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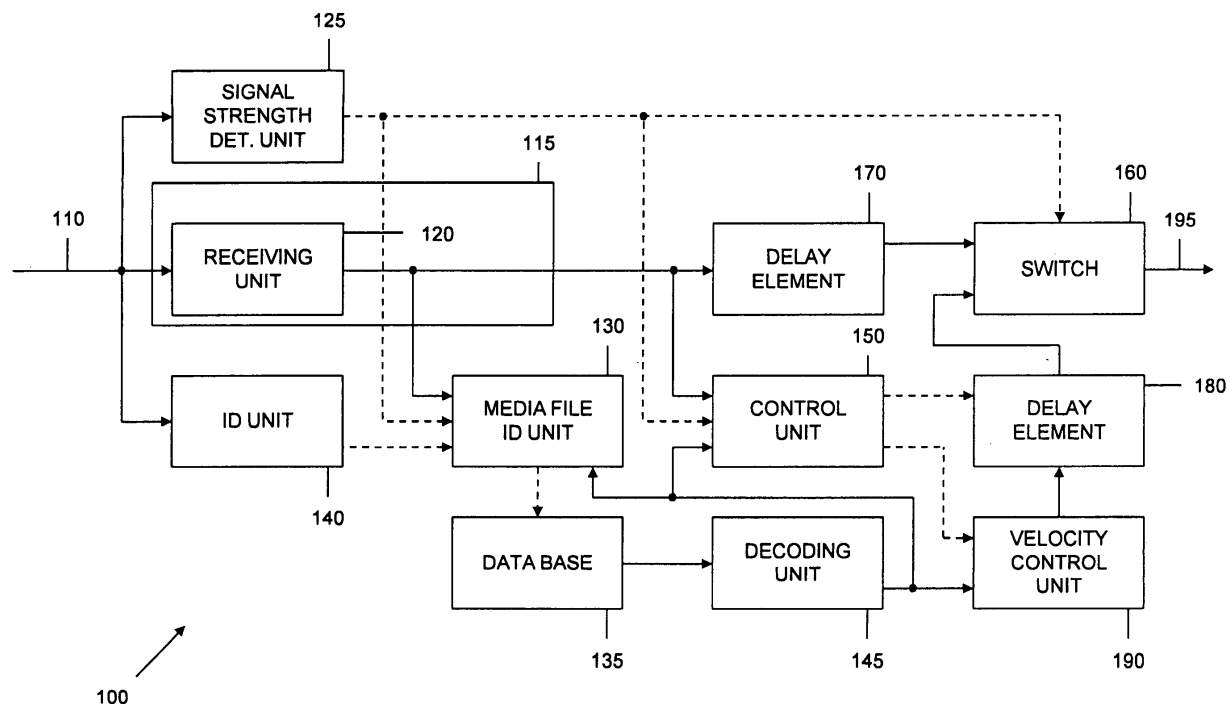
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(54) **Method for controlling the playback of a radio program**

(57) The present invention relates to a method for controlling the playback of a radio program, comprising the following steps:

- receiving a radio signal containing the transmitted radio program,
- determining the signal quality of the received radio program,

- playing back the radio program,
- accessing a database storing a plurality of media files,
- selecting one of the media files from the database, and if the signal quality of the received radio program is below a predetermined threshold,
- replacing the played back radio program by the selected media file and playing back the selected media file.

**FIG. 1**

Description

[0001] This invention relates to a method for controlling the playback of a radio program and relates to a multimedia system comprising a radio receiver and a media file player, which is able to control the reception of a radio signal in such a way that signal perturbations of the receiver radio signal are not noticed by the user.

Related Art

[0002] In the art radio receivers are known comprising receiver components able to receive analogously or digitally transmitted radio programs. These radio receivers, especially in vehicle applications, additionally contain an audio module for playing back audio files stored on a CD or a DVD. Recently compression techniques have become available allowing the storing of audio files in a compressed way (e.g. MP3) resulting in a greatly reduced amount of data for a digitally stored piece of music. With these compression techniques the storage of a larger amount of media files such as audio files has become available. Nowadays multimedia systems, especially in vehicles, often comprise an audio player adapted for playback of these compressed audio files. For storing the audio file the multimedia system comprises a hard disk or it is possible to insert memory sticks or other data storage devices containing the compressed audio files. The increasing amount of storage capabilities allows the storage of hundreds or thousands of audio files on one portable small storage unit. When the audio file is stored in the MP3 format (MP3 standing for MPEG Layer 3), the audio files do not only contain the audio data for replay, but also additional information about the stored file such as the artist or the name of the song. In the MP3 format these data are stored as MP3 tags.

[0003] In vehicle applications the quality of the received radio program varies continuously as the vehicle is moving and as the signal strength of the received radio signal is varying. In the case of distortions due to a low signal strength prior art radio receivers try to use redundant information contained in the received audio signal. However, these methods for improving the signal quality of the received radio signal can only be used when the distortions are very short, i.e. in the range of 50 ms or less.

Summary of the Invention

[0004] Accordingly, a need exists to provide a method for improving the playback quality of a radio program when signal distortions of the received radio signal occur over longer periods of time. This need is met by the features of the independent claims. In the dependent claims preferred embodiments of the invention are described.

[0005] According to one aspect of the invention a method is provided for controlling the playback of a radio program, the radio program being transmitted by a radio signal which is received from a radio receiver of a multimedia system. After the radio signal is received, the signal quality of the received radio program is determined and the radio program is played back, i.e. output to the user. Additionally, a database storing a plurality of media files is accessed and one of the media files from the database is selected and the played back radio program is replaced by the selected media file and the selected media file is played back instead of the broadcast radio program if it is determined that the signal quality of the received radio program is below a predetermined threshold. The claimed method helps to mask distortions in the received radio signals by switching the output from the received radio program to the output of a played back media file. The distorted radio signal can be replaced by an audio signal from a media file stored on the database. The database may be part of the radio receiver or can be part of an external device such as an audio player coupled to the radio receiver. When the correct media file is selected from the database, a replacement can be carried out in such a way that signal distortions of the transmitted radio signal can be compensated in such a way that the user is not even aware of them anymore.

[0006] In order to correctly select a media file used for replacing the radio program, the radio program may be identified by identifying the piece of music played back in the radio program. The broadcast radio program normally comprises additional information contained in the transmitted radio signal allowing the identification of the current song or the current piece of music. This information can be used to identify the audio content of the broadcast radio program.

[0007] According to a preferred embodiment the media files contained in the database are digitally encoded media files. With these digitally encoded media files it is easy to search in the database for media files containing the same piece of music as played back in the radio program. When a media file corresponding to the piece of music of the radio program can be found in the database, the radio program can be replaced by the media file containing the same piece of music. It should be understood that this invention is not restricted to a certain type of music or to the playback of music at all. It is also possible to use the invention in connection with other audio files such as audio books or any other kind of audio data broadcast by a radio program. The piece of music broadcast by the radio program can be any type of music, be it classic music, jazz music, rock or pop music.

[0008] Preferably the piece of music played back in the radio program is identified when the signal quality of the radio program is higher than a predetermined threshold. This threshold can be the threshold mentioned above which is used

as a replacement threshold. However, it is also possible to use any other threshold. This feature helps to ensure that the transmitted radio program can be identified correctly. When the signal quality, e.g. the signal level, is too low, the identification of the played back piece of music might be erroneous. Accordingly, it is preferable to carry out the identification of the radio program when the radio signal is received at a high signal strength before the low signal is detected.

As it is not shown in advance when the quality of the received radio signal will become lower, it is preferable to identify the broadcast piece of music as soon as it is received in a sufficient quality allowing the extraction of the information which piece of music is actually played back.

[0009] Before the played back radio program is replaced by a played back media file, it is preferable to carry out a temporal fitting of the piece of music played back in the radio program and the selected media file of the database in such a way that the piece of music played back in the radio program is substantially synchronous to the played back media file. This temporal fitting can mean that the playback of the media file is started substantially at the same position within the media file at which the output of the piece of music of the radio program is stopped. The synchronization of the audio parts of the piece of music to the media file can also mean that the playback velocity of the piece of music in the radio program is determined and the playback velocity of the media file is adapted accordingly. It is known that broadcasting radio stations sometimes slightly change the playback velocity in order to terminate at a predetermined point in time, e.g. before the news or before another break. As a consequence, it is advantageous to first determine the playback velocity of the broadcast radio program and then to adapt the playback velocity of the media file accordingly. Preferably, the media file is a digitally stored bit stream in which the media files are stored in different frames. The playback velocity can be adapted by adapting the frame rate of the file.

[0010] As mentioned in the introductory part of the description, the media file is used for masking distortions of the broadcast radio program. Accordingly, it is preferable to continuously determine the signal quality of the received radio program. As soon as the signal quality of the received radio program is again higher than the predetermined threshold, the played back media file can be again replaced by the broadcast radio program broadcasting the piece of music which was replaced by the media file containing the same piece of music before. When the media file is played back at about the same velocity as the piece of music in the radio program and when the position within the piece of music is correctly identified, the first replacement of the radio program by the media file and the second replacement replacing the media file again by the radio program can be done in such a way that the user does not even notice the replacement.

[0011] For correctly identifying the piece of music played back in the radio program, preferably the title and the artist of the piece of music are determined and the media file having the same title from the same artist is preferably selected for replacement. Furthermore, it is possible to additionally analyze the piece of music in the radio program and the media file in order to be sure that the piece of music of the broadcast radio program is replaced by the correct media file. It is possible that different recordings of the same piece of music exist, e.g. a live recording and a studio recording. Normally a studio recording cannot be replaced by a live recording without the notice of the user. As a consequence, additional analysis can be carried out, e.g. by carrying out a correlation analysis.

[0012] When the received radio signal is demodulated in the case of an analog radio signal or decoded in the case of a digital radio signal and directly fed to the output for playback, a signal distortion could be detected. However, a replacement of the radio program by a media file of the database could not be carried out without notice of the user. For this reason it is preferred to delay the playback of the radio program by a predetermined delay time before it is output to the user. This delay time can then be used when it was detected that the signal quality of the received radio program is below the predetermined threshold. In a next step the media file can be selected from the database, the corrected time within the media file can be determined and the radio program can be replaced by playing back the media file within said delay time.

[0013] It may now happen that the playback of the media file ends before the signal quality of the radio signal is again above the predetermined threshold. In this situation the user of the radio receiver should be informed of the presence of the distorted radio signal quality. Additionally, it is possible to present a selection of media files of the same artist or of the same piece of music played back by the radio program to the user for further selection. However, it is also possible to switch to another radio station after the end of the playback of the media file.

[0014] In case the radio signal or the database do not contain the information needed to identify the piece of music by the artist or the title of the song, it is also possible to carry out a similarity check of the piece of music in the radio program in connection with all media files of the database and the media file best matching the piece of music broadcast in the radio program could be used for replacing the radio program.

[0015] Furthermore, it is possible that the played back piece of music in a radio program is not contained in the database of the user. In this situation it is possible to present other media files of the same artist or other media files of a similar genre to the user for further selection.

[0016] In order to increase the chances that the played back piece of music is contained in the database, it is also possible to store the identified pieces of music played back in the radio program in the database containing the media files. These additionally stored media files can then be part of the database that is searched for replacing the radio program. Especially in the case of radio programs dominated by the current music charts the same pieces of music are

repeated quite frequently. For this embodiment, however, the storage capacity of a storage unit storing different media files has to be quite large. By way of example several Gigabytes of storage space should be available in order to additionally store the pieces of music broadcast by the radio program.

[0017] The invention further relates to a multimedia system comprising a radio receiver receiving the radio signal containing the broadcast radio program. Furthermore, a media player configured for playing back media files and a database containing the media files are provided. Additionally, means for determining the signal quality of the received radio program and for determining whether the signal quality is below a predetermined threshold are provided. The multimedia system outputs the received radio program via an output unit. The multimedia system further comprises switching means configured for selecting the output from one of the media player and the radio receiver. When said means for determining the signal quality detects that the signal quality of the received radio program is below the predetermined threshold, the switching means replaces the played back radio program by a media file from the database. Furthermore, a radio program identification unit may be provided identifying the piece of music that is played back in the radio program. The identification of the radio program can be carried out on the basis of the data additionally transmitted in connection with the radio program (e.g. the RDS (Radio Data System) data). A media file identification unit may be provided using the metadata contained in the media files in order to identify the different media files.

[0018] As described above, it is preferred to delay the radio program output by a predetermined delay time. Accordingly, a delay element may be provided delaying the output of the received radio program before it is output via the output unit.

[0019] The playback velocity of the media file can be adapted to the playback velocity of the broadcast radio program by a playback velocity control unit. The playback velocity control unit helps to control the velocity in such a way that the velocities of the media file and of the piece of music in the radio program substantially coincide.

Brief Description of the Drawings

[0020] In the following the invention will be described in more detail with reference to the accompanying drawings, in which

Fig. 1 is a schematic view of a multimedia system capable of masking distortions in the received radio signal by replacing the radio signal by playing back a media file, and

Fig. 2 is a flowchart showing the basic steps of a method for controlling the playback of a radio program.

Detailed Description of a Preferred Embodiment

[0021] In Fig. 1 a multimedia system 100 is shown which may be incorporated into a vehicle (not shown). The multimedia system 100 can overcome distortions in mobile radio reception by replacing the broadcast radio program by playing back a media file stored in a database coupled to the radio receiver. The broadcast radio signal is fed to the system as signal 110. The received radio signal 110 is first of all fed to a conventional radio receiver 115 comprising a receiving unit 120, where the received radio signal 110 is demodulated. The radio signal 110 can be an analogously broadcast signal, however it is also possible that signal 110 is a digitally broadcast signal. In this case the receiving unit 120 additionally decodes the radio signal. The radio signal 110 is additionally fed to a signal strength determination unit 125, where the signal strength of the received radio signal and of the radio program contained in the radio signal is analyzed. The information of the extracted signal strength is fed to a media file identification unit 130 and to a main control unit 150. In the embodiment shown in Fig. 1 the dashed lines indicate control signals, whereas the continuous lines indicate audio, radio or data signals.

[0022] The received radio signal is additionally fed to an identification unit 140 which extracts additional information from the radio signal. The additional information can be the name of the broadcasting radio station, the name and the artist of the currently broadcast song, etc. All these pieces of information can be found in the RDS signal (radio data system signal). The information about the title of the currently played piece of music and the artist is fed to the media file identification unit 130. The media file identification unit 130 then accesses a database 135 containing a large number of audio files. The database can be part of a media player such as an MP3 player where the media files are stored in the database 135 in a compressed way. When the piece of music played back in the radio program can also be identified in the database, the media file is fed to a decoding unit 145, where the digitally encoded file data are decoded and are made ready for playback. However, it is possible that a combination of the artist and the title of the song cannot clearly define a media file, as it is possible that different recordings of one title exist. By way of example the piece of music played back in the radio program could be a live recording and the media file in the database 135 could be a studio recording. Normally, these two recordings differ from each other in such a way that the replacement of the radio program by the media file is not possible without notice of the user. In order to be sure that the piece of music broadcast by the radio program and the selected media file coincide, the two audio signals are compared to each other. To this end the

audio file decoded by unit 145 is fed back to the media file identification unit which also receives the demodulated and decoded audio signal. The comparison of the two signals can be obtained through a correlation analysis. However, it is also possible to use other methods for comparing two audio signals, e.g. cepstral distance measures. A standardized cross-correlation analysis can be used as follows:

$$\rho(n, k) = \frac{\sum_{i=0}^{N-1} x_r(n-i) x_d(n-i-k)}{\sqrt{\sum_{i=0}^{N-1} x_r^2(n-i) \sum_{i=0}^{N-1} x_d^2(n-i-k)}} \quad (1)$$

[0023] The signal $x_r(n)$ and $x_d(n)$ relate to the demodulated radio signal and the decoded audio file, respectively, n being the time index, N being the number of cycles. Additionally, an unknown time delay k_0 between the two audio signals has to be considered. For this reason in order to carry out the similarity check the two signals should be based on a short part of the audio signal (N cycles). Additionally, a radio signal should be used having a high signal-to-noise ratio. This part of the received radio signal is then compared to a corresponding segment of the media file. The comparison is then repeated for another part of the signal having a different time delay. Last but not least the maximum or the argument at which the maximum occurs, respectively, is determined by the following equations:

$$\rho_{\max}(n_0) = \max_k \{ \rho(k, n_0) \} \quad (2)$$

$$k_0(n_0) = \arg \max_k \{ \rho(k, n_0) \} \quad (3)$$

[0024] The parameter n_0 is the starting time of the analyzed segment. For the results of the correlation analysis the following can be said:

$$-1 \leq \rho(n, k) \leq 1 \quad (4)$$

[0025] If the title of the piece of music and the artist coincide and if the correlation analysis results in a high consistence of the two audio signals meaning that

$$\rho_{\max}(n_0) \geq \rho_0 \quad (5)$$

the media file of the database 135 can be used for replacing the broadcast radio program. When the signal strength determination unit 125 determines that the signal strength of the received radio signal is below a certain threshold, the corresponding information is fed to the media file identification unit in which, as discussed above, also the correlation analysis is carried out. The information about the lower signal quality is additionally fed to control unit 150 and to a switch 160 which is responsible for switching between the radio signal and the signal from the audio file.

[0026] For the parameter ρ_0 in equation 5 values close to 1 should be selected:

$$0 \ll \rho_0 < 1 \quad (6)$$

[0027] If the demodulated radio signal were directly fed to the switch and output to the user as output signal 195, a signal distortion in the radio signal could not be detected in such a way that at the same time the corresponding media file is searched in the database 135 and the radio signal is replaced by the audio signal of the media file. As a consequence, a delay element 170 is provided receiving the signal from the radio receiver 115. The delay element 170 introduces an additional time delay before the signal is fed to switch 160. For the audio file database 135 a delay element 180 is also provided adapting the time delay of the audio signal of the audio file to the time delay of delay element 170.

[0028] By switching from the radio signal to the audio signal of the media file, the delay $k_0(n)$ has to be considered. If several maxima were detected in the correlation analysis, the maximum having the lowest delay should be selected. In the correlation analysis it is possible that several maxima are detected when a part of the refrain was used as a segment for the comparison, as the refrain is normally repeated several times.

[0029] It can happen that the playback velocity of a piece of music played back in a radio program was slightly amended in order to assure that, e.g. the playback has finished before the news or before any other event, at a predetermined fixed time. For this reason the radio signal $x_r(n)$ and the media file signal $x_d(n)$ should be analyzed and it should be determined whether the two signals diverge. This divergence can be detected using correlation analysis which is repeated periodically $(\rho_{\max}(n_0) + m \times T_0)$. If the determined delay $k_0(n_0 + mT_0)$ changes compared to its predecessor $k_0(n_0 + (m-1)T_0)$, it can be followed that the transmitted radio signal was either played back faster or slower than normal. The relative velocity difference a can be determined using a simple linear regression using the following supporting points:

$$[k_0(n_0), k_0(n_0)], [k_0(n_0 + T_0), k_0(n_0) + aT_0], [k_0(n_0 + 2T_0), k_0(n_0) + 2aT_0], \dots \quad (7)$$

[0030] The relative velocity difference a is fed to a velocity control unit 190, which adapts the playback velocity of the media file.

[0031] During use the system 100 shown in Fig. 1 is configured in such a way that the signal strength determination unit continues to determine the signal strength of the received radio signal. When the signal is distorted, the broadcast radio program can be replaced with a media file selected from the database as discussed above. After adaption, if necessary, the playback velocity of the media file and after controlling the delay time in unit 180, the audio file is fed to switch 160 which then may switch from the radio signal to the audio signal from the media file. The switch may either abruptly switch from one audio signal to the other; however, preferably a smooth transition is carried out so that the user does not even notice that the radio signal was replaced by another audio signal. The adaptive mixing of the two audio signals can be done in the following way:

$$x(n) = \beta(n)x_r(n) + (1 - \beta(n)) \gamma \tilde{x}_d(n - k_0(n_0)) \quad (8)$$

[0032] The term $x(n)$ corresponds to the output signal 195, $\beta(n)$ determines the time-dependent mixing relation. When a strong radio signal is received, $\beta(n)$ should be selected as $\beta(n)=1$. When the radio signal is heavily distorted, $\beta(n)$ should be set to 0. The signal $\tilde{x}_d(n)$ is the velocity compensated signal of $x_d(n)$. When the signal strength determination unit 25 detects that the signal can again be received with high signal quality, the switch 160 can switch back and can replace the audio output of the media file to the audio output of the radio signal.

[0033] In order to ensure that the same output signal level is used for both signals, the playback sound level is adapted to the sound level of the broadcast radio program. With the following equation 9 using the parameter γ the signal of the media file is adapted

$$\gamma = \sqrt{\frac{\sum_{i=0}^{N-1} \tilde{x}_d^2(n_0 - i - k_0(n_0))}{\sum_{i=0}^{N-1} x_r^2(n_0 - i)}} \quad (9)$$

[0034] In the case of a detected signal distortion the weighting of β should not be changed abruptly. A slow switching, e.g. in a logarithmic way between $\beta=1$ and $\beta=0$ might be advantageous. This is also true for the switching back mechanism switching from the media file back to the radio program.

[0035] The steps for replacing the playback of a radio program by the playback of an audio file in the case of a signal distortion of the radio program are summarized in Fig. 2. The method starts in step 200. The radio program is received in step 210 and in steps 220 and 230 the played back piece of music is identified and the signal strength of the received radio signal is determined in unit 125 of Fig. 1. In step 240 a delay time is inserted before the signal is output as output signal 195. In step 250 it is asked whether the signal strength of the received radio signal is higher than a predetermined threshold. If this is the case, the received radio signal is output with the inserted delay time in step 260. If, however, it is determined in step 250 that the signal cannot be received with a desired quality, it can be checked in step 270 whether a media file having the same audio content as the broadcast radio program can be found in database 135. If such a media file cannot be detected in the database, the system can return to step 260 and can continue to output the radio program. If, however, in step 270 a media file having the same audio content as the broadcast radio program can be found, the piece of music played back in the radio program can be replaced by the played back media file in step 280. The system continues to analyse the signal quality of the received radio signal and when the received radio signal is again over the predetermined threshold, the radio signal is again output to the user.

[0036] The system of Fig. 2 shows the basic steps. However, the following situations may occur:

First of all, it is possible that the signal distortion continues over time and the media file is played back and now the media file ends before the radio signal can again be received with the desired quality. In this situation after step 280 the user can be informed of the signal distortion of the radio signal. Additionally, it is possible that the system suggests to play back other media files of the same artist or of the same music genre till the signal can be again received with sufficient quality. Another possibility would be to switch over to another radio station. According to another embodiment of the invention it is also possible that in the case of a signal distortion corresponding media files cannot be found in the database. In this situation it is also possible to provide the possibility to the user to select other media files of the same artist or other media files of the same genre, etc. In this situation the switching from one audio output to the other should be carried out in a slower way introducing a pause between two audio files. As soon as speech is again detected in the broadcast radio signal, the output media file should be again replaced by the radio signal.

[0037] Furthermore, it may happen that either the radio signal or the database do not contain data allowing the identification of the audio data. In this situation the received radio signal can be compared to all the media files in the database, e.g. the comparison can be based on a correlation analysis as disclosed in equation 1 above. The media file best fitting the received radio signal could then be selected in order to replace the radio signal.

In a further embodiment of the invention it is also possible to store the detected radio signal on the database. Especially, it is possible to store the identified pieces of music in the database, preferably also in a compressed way. The radio content could such be ripped on the storage unit of the database. In many radio stations the current hits are often repeated. It may happen that the same piece of music is again broadcast by the radio station and in this situation when the same song was recorded earlier and stored in the database the stored version could be used for replacing the broadcast version in the case of a signal distortion in the radio signal.

[0038] As can be seen from the above, the invention provides an efficient possibility to mask signal distortions in the received radio signal by replacing the radio signal by a signal from an audio file stored in a database coupled to the radio receiver.

Claims

1. A method for controlling the playback of a radio program, comprising the following steps:

- receiving a radio signal containing the transmitted radio program,
- determining the signal quality of the received radio program,
- playing back the radio program,
- accessing a database storing a plurality of media files,
- selecting one of the media files from the database, and if the signal quality of the received radio program is below a predetermined threshold,
- replacing the played back radio program by the selected media file and playing back the selected media file.

2. The method according to claim 1, wherein the radio program is identified by identifying a piece of music played back in the radio program.

3. The method according to claim 2, further comprising the step of searching the database for media files containing the same piece of music as played back in the radio program and replacing the radio program by the media file containing the same piece of music.

4. The method according to claim 2 or 3, wherein the piece of music played back in the radio program is identified when the signal quality of the radio program is higher than a predetermined threshold.

5. The method according to any of the preceding claims, further comprising the step of carrying out a temporal fitting of the piece of music played back in the radio program and of the selected media file of the database in such a way that the piece of music played back in the radio program is substantially synchronous to the played back media file.

6. The method according to any of the preceding claims further comprising the step of carrying out a temporal fitting of the piece of music to the media file in such a way that, when replacing the piece of music in the radio program by the media file, the play back of the media file is started substantially at the same position within the media file at which the output of the piece of music of the radio program is stopped.

7. The method according to any of the preceding claims further comprising the step of determining the playback velocity of the piece of music in the radio program and adapting the playback velocity of the media file to the play back velocity of the piece of music.

8. The method according to any of the preceding claims wherein, when the media file is selected for playback, the signal quality of the received radio program is continuously determined, and when the signal quality of the received radio program is again over the predetermined threshold, the played back media file is again replaced by the radio program.

9. The method according to any of the preceding claims wherein the media file is selected from a database of a media player coupled to a radio receiver receiving the radio signal.

10. The method according to any of the preceding claims further comprising the step of determining the title and the artist of the piece of music played back in the radio program, wherein the media file is selected from the database based on the title and artist information.

11. Method according to claim 10, wherein, after determining the media file based on the title and artist information it is checked whether the played back piece of music and the selected media file originate from the same recording.

12. The method according to any of the preceding claims, wherein the received radio signal is demodulated or decoded before the radio program is played back, wherein the playback is delayed by a predetermined delay time before playback.

13. The method according to claim 12, wherein, when it is detected that the signal quality of the received radio program is below the predetermined threshold, the replacement of the piece of music by the media file of the database is carried out within said delay time.

14. The method according to any of the preceding claims, wherein in case the playback of the media file ends before the signal quality of the radio program is above the predetermined threshold, the user of the radio receiver is informed of the low signal quality of the received radio program.

15. The method according to any of the preceding claims, wherein in case the playback of the media file ends before the signal quality of the radio program is above the predetermined threshold, a selection of media files of the same artist as the artist of the piece of music played back by the radio program is presented to the user for selection.

16. The method according any of the preceding claims, wherein for the identification of the media file replacing the played back piece of music, a similarity check of the piece of music in the radio program is carried out in connection with all media files of the database, and the media file best fitting the piece of music in the radio program replaces the radio program.

17. The method according any of the preceding claims, further comprising the step of storing identified pieces of music played back in the radio program in the database of media files, wherein in case the signal quality of the received radio program is below the predetermined threshold, a search for a media file is carried out in the database including the stored pieces of music played back in the radio program.

18. Multimedia system comprising:

- a radio receiver (115) receiving a radio signal containing a radio program,
- means (125) for determining the signal quality of the received radio program and for determining whether the signal quality is below a predetermined threshold,
- a database (135) containing a plurality of media files,
- a media player (145) configured for playing back media files,
- an output unit outputting the played back media file or the radio program,
- switching means (160) configured for selecting the output from one of the media player and the radio receiver,

wherein, when said means (125) for determining the signal quality detects that the signal quality of the received radio program is below the predetermined threshold, said switching means (160) replaces the played back radio program by a media file from the database.

19. Multimedia system according to claim 18, **characterized by** further comprising a radio program identification unit (140) identifying the piece of music played back in the radio program.

20. Multimedia system according to claim 18 or 19, **characterized by** further comprising a media file identification unit (130) identifying the media files of the database.

21. Multimedia system according to any of claims 18 to 20, **characterized by** further comprising a delay element (170) delaying the output of the received radio program before it is output via the output unit.

22. Multimedia system according to any of claims 18 to 21, **characterized by** further comprising a playback velocity control unit (190) controlling the playback velocity of the played back media file.

23. Multimedia system according to any of claims 18 to 22, wherein the multimedia system is operating as mentioned in any of claims 1 to 17.

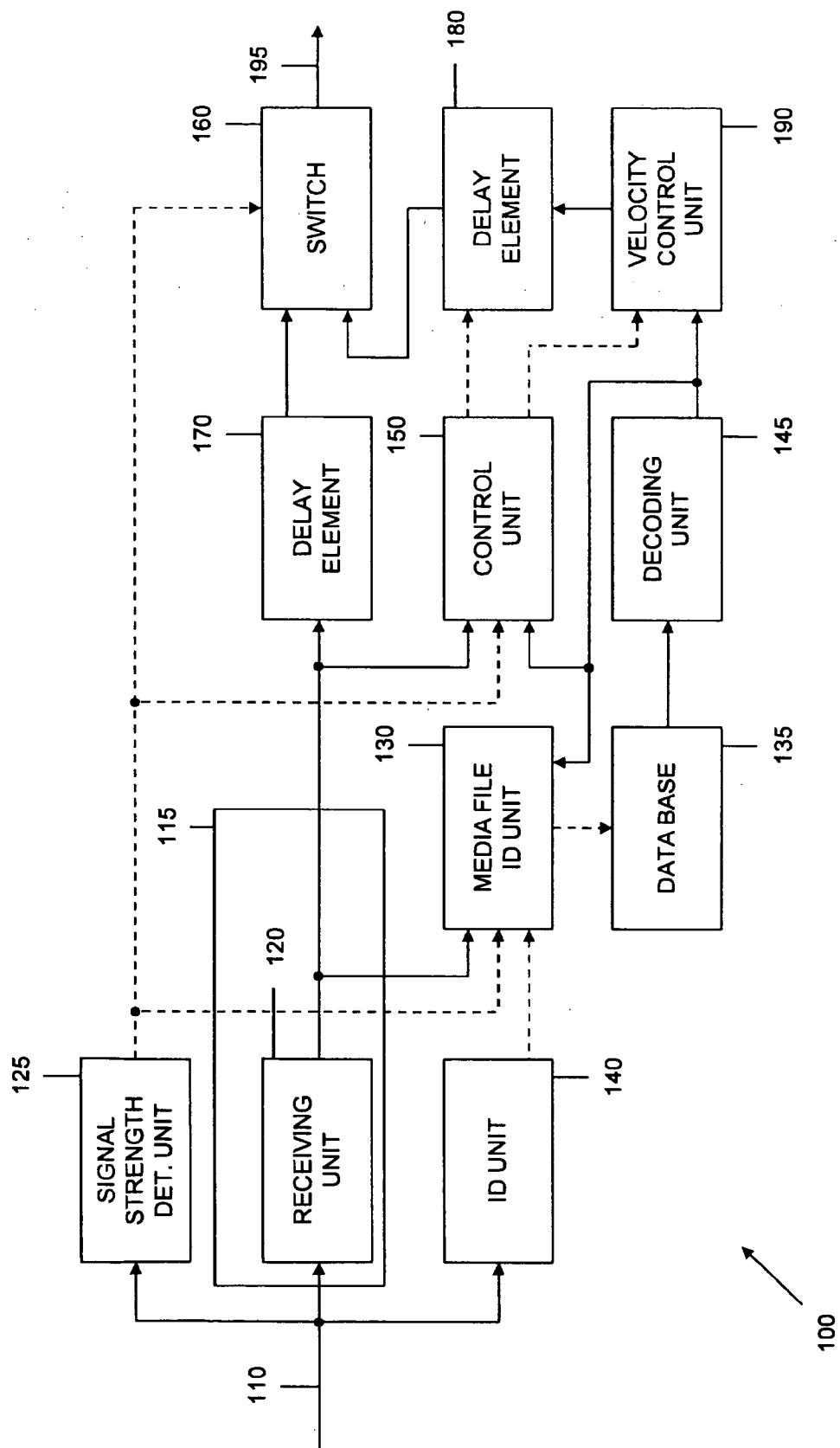


FIG. 1

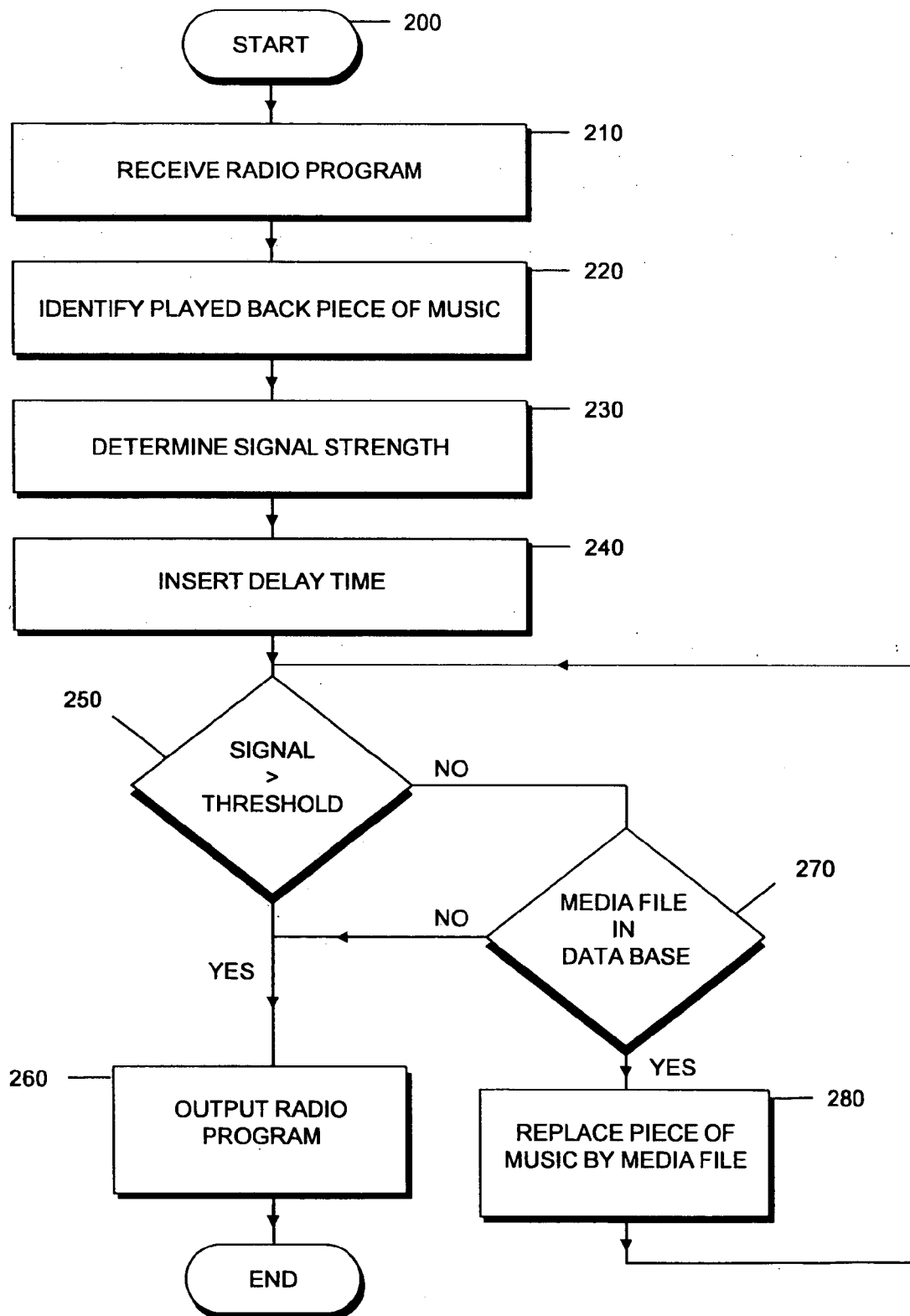


FIG. 2



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 07 01 4290

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 2006/134516 A (KONINKL PHILIPS ELECTRONICS NV [NL]; PHILIPS INTELLECTUAL PROPERTY [DE]) 21 December 2006 (2006-12-21) * the whole document *	1-23	INV. H04H1/00
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 9 November 2007	Examiner Willems, Brigitte
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.02 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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09-11-2007

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