 -- a first system disposed at the broadcast transmitter station, and comprised of:

. means of binary coding intended to generate a stream of bits comprising a code which corresponds to a command intended for a recording apparatus ;

- means of modulating the code generated ;
 - an interface system enabling the generated code to be input to the audio signal processing device of the "system of transmission employed, ahead of the broadcast transmission; and
- 5 -- a second system disposed at the receiver station, and comprised of:
- a system for detecting (recognizing) the code, which separates the signal representing the code from the signal representing the audio; and
- 10 · an interface for transmitting the code to the recording apparatus.

The invention will be better understood with the aid of an exemplary embodiment illustrated in the accompanying drawings.

Fig. 1 is a block schematic of the transmission system" for the
15 audio signal and code signal, in the case of use of NICAM;

Fig. 2a shows the pattern (or packet) comprising the command and identification codes;

Fig. 2b shows a part of said pattern wherein the header of the pattern is intercalated in the audio signal of the right [audio] channel;
20 and

Fig. 2c shows a part of said pattern wherein the header of the pattern is intercalated in the audio signal of the left [audio] channel.

The process of transmission and reception of a television broadcast wherein the audio signal is encoded by the NICAM process
25 may be accomplished as follows:

The stereophonic audio portion is digitalized in 14 bits and then sampled to give 32 sample [bits] per channel (right and left), whereupon each bit stream is processed such that two sequences of 364 bits each are obtained at the output. The carrier for the digital signal is then

modulated and Incorporated into the video signal, whereafter the combination is broadcast.

For reception, these operations are reversed.

According to an embodiment of the invention, the programming
5 code for a recording apparatus, e.g. a magnetic video recorder, is present in binary form, with a pattern (or packet) of 64 bits (8 bytes).

The Initial 5 bits characterize the command for the recording apparatus (e.g. start recording, pause, resume, or stop).

The subsequent 43 bits identify the broadcast.

10 The remaining 16 bits allow for transmission of additional information in a future version of the system.

In the embodiment described here, the following codes represent the various commands for the recording apparatus:

	Start recording	00001
15	Pause recording	00010
	Resume recording	00011
	Stop recording	00100.

The code serving to identify the broadcast may be present : in various forms:

20 -- Scheduled time of broadcast according to published broadcast schedules (this code requires 12 bits);

-- The published program code known variously as "VCR Plus" or "Show View" (requires 34 bits); or

25 -- Any other suitable scheme capable of delivering a distinctive code.

In any event, the 43 bits reserved are sufficient to cover numerous possibilities.

According to the exemplary embodiment of the invention, the bit pattern (or packet) is divided in two. A synchronization header comprising 1 octet is added to each half, thereby bringing the total transmission pattern to 10 octets. These data may be Interlaced or not.

- 5 The two modulated parts are transmitted on the right and left audio-channels of the encoder employed (e.g. NICAM in the present example or DVB) , wherewith the combined signals are transmitted in place of the customary audio signal of the broadcast.

- 10 According to the invention, means of compression of the code pattern according to any known algorithm may be employed.

On the receiver aide, a code for the broadcast selected :La entered into the inventive apparatus by means of a keyboard, a bar-code reader, or any suitable means.

- 15 On reception the NICAN decoder (or DVB or other decoder) demodulates the signal- and restores the audio and code signals, and sends them to the audio amplifier of the recording apparatus and to the inventive apparatus. The inventive apparatus continuously converts the analog signal received into a digital signal which it compares to the code pattern programmed by the user. After such comparison identifies a
20 code pattern identical to that resulting from said programming of the inventive apparatus effected by the user, a command signal is sent to the recording apparatus and is executed. A general block schematic of the inventive apparatus is shown in Fig.1. Here, the MICAM system is used, but the schematic is also applicable for DVB or any other
25 encoding system.

At the broadcasting station, the inventive apparatus comprises a first system 1 for encoding and Inputting the data to the right and left audio channels.

- 30 The described system comprises a device for generating the code pattern 3, which receives data from a keyboard (or any other programming means), generates the control pattern, divides the resulting bit stream into two parts, and modulates these two parts. This

device also controls the two devices whereby the modulated control signal 4 (comprised of switching signals) is transmitted, in the form of respective right and left signals representing the two parts of the code, in lieu of the customary right and left audio signals, to the NICAM system 5. The signal output by the NICAM system is sent to the broadcast transmitter 6.

At the user's location, the inventive apparatus is comprised of a second system 2 for receiving the broadcasted control code and sending it in suitable form to the recording apparatus.

10 This second system is comprised of a device 9 which receives the signals sent by the receiver 7 and NICAM decoder 8 and continuously converts them to digital form. It (said second system) also is comprised of a comparator which continually compares the digital sequences with the pattern programmed by the user. If the comparator finds a match, it
15 sends a command signal to the recording apparatus.

Figs. 2a to 2c illustrate the digital pattern of the programmed code and the distribution (division) of the bits into the two channels, right and left.

According to a particular embodiment of the invention, the device
20 9 is comprised of an error detection circuit which detects a received pattern having a bit stream close to that of the programmed pattern. When such a pattern is detected, the device 9 performs a correction according to a known algorithm for regenerating the correct pattern of the code.

25 The system according to the invention is not limited to the example described, but may be improved by the use of other codes simultaneously broadcast by the television network.

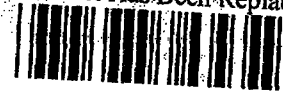
For example, one may utilize the Teletext (captioning) code to precisely identify the broadcast, whereupon the user may select the
30 Teletext description of the broadcast in an on-screen display, by any

known means (e.g. mouse, joystick, cursor keypad, etc.), when he programs his recording apparatus.

According to another embodiment, the code pattern which is programmed for broadcasting with the broadcast signal, may be input
5 directly into the NICAM encoder, wherewith the code bits will follow reserved code bits of the NICAM pattern which contain an indication of the code which follows.

One may also provide that the code is transmitted a plurality of times In succession, to ensure that it will be properly received.

10 In the exemplary embodiment described above, the "transmission system" employed was the NICAM system. Obviously, this choice does not limit the scope of the invention; any suitable transmission system for audiovisual information which system utilizes digital or analog coding may be employed, e.g. the DVB system. The principle remains
15 the same.



Claim:

1. A method for programmable control of a recording apparatus for recording television broadcasts, whereby with such control one can start, pause, resume, or stop the recording of a specified broadcast (or other transmission), thereby avoiding the recording of all Material except that comprising a part of said broadcast (or other transmission) ;

characterized by the following stages:

- generation of a binary code, including, in particular, data representing the start time, suspend time (pause time), resume time, and end, of the broadcast which is to be recorded;

modulation of a signal, corresponding to said code; transmission of the modulated code i.e. modulated encoded signal to at least one channel (right or left) in lieu of the customary audio signal;

- transmission of the combined signal to the audio input of the digital or analog transmission system (e. g. DVB) employed, whereby the signal is processed and sent to the broadcast transmitter;

-- reception and separation-out of the signal carrying the code and the signal carrying the audio;

- demodulation to restore the aforesaid binary code

transmission of the data to the programming system of the recording apparatus; and

- execution of the commands transmitted.

2. A method according to claim 1; characterized in that the transmission system employed is the Digital Video Broadcasting (DVB) system.

3. A method according to claim 1; characterized in that the transmission system employed is the NICAM system.

4. A method according to one of claims 1 to 3; characterized in that the binary code also includes data identifying the broadcast.



5. A method according to one of claims 1 to 3; characterized in that the binary code is divided into two parts, each transmitted on a respective audio channel (right and left).

6. A method according to claim 5; characterized in that the
5 binary code is divided into the two parts in an interlaced manner.

7. A method according to one of the preceding claims; characterized in that the binary code is a code comprising 64 bits.

8. A method according to one of the preceding claims characterized in that the pattern of the command code is compressed
10 according to a known algorithm.

9. A method according to one of the preceding claims ; characterized in that the received code pattern is subjected to detection and error correction.

10. An apparatus for programmable control, for carrying out
15 the method according to one of the preceding claims; characterized in that said apparatus is comprised of:

-- a first system (1) disposed at the broadcast transmitter station, and comprised of :

. means of binary encoding (3) intended to generate a stream of
20 bits comprising a code which corresponds to a command intended for a recording apparatus;

means (3) of modulating the code generated; an interface system (4) enabling the generated code to be input to the audio signal processing device of the system of transmission employed, ahead of the
25 broadcast transmission; and

-- a second system (2) disposed at the receiver station, and comprised of :

. a system (9) for detecting (recognizing) the code, which separates the signal representing the code from the signal representing the audio;
30 and





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. an interface (9) for transmitting the code to the recording apparatus.

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KEY to Fig. 1, top:

Son D = Audio, right.

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Son G = Audio, left.

codage et modulation = Encoding and modulation.

Ordres = Orders.

Identité = Identity.

10 Son ou code D = Audio or code, right.

Son ou code G = Audio or code, left.

NICAN = (a certain "transmission system" [for transmitting stereo audio signals with TV-band FM or AM carriers]).

Son ou commande = Audio or command.

15 émetteur = Broadcast transmitter.

KEY to Fig. 1, bottom:

Récepteur = Receiver.

Son = Audio.

20 Détection et transmission du code = Detection and transmission of the code.

Enregistreur = Recording apparatus.

KEY to Fig. 2a:

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Title: Pattern (or packet) of control (or command) code.

Commande -- 5 bits = Control bits 5 bits.

Identité de l'émission 43 bits Identification of the broadcast 43 bits.

Usages futurs - Available for future use.

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KEY to Figs. 2b and 2c:

Voie Droite = Right audio channel.

35 Voie Gauche = Left audio channel.

Entête de synchronisation = Synchronization header.

Demi-trame du code = Half of interlaced code pattern.

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