# PCT

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 7 : H03M 7/40, H04N 7/50	A1	(11) International Publication Number: **WO 00/51243**
		(43) International Publication Date: 31 August 2000 (31.08.00)

(21) International Application Number: PCT/KR99/00764

(22) International Filing Date: 11 December 1999 (11.12.99)

(30) Priority Data:
1999/6157   24 February 1999 (24.02.99)   KR

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(81) Designated States: AU, BR, CA, CN, DE, ES, GB, IN, JP, RU, US, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Published
With international search report.
Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

(54) Title: A BACKWARD DECODING METHOD OF DIGITAL AUDIO DATA
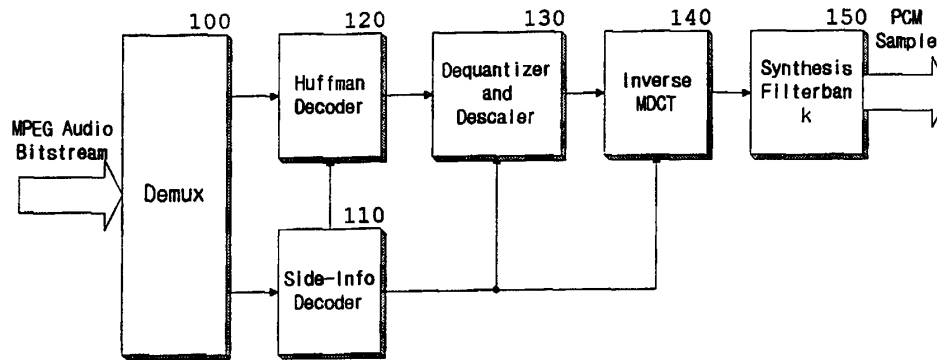
(57) Abstract

This invention provides a method of backward decoding compressed digital audio data into an analog audio data reversed in time. The method according to this invention comprises the steps of locating a header of a last frame of the compressed digital audio data; dequantizing a plurality of data blocks constructing the frame based on information contained in the located header; extracting time signals of each frequency subband from the dequantized data blocks, reducing discontinuities between the dequantized data blocks; and synthesizing the extracted time signals of all subbands backward into real audio signal reversed in time. Therefore, this invention enables to record the decoded analog signal on both tracks on a magnetic tape simultaneously while the magnetic tape travels in one direction with little increase of computation load and memory size, resulting in a high speed recording.

D E S C R I P T I O N

A BACKWARD DECODING METHOD OF DIGITAL AUDIO DATA

1. Technical Field

The present invention relates to a method of decoding

5 compressed digital audio data backward, more particularly,

to a method of backward decoding an MPEG (Moving Picture

Experts Group) encoded audio data into analog audio

signal with little increase of computation load and

memory size.

10 ## 2. Background Art

Digital audio signal is in general more robust to noise

than analog signal and thus the quality is not subject to

degradation during copy or transmission over network. The

digital audio signals are, moreover, transmitted more

15 rapidly and stored in storage media of less capacity due

to effective compression methods recently developed.

Many compression methods have been proposed to

effectively encode audio signals into digital data. MPEG

(Moving Picture Experts Group) audio coding schemes have

20 been used for the standard in this area. The MPEG audio

standards that are standardized as ISO (International

Standardization Organization) – MPEG audio layer-1,

1

layer-2, and layer-3 were devised to encode high-quality

stereo audio signals with little or no perceptible loss

of quality. They have been widely adopted in digital

music broadcasting area and in addition have been used

5   with MPEG video standards to encode multimedia data. In

addition to MPEG-1, standard specifications for digital

environments have been proposed; MPEG-2 includes

standards on compression of multimedia data. Standards

for object oriented multimedia communication are included

10 in MPEG-4, which is in progress.

MPEG-1 consists of five coding standards for

compressing and storing moving picture and audio signals

in digital storage media. MPEG audio standard includes

three audio coding methods: layer-1, layer-2, and layer-3.

15 MPEG audio layer-3 (hereinafter referred to as "MP3")

algorithm includes a much more refined approach than in

layer-1 and layer-2 to achieve higher compression ratio

and sound quality, which will be described briefly below.

MPEG audio layer-1, 2, 3 compress audio data using

20 perceptual coding techniques which address perception of

sound waves of the human auditory system. To be specific,

they take an advantage of the human auditory system's

inability to hear quantization noise under conditions of

auditory masking. The "masking" is a perceptual property

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of the human ear which occurs whenever the presence of a
strong audio signal makes a temporal or spectral
neighborhood of weaker audio signals imperceptible. Let
us suppose that a pianist plays the piano in front of

5 audience. When the pianist does not touch keyboard, the
audience can hear trailing sounds, but is no longer able
to hear the trailing sounds at the instant of touching
the keyboard. This is because, in presence of masking
sounds, or the newly generated sounds, the trailing

10 sounds which fall inside frequency bands centering the
masking sound, so-called critical bands, and loudness of
which is lower than a masking threshold are not audible.
This phenomenon is called spectral masking effect. The
masking ability of a given signal component depends on

15 its frequency position and its loudness. The masking
threshold is low in the sensitive frequency bands of the
human ear, i.e., 2KHz to 5KHz, but high in other
frequency bands.

There is the temporal masking phenomenon in the human

20 auditory system. That is, after hearing a loud sound, it
takes a period of time for us to be able to hear a new
sound that is not louder than the sound. For instance, it
requires 5 milliseconds for us to be able to hear a new
sound of 40 dB after hearing a sound of 60 dB during 5

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