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(54) **RADIO MESSAGE DETECTION**

(57) An example radio data message detection includes receiving, with a radio receiver, from at least one radio station a broadcast signal carrying radio data messages and an audio signal; providing from a database a database output signal representative of the media assets stored in the database; calculating correlation values

representative of the correlation between the audio signal and the database output signal; and comparing the correlation values to a pre-defined threshold value, and outputting, based on results of the comparisons, values indicative of a start or an end of one of the radio data messages.

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Description**BACKGROUND****1. Technical Field**

[0001] The disclosure relates to a system and method (generally referred to as a "system") for radio message detection such as traffic announcement detection in radio data service systems.

2. Related Art

[0002] Radio Data System (RDS) is a communications protocol standard for embedding small amounts of digital information in conventional modulation (FM) or very high frequency (VHF) radio broadcasts. The RDS standard is defined in the European Committee for Electrotechnical Standardization, EN 50067 standard. Another exemplary utilization of RDS is represented by the North American radio broadcast data system (RBDS) standard (also referred to as NRSC-4).

[0003] RDS standardizes several types of transmitted information, including alternative frequency (AF), program identification (PI), program type identification (PTY), traffic announcements (TA), radio text (RT), clock type and date (CT), decoder identification (DI), dynamic PTY indicator (PTYI), enhanced other networks information (EON), music speech switch (MS), open data applications (ODA) and program item number (PIN). For example, PI indicates the program being received or the name of the station/transmitter that is tuned in. On the other hand, PTY displays the type of program such as music, news, etc. The TA or RT that contains information accompanying the program on, e.g., the music title, performer, program changes, and the like. Traffic Message Channel (TMC) is another important service provided by the RDS specifications. RDS-TMC broadcasts digital traffic and travel information (TTI) messages as data on FM transmission paths using RDS. This allows delivering timely accurate and relevant information without the need to interrupt the radio program.

[0004] RDS is primarily used in automotive receivers, but has also some merits in non-automotive applications such as home radio receivers as it contains data about frequencies of nearby transmitters. For example, when the reception quality of a transmitter that is currently tuned in degrades, RDS-capable car radios automatically switch over to a better, or to the best receivable, transmitter broadcasting the same program without the need for action by the user. The information required to do this includes PI and the list of alternative frequencies that are being broadcast by RDS-capable radio stations. This is especially useful for car radios, which automatically retune themselves when travelling between different transmitter coverage areas.

[0005] Common radio broadcast receivers may comprise a main tuner and a background tuner. The main tuner may allow receiving the radio broadcast program at a predetermined frequency selected by the listener and providing the received audio signal to an outputting unit, such as a speaker. Further, the main tuner may be used to receive RDS data corresponding to the radio broadcast program to which it is tuned, the main task of the background tuner being to scan the frequency band for alternative frequencies in order to receive the same radio broadcast program to which the main tuner is tuned. Commonly, those alternative frequencies are provided within an RDS data stream, i.e., an alternative frequencies feature that is analyzed by the background tuner to obtain information on the alternative frequencies. Such receivers are relatively complex and only high end vehicle infotainment systems may employ such systems. Thus, there is a need for high performance single tuner system of less complexity.

SUMMARY

[0006] An example system includes a radio receiver configured to receive from at least one radio station a broadcast signal carrying radio data messages and an audio signal; a database configured to store media assets and to provide a database output signal representative of the media assets stored in the database; a correlation unit operatively coupled to the radio receiver and the database, and configured to determine correlation values representative of the correlation between the audio signal and the database output signal; and a control unit operatively coupled to the correlator and configured to compare the correlation values to a pre-defined threshold value and to output, based on results of the comparisons, values indicative of a start or an end of one of the radio data messages.

[0007] An example method includes receiving with a radio receiver from at least one radio station a broadcast signal carrying radio data messages and an audio signal; providing from a database a database output signal representative of the media assets stored in the database; calculating correlation values representative of the correlation between the audio signal and the database output signal; and comparing the correlation values to a pre-defined threshold value, and outputting, based on results of the comparisons, values indicative of a start or an end of one of the radio data messages.

[0008] Other systems, methods, features and advantages will be, or will become, apparent to one with skill in the art upon examination of the following detailed description and appended figures. It is intended that all such additional

systems, methods, features and advantages be included within this description, be within the scope of the invention, and be protected by the following claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] The system may be better understood with reference to the following drawings and description. The components in the figures are not necessarily to scale, emphasis instead being placed upon illustrating the principles of the invention. Moreover, in the figures, like referenced numerals designate corresponding parts throughout the different views.

Figure 1 is a schematic diagram illustrating an exemplary radio broadcast network including radio stations and radio receiver installed in an automobile.

Figure 2 is a schematic diagram illustrating an exemplary radio receiver including a data processor for determining a country encoded in PI codes of radio signals.

Figure 3 is a schematic diagram illustrating a cross-correlation $C_{u,v}(m - N)$ and $C_{u,v}(m)$.

Figure 4 is a schematic diagram illustrating a cross-correlation $C_{u,v}(2 - N)$ and $C_{u,v}(2)$.

Figure 5 is a schematic diagram illustrating an output of an exemplary stereo decoder.

Figure 6 is a schematic diagram illustrating contents of an exemplary jingle database.

Figure 7 is a schematic diagram illustrating an aperiodic cross-correlation between an output of a stereo decoder and a jingle database.

DETAILED DESCRIPTION

[0010] The words and phrases used herein should be understood and interpreted to have a meaning consistent with the understanding of those words and phrases by those skilled in the relevant art. No special definition of a term or phrase, i.e., a definition that is different from the ordinary or customary meaning as understood by those skilled in the art, is intended to be implied by consistent usage of the term or phrase herein. To the extent that a term or phrase is intended to have a special meaning, i.e., a meaning other than that understood by skilled artisans, such a special definition shall be expressively set forth in the specification in a definitional manner that directly and unequivocally provides the special definition for the term or phrase.

[0011] The demand for accurate and timely information on traffic conditions is dictated by the increasing traffic congestions on streets. Broadcasters cannot respond simply by increasing the number of on-air announcements in their traditional delivery modes. This would be unacceptable to the public, many of whom express complaints that such announcements are, for example, untrustworthy, repetitive and irritating unless -of course- the information is relevant to them.

[0012] The RDS system offers a wide range of very useful services. One such very widely used service is providing travel news. It is often used by motorists to assist with route planning, and for the avoidance of traffic congestion. This service is available on most local radio stations. All of these stations transmit the TP code to identify the travel messages that are flagged by RDS. When the radio is set for travel news, it will only tune to stations which carry the respective TP indication.

[0013] TA refers to the broadcasting of a specific type of traffic report on the RDS. The RDS-enabled receiver can be set to pay special attention to this TA flag and, e.g., stop replaying a compact disc (CD) or retune to receive a traffic bulletin. In addition to this, volume may also be set slightly higher to allow the announcement to be heard more easily. The related TP flag is used to allow the user to find only those stations that regularly broadcast traffic bulletins.

[0014] RDS specification EN 50067:1998 defines a number of RDS group types that are each reserved for a particular application. Type 0A group -basic tuning and switching information- is a special case, designed to carry the fundamental components of RDS all together in a single group that will be transmitted frequently to convey many pieces of information to an RDS receiver to enable it to perform a considerable number of tuning functions. These fundamental components, known as features, allow a degree of automatic tuning in an RDS receiver and allow it to present tuning-related information to the user. The type 0A group contains all of the following RDS features: AF, DI, MS, PI, PTY, TA, and TTP. The type 0B group contains the same features except the AF feature.

[0015] The implementation of the type 0 groups in any RDS transmission is essential, and not optional -unlike many of the other possible groups in RDS- because it carries vital information required for automated tuning of an RDS receiver.

From these basic RDS features serving as tuning aids, it is useful to initially consider AF, PI, PS, and TP. Here PS stands for 'program service name' and TP stands for 'traffic program signal'.

[0016] TP is a two-state flag signal to inform a receiver whether the transmission being received carries traffic announcements or not. The TP flag must only be set high on transmissions which dynamically switch on the TA flag during TA. TP may be used during automatic search tuning. If the TP flag is set to the logic state /1/, this indicates that the tuned program service provides the RDS traffic service. Broadcasters must not set the TP flag to /1/ unless the TA is also dynamically controlled.

[0017] The TA indicator feature is a two-state flag signal to inform a receiver that there is a TA on air or not. This signaling may permit a receiver to: switch automatically from any audio mode to the traffic announcement; switch on the traffic announcement automatically when the receiver is in a waiting reception mode and the audio signal is muted; switch from a program to another one carrying a traffic announcement, according to those possibilities.

[0018] The TP flag can be used by an RDS receiver, since it is in every RDS group, to easily evaluate the availability of the RDS traffic service when checking a frequency as part of the automatic tuning capability. If the tuned service does not provide the RDS traffic service feature, an RDS receiver should indicate this to the listener in some way. Options include the following:

[0019] Visually on the display or audibly by a bleep. This is particularly useful when moving away from a service and signal strength weakens to the point where the TP flag status becomes uncertain.

[0020] The receiver may automatically start to seek for an alternative service that is able to provide a traffic service.

[0021] Alternatively, the receiver could allow the user the option of continuing to listen to the currently tuned service without the traffic service, or manually initiating a search for an alternative service. The options provided might be different, depending on how the user is currently operating the receiver. For example, a routine may be as follows:

[0022] If the RDS traffic information service is selected while the user is listening to a CD or cassette, the receiver may automatically seek and tune to a service capable of providing a traffic service, without either beeping or requiring a listener to manually initiate a search.

[0023] If listening to the radio when traffic information is selected, the receiver may alert the listener visually or with a brief audible warning if the traffic service is unavailable, but not automatically retune. The user then has the option to initiate a search for another traffic service program, if required, or to continue listening to the tuned service but without a traffic service.

[0024] The same routine may be adopted if, while tuned to a service that was offering a traffic information service, the status of the TP/TA flags changes and indicates that a travel service is no longer available. Interference on areas with poor reception will mean that the TP and/or the TA flag may at times be read unreliably. The status of TP and TA flags may be evaluated over several groups, and momentary switching may be avoided as the result of short-term signal fluctuations.

[0025] Broadcasters must only set the TA flag to /1/ while a traffic announcement is in progress, although it may be necessary for operational transmission reasons to set it a few seconds (perhaps no more than three seconds) before the announcement starts. Delays inevitably occur in both the broadcast infrastructure and in RDS receiver processing, such that up to about two seconds may elapse between a broadcasting studio setting the TA flag and a receiver responding as described above. The traffic service identification jingle, which is played from a source that can be used to trigger the mechanism, is often used to provide the very short advance time required to achieve the flag setting.

[0026] In certain cases, many commercial radio stations may broadcast three tones or 'beeps' before and after the travel bulletin. These tones or beeps are used when the transmitter is located remotely from the studio, and for reasons of cost or practicality there is no control path from the studio to the transmitter to tell the transmitter when to switch on the TA flag. The only link from the studio to transmitter is the station audio itself. In these situations, "in-band signaling" is used. A unit at the transmitter site listens out for the tones or beeps in order to switch the TA flag on and off. The tones or beeps may be recorded on the traffic jingles to make life easier for the presenter. For the TA feature to work under any circumstances, however, the function marked TA, TI, TP or 'Traffic' must be switched on. It is possible to search out only those stations broadcasting the Traffic program on some radios.

[0027] Moreover, broadcasters should ensure that mechanisms are in place to monitor the status of the TA flag to assist in resetting it to a logic status /0/ immediately after traffic announcements have ended. This is very important to ensure that RDS receivers, having been automatically controlled by the broadcaster, are able to return to their previous listener setting (such as CD listening).

[0028] In the case of an accident, the various traffic and travel information (TTI) service providers may need to be informed about the event or accident. Depending on the time of day, radio stations in the area use different TTI service providers, such as Automobile Association service or central travel center of a broadcaster. In this example, it is assumed that central travel center of a broadcaster is informed of the accident by a police control room. The information may be sent to the traffic presenter by dial-up modem link, fax, or a phone call, but this may depend upon operational circumstances of a broadcaster.

[0029] When a travel center of the broadcaster is aware of the accident they will talk to the Radio A on-air studio to

agree on the timing for broadcasting a suitable traffic announcement. Depending on the program schedule, the announcement may be held back for a few minutes and may not be announced until a suitable program break occurs or until a scheduled traffic announcement time slot comes up, or it may be given urgent status.

[0030] When a traffic announcement is being made with RDS implementation, the Radio A transmitters must have their TA flag set to /1/, but this will only help a user who is already tuned to a Radio A transmission. If a user is tuned to a station other than Radio A, this user may have to preset his EON-capable RDS receiver to EON traffic service reception mode.

[0031] Today, the vast majority of communication/broadcast links are digital and may have at least one serial data multiplexed into the broadcast audio data. This enables RDS encoders to now be controlled by simple command strings, i.e., TA/1/ to turn the TA flag on and TA/0/ to turn it off. If TA flag is turned off too late, e.g., due to human error, TA may still appear when it may not be needed. In order to avoid such a situation, the appropriate strings may be generated by the music playout systems, so when the radio jockey (RJ) plays the jingle at the start of the TA report, the playout system also sends the command to the RDS encoder. The jingle serves as an indication to the RDS encoder to set TA flag to appropriate value.

[0032] Jingles are representative of a specific audio signal sequence occasionally contained in the audio signal. The specific audio signal sequence may have at least one of a specific temporal structure and specific spectral structure. For example, jingles are very short pieces of tones (e.g., music) that a radio station broadcasts as an audio divider between other programming elements. Jingles may also be regarded as station identity (ID) and are also known as radio imaging. They may bridge tempo changes, introduce news and traffic reports, punctuate promos, and add excitement to special features. Good jingles help create a unique identity that only one particular station will have. Jingles are one way to put an individual touch on a station's sound. The musical style and attitude of the jingles tell listeners what they can expect from the station. And many times a slogan or positioning statement is delivered most effectively in a musical context with a well-produced jingle. For example, a jingle is played between the end of one song and the beginning of the next; a jingle is played at the end of a series of radio commercials and before the next piece of music is played; a jingle is played at the beginning and the end of a news report. Jingles can be purely instrumental, or they can comprise of a voice singing the station name and FM frequency over a music track, or they can be in the form of a voice speaking the station name, FM frequency and/or station slogan over a music track.

[0033] Jingles may be regarded as a wrapper on a packet of merchandise or the box in which the merchandise is sold. The more distinctive the packaging, the more quickly the merchandise can be identified. Radio jingles work the same way - the more distinctive the jingles are, the more quickly the listener can be certain they are listening to the right radio station. Jingles that include the station's name and FM frequency also help the RJ by announcing the station name in an interesting way, so that the RJ does not have to repeat exactly the same information between every song.

[0034] In the context of the present disclosure, where above mentioned situation may be avoided on the receiver side, e.g., in car radio or car infotainment systems, and where radio or tuners are important components, RDS decoding is improved by constantly monitoring and comparing the jingle that may be stored in a database or alternatively stored on a remote server, i.e., cloud environment.

[0035] As RDS is one of the main sources used by many broadcasters to transmit traffic messages, however, due to multiple reasons such as propagation effects, or human errors the TA may arrive too late. In this case, the user may miss part of the TA message. In the case of weak RDS reception conditions, the user may completely miss the TA message, even though the user may be able to listen to the content of the broadcast. It may take 500 ms or more, based on signal quality, in order that RDS synchronization of a 57 kHz carrier of an FM MPX signal be acquired. This may result in an RDS block error rate (resulting in intermittent synchronization loss) that may prevent the RDS decoder from decoding the RDS signal properly.

[0036] Figure 1 illustrates a radio broadcast network 100 including radio stations 101, 102 and 103 that broadcast radio signals. The broadcasted radio signals are, for example, transmitted as stereo-multiplex signals in an FM frequency band. RDS data may be broadcast by all three radio stations 101, 102 and 103, to display, at the receiver, information relating to the radio broadcast. For example, the station name, song title, and/or artist may be included in the RDS data. In particular, the radio signals may include PI codes indicating the country of the radio station.

[0037] A radio receiver 104 that is installed in a vehicle 105 receives the radio signals and, thus, the RDS data. Figure 2 shows an exemplary radio receiver 200 for receiving and processing radio signals and for decoding and further processing RDS data in some more detail. The RDS data may be RDS-TMC data and may comprise traffic announcements, data about alternative frequencies of the tuned transmitter, etc. The radio signals may include PI codes.

[0038] The radio receiver 200 includes an antenna 201 for receiving a radio signal. The received radio signal is transmitted via a tuner 202 and an intermediate frequency stage 203 to a stereo decoder 204 and an RDS decoder 205. The tuner 202 is controlled by a tuning circuit 206 which is set by a control circuit (not shown in Figure 2) that is connected to a control device 208 by which a user may make user inputs. The control circuit is, for example, a processing circuit with peripheral circuits such as Digital Signal Processor (DSP) 207.

[0039] The DSP 207 may be a general-purpose processor optimized to efficiently execute digital signal processing

operations, such as a multiply-accumulate operation for Finite Impulse Response (FIR) filtering and Fast Fourier Transform (FFT) operations, as fast-access two-level cache, Enhanced Dynamic Memory Access (EDMA) circuitry, a bus system, etc. (not shown in Figure 2). The DSP 207 may also include a correlation unit 216 and a control unit 217. The units 216 and 217 may be implemented in hardware, software, and firmware, or some combination of at least two of the same. The radio receiver 200 may further include a memory 212 for storing permanently and/or temporarily various data used in connection with various operations executed by the DSP 207, as well as a display 213 and a speech synthesizer circuit 214 to visually output information generated by the DSP 207 to a user.

[0040] The stereo decoder 204 produces low-frequency stereo signals, which are supplied via audio amplifier 209 to two loudspeakers 210 and 211. The low-frequency stereo signals also referred to as 'Live Audio' are also routed to correlation unit 216 that may include buffer to hold back a few seconds (e.g., two to five seconds) of Live Audio data.

[0041] The RDS decoder 205 decodes RDS signal in particular PI, TP and TA codes and extracts various flags, which are supplied to control unit 217. If TP and TA flags are /1/, and if the traffic service identification jingle is played at the start of the TA, initially the traffic service identification jingle may be downloaded in the jingle database 215. Alternatively, jingle database 215 may be created externally and may be contained in a car infotainment system or in a cloud environment. A unique traffic service identification jingle may be used to detect the trigger of TA flag and is often used to provide the very short advance time required to achieve the TA flag setting. The stored jingle in the jingle database 215 may improve the accuracy and detection of a start of TA.

[0042] The correlation between the content of the buffer in correlation unit 216, i.e., Live Audio may be shifted either to the right or to the left relative to the jingle initially stored in the jingle database 215. The correlation between the Live Audio and initially stored jingle may be represented by aperiodic correlation. The aperiodic cross-correlation for two vectors $\mathbf{u} = (u_0, u_1, u_2, \dots, u_{N-1})$ and $\mathbf{v} = (v_0, v_1, v_2, \dots, v_{N-1})$ of length N is defined as

$$C_{u,v}(i) = \sum_{j=0}^{N-1-i} u_j v_{j+i}, \quad 0 \leq i \leq N-1 \quad (1)$$

$$C_{u,v}(i) = \sum_{j=0}^{N-1-i} u_{j-i} v_j, \quad -(N-1) \leq i \leq 0 \quad (2)$$

and $C_{u,v}(i) = 0$ if $i \geq N$ or $i \leq -N$. The elements of arbitrary sequence that are involved in the expressions for the cross-correlation function $C_{u,v}(i)$ for $i = m$ and for $i = m-N$ are illustrated in Figure 3. As shown in Figure 3, the integer m represents the offset of sequence $\mathbf{u}$ relative to sequence $\mathbf{v}$.

[0043] The cross-correlation (value) is somewhat simpler to illustrate for a specific value of m . The elements of $\mathbf{u} = (u_0, u_1, u_2, \dots, u_{N-1})$ and $\mathbf{v} = (v_0, v_1, v_2, \dots, v_{N-1})$ involved in the expressions for $C_{u,v}(m-N)$ and $C_{u,v}(m)$ are shown in Figure 3 for $m = 2$.

[0044] For example, $\mathbf{u}$ may be regarded as an output of stereo decoder 204, and $\mathbf{v}$ as a jingle initially stored in the jingle database 215, respectively, where, the elements of $\mathbf{u}$ and $\mathbf{v}$ may be represented as shown in Figure 4 and Figure 5, respectively.

[0045] According to Figure 3, the output of stereo decoder 204 in correlation unit 216 may be shifted to the right relative to the contents of the jingle database 215. The correlation unit 216 performs a correlation at regular intervals between the contents of the buffer, i.e., the output of stereo decoder 204 and the jingle data file stored in jingle database 215 associated with the previous TA flag. The regular intervals being defined as the detection of the TA flag as a reference point.

[0046] The output of stereo decoder 204 may be shifted to the right by 2 ($m = 2$) relative to the contents of the jingle database 215 as shown in Figure 4. The correlation unit 216 will perform a correlation operation between the output of the stereo decoder 204 and the contents of the jingle database 215 associated with the previous TA flag. For example, an aperiodic cross-correlation between the output of stereo decoder 304 and jingle database 315 as shown in Figure 7.

[0047] If the output of the correlation unit 216 is, e.g., zero, it will indicate the change in the contents of the jingle of a particular broadcaster. In such cases, the jingle stored in the jingle data file in jingle database 215 associated with a particular broadcaster may be replaced with the newly transmitted and detected jingle. This iterative comparison mechanism provides a simple and dynamic way to update the jingle data files stored in the jingle database 215. However, if the result of the correlation is, e.g., one, this will indicate the start of the TA flag and will force the receiver to act as if the relevant RDS information has actually been received.

[0048] The description of embodiments has been presented for purposes of illustration and description. Suitable modifications and variations to the embodiments may be performed in light of the above description or may be acquired from practicing the methods. For example, unless otherwise noted, one or more of the described methods may be performed by a suitable device and/or combination of devices. The described methods and associated actions may also be performed in various orders in addition to the order described in this application, in parallel, and/or simultaneously. The described systems are exemplary in nature, and may include additional elements and/or omit elements.

[0049] As used in this application, an element or step recited in the singular and proceeded with the word "a" or "an" should be understood as not excluding plural of said elements or steps, unless such exclusion is stated. Furthermore, references to "one embodiment" or "one example" of the present disclosure are not intended to be interpreted as excluding the existence of additional embodiments that also incorporate the recited features. The terms "first," "second," and "third," etc. are used merely as labels, and are not intended to impose numerical requirements or a particular positional order on their objects.

[0050] While various embodiments of the invention have been described, it will be apparent to those of ordinary skilled in the art that many more embodiments and implementations are possible within the scope of the invention. In particular, the skilled person will recognize the interchangeability of various features from different embodiments. Although these techniques and systems have been disclosed in the context of certain embodiments and examples, it will be understood that these techniques and systems may be extended beyond the specifically disclosed embodiments to other embodiments and/or uses and obvious modifications thereof.

Claims

1. A system comprising:

a radio receiver configured to receive from at least one radio station a broadcast signal carrying radio data messages and an audio signal;
 a database configured to store media assets and to provide a database output signal representative of the media assets stored in the database;
 a correlation unit operatively coupled to the radio receiver and the database, and configured to determine correlation values representative of the correlation between the audio signal and the database output signal; and
 a control unit operatively coupled to the correlator and configured to compare the correlation values to a pre-defined threshold value and to output, based on results of the comparisons, values indicative of a start or an end of one of the radio data messages.

2. The system of claim 1, wherein

the radio receiver is further configured to operate in a specific mode when a radio data message is received, and the control unit is further configured to control the radio receiver to operate in this specific mode after values indicative of the start and before values indicative of the end of one of corresponding radio data messages occur.

3. The system of claim 1 or 2, wherein the media assets comprise at least one jingle representative of a specific audio signal sequence occasionally contained in the audio signal.

4. The system of claim 3, wherein the specific audio signal sequence comprises at least one of a specific temporal structure and specific spectral structure.

5. The system of any of claims 1 to 4, wherein the radio data messages are in compliance with a Radio Data System (RDS) communications protocol.

6. The system of claim 3, wherein the radio data messages further comprise of additional information according to a Programme Identification (PI) and Traffic Announcement (TA) information field of the RDS communications protocol.

7. The system of any of claims 1 to 6, wherein the correlation values are between and including 0 and 1.

8. A method comprising:

receiving with a radio receiver from at least one radio station a broadcast signal carrying radio data messages and an audio signal;
 providing from a database a database output signal representative of the media assets stored in the database;
 calculating correlation values representative of the correlation between the audio signal and the database output signal; and
 comparing the correlation values to a pre-defined threshold value, and outputting, based on results of the comparisons, values indicative of a start or an end of one of the radio data messages.

9. The method of claim 8, wherein

the radio receiver is configured to operate in a specific mode when a radio data message is received; the method further comprising
controlling the radio receiver to operate in this specific mode after values indicative of the start and before values indicative of the end of one of the radio data messages occur.

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10. The method of claim 8 or 9, wherein the media assets comprise at least one jingle representative of a specific audio signal sequence occasionally contained in the audio signal.

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11. The method of claim 10, wherein the specific audio signal sequence comprises at least one of a specific temporal structure and specific spectral structure.

12. The method of any of claims 8 to 11, wherein the radio data messages are in compliance with a Radio Data System (RDS) communications protocol.

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13. The method of claim 10, wherein the radio data messages further comprise of additional information according to a Programme Identification (PI) and Traffic Announcement (TA) information field of the RDS communications protocol.

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14. The method of any of claims 8 to 13, wherein the correlation values are between and including 0 and 1.

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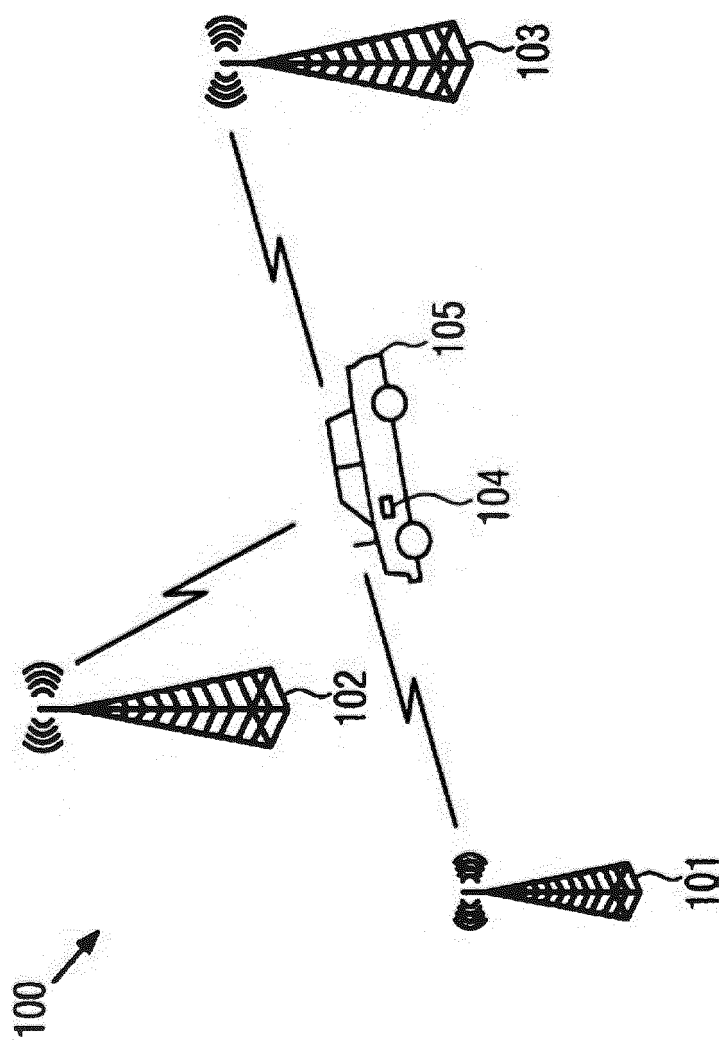


FIG 1

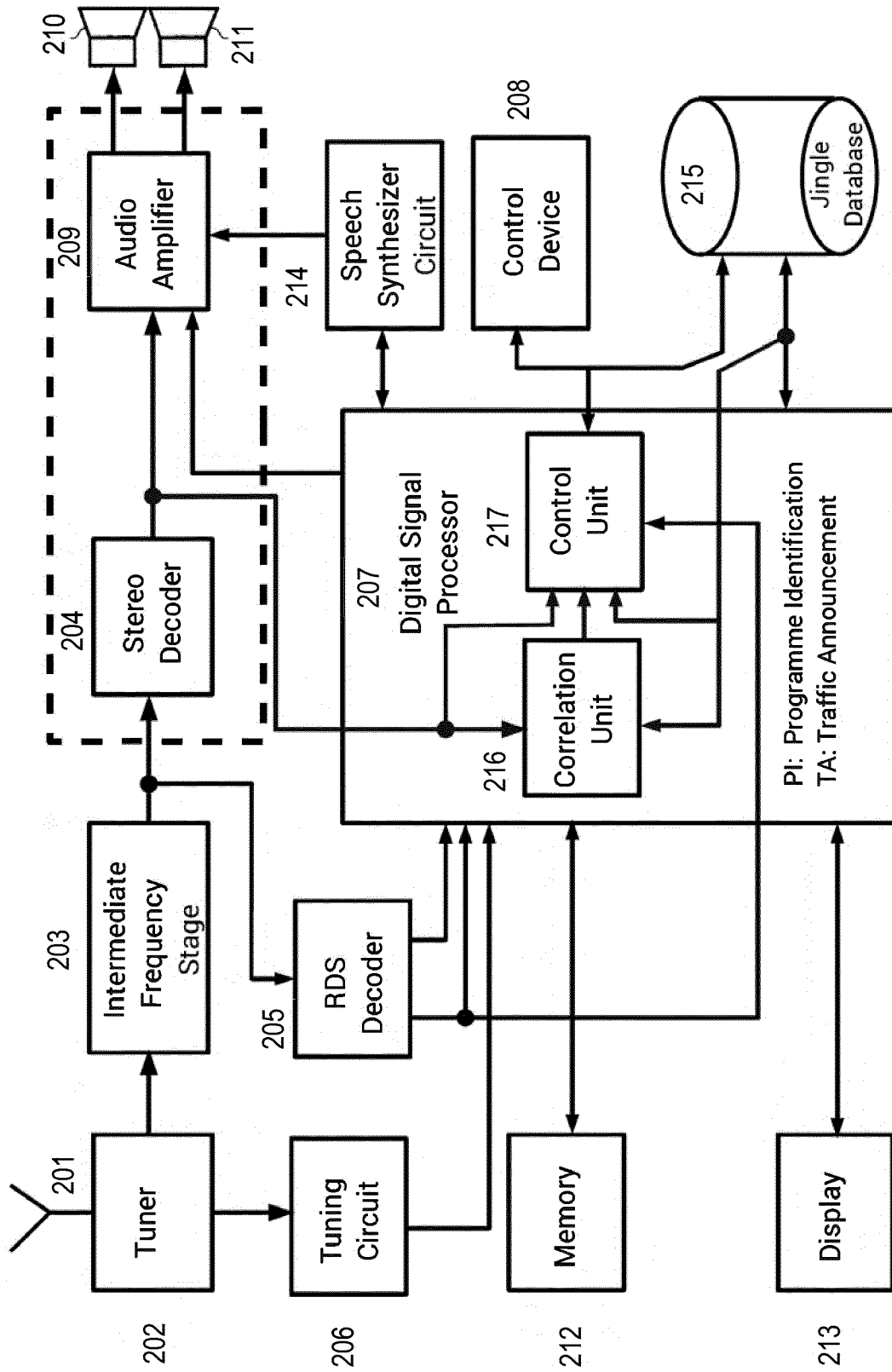


FIG 2

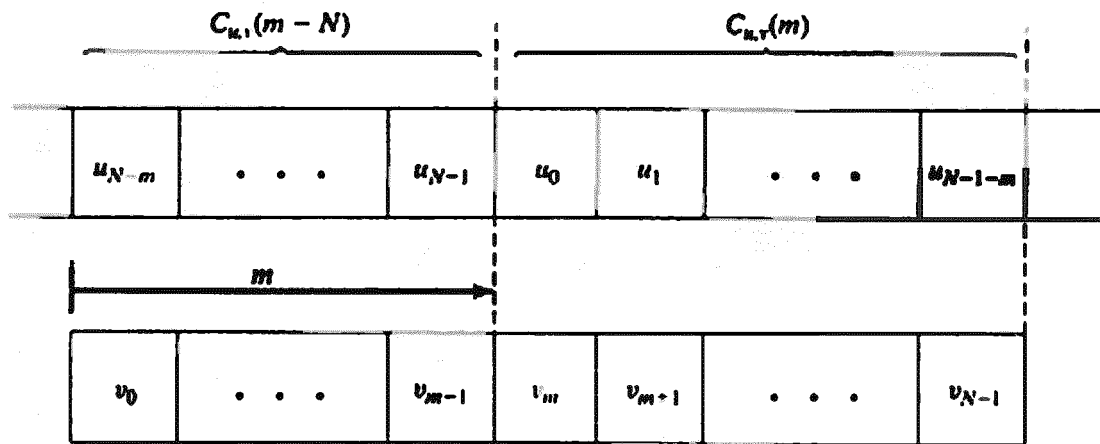


FIG 3

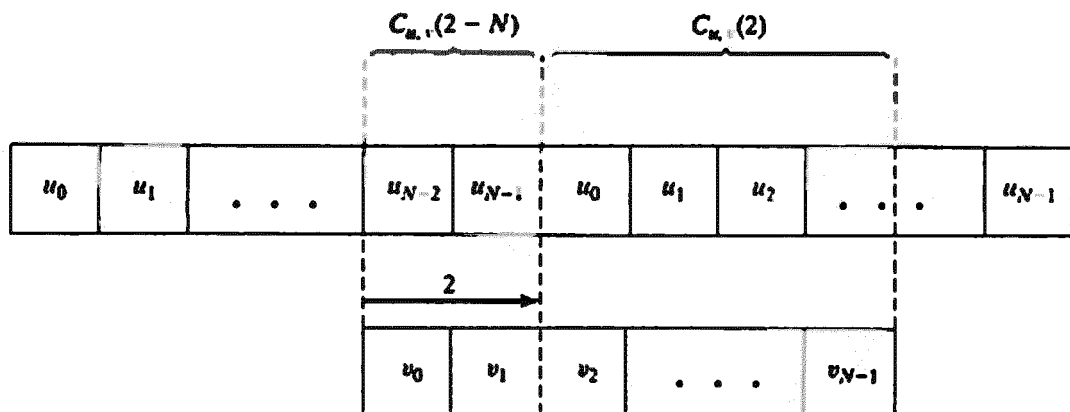


FIG 4

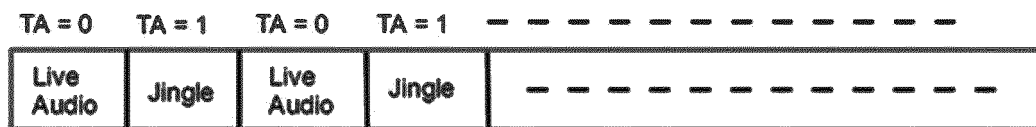


FIG 5

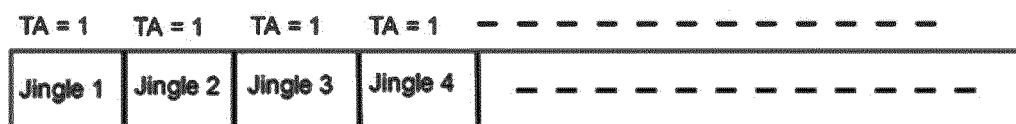


FIG 6

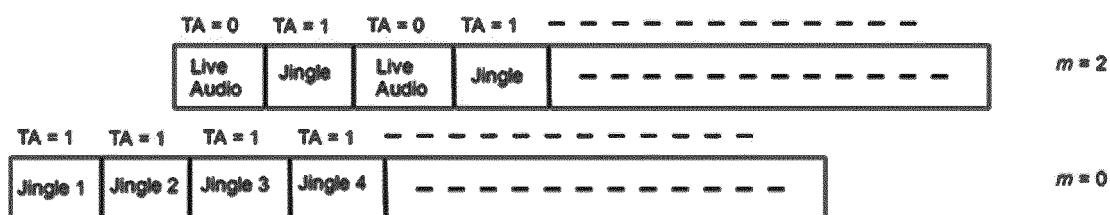


FIG 7



EUROPEAN SEARCH REPORT

Application Number
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 16 February 2018	Examiner Iovescu, Vladimir
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82