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Method and apparatus for encoding signals

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The invention concerns a method of encoding signals, in particular digitised audio signals, with an encoding device for encoding the signal in an encoding format and a processing device for processing the encoded signal.

10 Methods of that kind are known for example from European patent specification No 290 581. In that case, in the bit rate-reducing encoding of audio signals which are already present in digitised form, for example 48 kHz sampling frequency/16-bit resolution, psycho-acoustic phenomena of the perception of audio signals are used in such a way that the original bit
15 rate of the audio signals is considerably reduced. Such methods are also familiar and standardised under the heading of 'source encoding' (ISO 11172 and 11318).

With some encoding methods there is also the option of encoding the signal in a given transmission or storage format in order then to be able to
20 transmit and/or store the signal. That encoding however frequently gives rise to the necessity for the signals to be re-coded in regard to the transmission or storage format used as the transmission channel which is then actually employed or the storage device which is actually used employs another encoding format. If the necessary re-coding algorithms for
25 re-coding the signal for adaptation to the actual encoding format are not available, the result of this is that complete decoding of the signal into a linear, non-data-reduced format and subsequent encoding to the desired format have to be implemented. That frequently results in quality losses of greater or lesser severity. Either that expensive path is adopted or
30 adaptation is not possible.

The object of the present invention is to provide a method of the kind set forth in the opening part of this specification, which resolves the

above-indicated problems and in which re-coding operations, once encoding has been effected, are very substantially avoided.

In accordance with the invention that object is attained in that, in a method of the kind set forth in the opening part of this specification, the
5 encoding format is determined in dependence on the properties of the processing device.

With the method according to the invention it is particularly advantageous that encoding is already effected at the transmission end, taking account of the properties of the connected devices for subjecting the
10 signals for further processing. In other words, it is already possible in the encoding procedure to take account of and use the encoding formats which are necessary for the connected items of equipment. In particular by means of the present method it is possible to implement encoding which is adapted to the possibilities of the selected transmission channel and
15 decoding at the reception end, so that the signal can be transmitted and received or decoded at the maximum possible quality.

Furthermore the method according to the invention makes it possible in any case to avoid expensive re-coding of the encoded signal as the signal is encoded from the outset in the correct format, that is to say the format
20 which corresponds to the connected items of equipment, for example the connected storage device or the connected transmission channel. The method therefore not only permits higher-quality transmission of signals but also faster transmission.

A particularly advantageous embodiment of the invention is distinguished in that, prior to establishing the encoding algorithm, the
25 properties or the property parameters of the selected transmission and/or storage and/or decoding devices are ascertained by one or more test signals directed to the corresponding device. In that way by virtue of the method according to the invention it is possible for the encoding format to
30 be used or the encoding algorithm to be applied to be directly adapted to the devices which are actually connected in each case, such as for example transmission channels, storage means or decoding devices at the reception end. With the method according to the invention therefore, a person who

would like to transmit signals, by virtue of the test signal, no longer needs to establish or make adjustments for connected items of equipment which are involved, such as for example transmission channel, storage device or decoding devices at the reception end, when that person would like to transmit or send signals. With the solution according to the invention however it is possible, prior to the actual encoding by hand, to preset the corresponding parameters for selection of the desired encoding format in order for example to permit transmission even with devices which are not recognised by means of the test signal. In any case therefore the method according to the invention permits adaptation of the encoding format to the items of equipment used.

If the signal to be sent is a digitised audio signal and the signal is present in source-encoded form, that is to say in bit rate-reduced form, the method according to the invention makes the following possible: if transmission and/or storage devices of various capacities are available, then, having regard to the amount of data which is still to be transmitted after bit rate-reduced encoding, it is possible to select a transmission channel which enjoys appropriate capacity or a storage device which enjoys appropriate capacity. Thus for example in the case of signals of relatively low quality or when the demands in terms of reception quality are relatively low, that is to say with a higher level of redundancy, it is possible to adopt a transmission channel of lower capacity and thus possibly save cost.

The invention is used for example in regard to transmission or storage of data-reduced audio signals which are present for example in the formats G.711, G.722, MPEG 1/2-layer 1, 2, 3 or MPEG 4. The invention can be applied to all systems, for example transformation and subband encoding methods, adaptive and non-adaptive pulse code modulation methods, with linear and non-linear quantisation, combinations thereof and other audio encoding methods.

The invention also makes use of certain properties of such methods. Typically audio signals which are to be transmitted or stored and which are data-reduced require only a low transmission or storage capacity. The result of this is that audio signals can be transmitted even over narrow-

band lines in real time. In that case the data rate of the audio signals is so selected that they satisfy either the qualitative claims or the economic and commercial requirements. A high data rate has a correspondingly high quality, on the other hand it also requires a larger channel or storage capacity, which in turn gives rise to higher costs. When dealing with very narrow-band transmission channels, if wide-band channels are not available, the transmission of high-quality audio signals, that is to say audio signals having large quantities of data, are implemented in an n-times real time with $n > 1$.

10 Therefore a particularly preferred embodiment of the invention is one in which bit rate-reduced audio signals are to be sent and a plurality of transmission channels and/or bit rates are available for transmission of the audio signals. Then, by virtue of the method according to the invention, the transmission channel and/or the bit rate in the transmission of the audio signals can be selected in such a way that the audio signal can be transmitted in real time or even faster than real time:

Advantageous developments and configurations of the method according to the invention are set forth in the appendant claims.

Another object of the present invention is to provide an apparatus for encoding signals, which avoids the problems set forth in the opening part of this specification and in which re-coding of the signal after encoding has been effected is no longer necessary.

In accordance with the invention that object is attained by an apparatus for encoding signals, having a control device which presets the encoding format to be used for the encoding operation in dependence on the properties of a processing device for subsequent processing of the signals.

The advantage of the apparatus according to the invention is that the encoding format takes account from the outset of further processing, that is to say for example transmission or storage of the signal. That means that the signal cannot undergo incorrect encoding in the sense that the signal is encoded in an encoding format which does not suit the selected

transmission or further processing devices, such as for example a storage device.

In a particularly preferred embodiment of the invention it is possible by means of a control device having a test signal generator which emits a test signal, by means of which the control device establishes the properties of the connected device, thus for example the bit rate of the connected transmission channel, suitably to automatically select the encoding format by means of the control device. The user therefore does not need to intervene manually in the procedure for selecting the desired encoding format. That therefore advantageously affords a considerable simplification in operation. For, on the one hand there is now no need for manual setting of the encoding format and in addition the user of the apparatus is not embarrassed even if that person - for example as a lay person - does not have the appropriate knowledge about the transmission channel or the decoding options at the reception end. The invention is therefore distinguished in particular by its user-friendliness.

In a further embodiment of the invention, provided at the control device is a display input device which makes it possible for a user to preset an encoding format to be used. It is thus possible to select the correct encoding format even when the format suiting the selected transmission device or storage device or decoding device is not known and also detection by means of the test signal is not possible. It is particularly preferred in that respect that the user can select from predetermined formats; it is however also possible for the user to completely freely preset a given encoding procedure or even entirely prevent an encoding procedure.

Further advantageous embodiments of the apparatus according to the invention are set forth in the appendant claims.

The invention will now be described in greater detail by means of an embodiment with reference to the accompanying drawings in which:

Figure 1 is a block circuit diagram of the structure at the transmission end of an embodiment of the apparatus according to the invention for the encoding of signals or a possible implementation of the method according to the invention, and

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