

ACOUSTIC INTERNET OF THINGS INFORMATION TRANSMISSION SYSTEM, RELAY BASE STATION AND METHOD

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BACKGROUND

[0001] 1. Technical Field

[0002] The present disclosure relates to a computer technology, and particularly to an acoustic internet of things information transmission system, a relay base station and a method.

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[0003] 2. Description of the Related Art

[0004] With the development of information and communication technology and the popularization of mobile devices (such as smart phones), users often use mobile devices to acquire information. Specifically, in addition to the Internet, information content providers present resource information by means of posters, books, magazines, videos and other media (in this patent, resource information refers to URLs or QR codes converted from URLs, which are URLs for uoloading specific information interfaces). Users the URLs or type them manually by clicking on them, or open the corresponding information content page of the information resource by scanning the QR code by the camera of the mobile device.

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[0005] In recent years, with the characteristics of microphones and loudspeakers on most mobile devices, the scheme of information broadcasting based on acoustic wave has been proposed. Prefabricated information can be pushed out by playback of uoloaded high-frequency sound wave by any sound-producing hardware. Users only need to receive acoustic wave by means of mobile devices to achieve the acquisition of resource information.

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[0006] However, the existing acoustic information recognition technology is limited to the technical scheme of decoding acoustic waves to get links, and there is no acoustic-based solution for the realization of functions of specific business models in offline application scenarios.

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SUMMARY

[0007] An acoustic internet of things information transmission system, a relay base station and a method are provided.

[0008] An acoustic internet of things information transmission system is described
 5 that includes an acoustic code transmitting unit, an acoustic code push-casting system, a mobile terminal, and a push notification platform, wherein: the acoustic code transmitting unit configured to send an acoustic signal containing an acoustic code; the acoustic code push-casting system comprises a relay base station, configured to process the received acoustic signal to acquire an electric signal
 10 containing the corresponding acoustic code, and send the electric signal to the mobile terminal within a present range; the mobile terminal comprises an acoustic code processing module configured to acquire the electric signal so as to extract the corresponding acoustic code, and unload the acoustic code to the relay base station; the relay base station further configured to acquire a corresponding link address
 15 according to the acoustic code unloaded by the mobile terminal, and send the link address to the mobile terminal, wherein a relationship between acoustic codes and link addresses being pre-stored in the relay base station; the acoustic code processing module further configured to log in a webpage or the push notification platform by means of the link address so as to acquire the corresponding resource
 20 information when the link address is received, wherein the acoustic code and the resource information corresponding to the link address are pre-stored in the push notification platform.

[0009] Wherein, the relay base station includes: a communication module configured to communicate with the mobile terminal; a short address database
 25 configured to pre-store the relationship between acoustic codes and link addresses, wherein the link address are short address; an acoustic code analysis module configured to acquire the corresponding link address from the short address database according to the acoustic code unloaded by the mobile terminal, and send the link address to the acoustic code processing module by the communication
 30 module.

[0010] Wherein, the acoustic code processing module includes: a first acoustic

wave receiving module configured to receive the acoustic signal sent by the acoustic code transmitting unit; a first acoustic wave DAC module configured to convert the acoustic signal to acquire the corresponding acoustic code by inverse fourier transformation.

5 **[0011]** communicating with the relay base station; a beacon management system configured to preset the relationship between acoustic codes and link addresses, set up and manage the broadcast patch according to predefined rules; the relay base station further includes: a second acoustic wave receiving module configured to receive the acoustic signal sent by the acoustic code transmitting
10 unit; a second acoustic wave DAC module configured to convert the acoustic signal to the corresponding acoustic code by inverse fourier transformation; an acoustic code unloading module configured to acquire the acoustic code converted by the second acoustic wave DAC module, and embed the acoustic code into the beacon
15 information format by beacon coding function to form beacon information containing the acoustic code and beacon code corresponding to the broadcast patch; a communication module configured to establish one-way communication with the broadcast patch through bluetooth, and send the beacon information to the broadcast patch corresponding to the beacon code in response to the instructions
20 generated by the beacon management system, wherein the instructions being generated according to the predefined rules by the beacon management system; the broadcast patch further configured to receive the beacon information containing the acoustic code sent by the relay base station, and send the beacon information to the mobile terminal within the preset range.

25 **[0012]** Wherein, the relay base station is further configured to send the electric signal to another relay base station, the another relay base station is configured to send the electric signal to the mobile terminal which in the preset range.

[0013] Wherein, the mobile terminal is further configured to pre-store the relationship between acoustic codes and link addresses, which is preset by the
30 acoustic code processing module, or downloaded from the relay base station; the acoustic processing module is further configured to acquire the acoustic code from

the electric signal when it is received, and acquire the corresponding link address according to the relationship pre-stored in.

[0014] Wherein, the beacon management system is BLE4.0 LAN management system.

- 5 **[0015]** Wherein, resource information pre-stored in the push notification platform comprises acoustic codes as the main key content of the index table, short address bound to the acoustic codes, and information content corresponding to the short address including one or more of the following: merchant type, merchant ID, product type, product ID, customer mobile phone number, geoLocation, coupon ID,
10 coupon status, time stamp, advertisement, activities, and public service information, wherein the information content is videos, audios, pictures, texts, or webpages.

[0016] An acoustic internet of things information transmission relay base station is described that includes: a short address database configured to pre-stored a relationship between acoustic codes and link addresses, wherein the link address
15 being short address; a receiving module configured to receive an acoustic signal containing acoustic code, and process the acoustic signal to acquire an electric signal containing the acoustic code; a communicating module configured to send the electric signal to a mobile terminal within a preset range; and an acoustic analysis module configured to acquire a corresponding link address from the short
20 address database according to the acoustic code unloaded by the mobile terminal, and send the link address to the mobile terminal to log in a webpage or a push notification platform by means of the link address to acquire the corresponding resource information; wherein the acoustic code unloaded by the mobile terminal is acquired from the electric signal received, and the resource information
25 corresponding to the acoustic code and the link address being pre-stored in the push notification platform.

[0017] Wherein, further includes: a second acoustic wave DAC module configured to convert the acoustic signal to acquire the corresponding acoustic code by inverse fourier transformation; an acoustic code unloading module configured
30 to acquire the acoustic code converted by the second acoustic wave DAC module, and embed the acoustic code into the beacon information format by beacon coding

function to form beacon information containing the acoustic code and beacon code corresponding to broadcast patch; the communication module further configured to establish one-way communication with the broadcast patch through bluetooth, and send the beacon information to the broadcast patch corresponding to the beacon code in response to the instructions generated by a beacon management system, that the broadcast patch sends the beacon information to the mobile terminal within the preset range; wherein the instructions being generating according to predefined rules by the beacon management system.

[0018] Wherein, communication module is further configured to send the electric signal to another relay base station.

[0019] An acoustic internet of things information transmission method is described that includes: sending an acoustic signal containing an acoustic code by an acoustic code transmitting unit; processing the received acoustic signal by a relay base station to acquire an electric signal containing the corresponding acoustic code, and sending the electric signal to a mobile terminal within a preset range; acquiring the electric signal so as to extract the corresponding acoustic code by the mobile terminal, and uploading the acoustic code to the relay base station; acquiring a corresponding link address by the relay base station, and sending the link address to the mobile terminal, wherein a relationship between acoustic codes and link addresses is pre-stored in the relay base station; logging in a corresponding webpage or a push notification platform by means of the link address so as to acquire the corresponding resource information after the link address is received by the mobile terminal, wherein the acoustic code and the resource information corresponding to the link address are pre-stored in the push notification platform.

[0020] Wherein, further includes: receiving the acoustic signal containing the acoustic code by the mobile terminal sent by the acoustic code transmitting unit; converting the acoustic signal to the acoustic code by inverse fourier transformation by the mobile terminal, and uoloading the acoustic code to the relay base station.

[0021] Wherein, after sending an acoustic signal containing an acoustic code by an acoustic code transmitting unit, further includes: receiving the acoustic signal by the relay base station, and converting the acoustic signal to the acoustic code by

inverse fourier transformation; embedding the acoustic code into a beacon information format by beacon coding function to form beacon information containing the acoustic code and the beacon code corresponding to a broadcast patch; sending the beacon information to the broadcast patch corresponding to the beacon code in response to the instructions generated by a beacon management system, wherein the instructions being generated according to the predefined rules by the beacon management system; receiving the beacon information containing the acoustic code sent by the relay base station by the broadcast patch, and sending the beacon information to the mobile terminal within the preset range.

10 **[0022]** Wherein, after acquiring the electric signal so as to extract the corresponding acoustic code by the mobile terminal, further includes: acquiring the corresponding link address according to the relationship between acoustic codes and link addresses pre-stored in and preset by the mobile terminal or downuoloaded from the relay base station.

15 **[0023]** Wherein, the resource information pre-stored in the push notification platform comprises acoustic codes as the main key content of the index table, short address bound to the acoustic codes, and information content corresponding to the short address including one or more of the following: merchant type, merchant ID, product type, product ID, customer mobile phone number, geoLocation, coupon ID, coupon status, time stamp, advertisement, activities, and public service information.

20 **[0024]** An acoustic internet of things information transmission method is described that includes: receiving an acoustic signal containing acoustic code sent by an acoustic code transmitting unit; processing the acoustic signal to acquire an electric signal containing the acoustic code; sending the electric signal to a mobile terminal within a preset range; acquiring a corresponding link address from a short address database according to the acoustic code uoloaded by the mobile terminal, and acquired from the electric signal by the mobile terminal; sending the link address to the mobile terminal to log in a webpage or a push notification platform by means of the link address to acquire the corresponding resource information, wherein the acoustic code and the resource information corresponding to the link address are pre-stored in the push notification platform.

[0025] Wherein, after receiving an acoustic signal containing acoustic code sent by an acoustic code transmitting unit, further includes: converting the acoustic signal to the acoustic code by inverse fourier transformation; embedding the acoustic code into a beacon information format by beacon coding function to form
5 beacon information containing the acoustic code and the beacon code corresponding to a broadcast patch; sending the beacon information to the broadcast patch corresponding to the beacon code in response to the instructions generated by a beacon management system, wherein the instructions being generated according to the predefined rules by the beacon management system.

10 **[0026]** Wherein, after processing the acoustic signal to acquire an electric signal containing the acoustic code, further includes: sending the electric signal to another relay base station.

[0026] The acoustic information transmission system, relay base station and method of the embodiment of the present invention apply the acoustic information
15 transmission technology to the user access terminal of the Internet of Things, combine the acoustic transmission technology with the Internet of Things, not only simplify the user operation, make the information resource acquisition more convenient and fast, but also make use of the Internet of Things more abundant. The information resources not only improve the user experience of the whole
20 Internet of Things, but also expand the commercial use of the Internet of Things, and transmit the acoustic code to the user through BLE4.0 high-frequency radio signal, thus solving the problem that the acoustic wave can not carry a large amount of information. In addition, the present invention sets the information push for the customer (e.g. the business) as a unit. The broadcasting area is convenient for
25 customers to set, bind and update the information needed to be broadcasted offline and in real time, and the URL of the link address of the broadcasting information is distributed stored in the client, which reduces the cost of storage and information interaction of the information broadcasting service platform. The information broadcasting service platform emphasizes the collection of large data, and give
30 various trend forecast results, which greatly reflects the commercial value of the Internet of Things.

BRIEF DESCRIPTION OF THE DRAWINGS

[0027] FIG. 1 is a block diagram of an acoustic internet of things information transmission system in accordance with a first exemplary embodiment.

5 **[0028]** FIG. 2 is a block diagram of an acoustic internet of things information transmission system in accordance with a second exemplary embodiment.

[0029] FIG. 3 is a schematic diagram of an acoustic wave transport protocol model according to the invention.

10 **[0030]** FIG. 4 is a schematic diagram of an acoustic code data structure according to the invention.

[0031] FIG. 5 is a channel mapping table of an acoustic code information section in accordance with an exemplary embodiment.

15 **[0032]** FIG. 6 is a schematic diagram of the conversion of acoustic waves into acoustic codes uoloading to beacon information format in accordance with an exemplary embodiment.

[0033] FIG. 7 is a schematic diagram of data transmission information format of the acoustic Internet of things in accordance with an exemplary embodiment.

[0034] FIG. 8 is a flowchart of an acoustic internet of things information transmission method in accordance with a first exemplary embodiment.

20 **[0035]** FIG. 9 is a flowchart of an acoustic internet of things information transmission method in accordance with a second exemplary embodiment.

[0036] FIG. 10 is a flowchart of an acoustic internet of things information transmission method in accordance with a third exemplary embodiment.

25 **[0037]** FIG. 11 is an acoustic internet of things information transmission method in accordance with a fourth exemplary embodiment.

[0038] FIG. 12 is a flowchart of an acoustic internet of things information transmission method in accordance with a fifth exemplary embodiment.

DETAILED DESCRIPTION

30 **[0039]** FIG. 1 shows a block diagram of an acoustic internet of things information transmission system. The system 10 includes an acoustic code transmitting unit 1,

an acoustic code push-casting system 2, a mobile terminal 3, and a push notification platform 4.

[0040] The acoustic code transmitting unit 1 is configured to play video/audio documents containing acoustic code. In the embodiment, the acoustic code transmitting unit 1 is a video/audio playing device. The mobile terminal 3 includes a built-in bluetooth module 31 and an acoustic code processing module 32. The terminal mobile 3 communicates with the push-casting platform 4 via the acoustic code processing module 32. The mobile terminal 3 communicates with the push notification platform 4 via the acoustic code processing module 32 (such as internet). The mobile terminal 3 is smart phone, tablet computer, and PDA, etc..

[0041] The acoustic code push-casting system 2 includes a relay base station 22. The relay base station 22 is configured to receive an acoustic signal, process the acoustic signal to acquire an electric signal containing the acoustic code, and send the electric signal to the terminal mobile 3 within a present range.

[0042] The acoustic code processing module 32 is configured to process the electric signal to acquire the acoustic code, and uoload the acoustic code to the relay base station 22. The relay base station 22 is further configured to acquire a corresponding link address according to the acoustic code upuoloaded by the mobile terminal 3, and send the link address to the terminal mobile 3. A relationship between acoustic codes and link addresses is pre-stored in the relay base station 22.

[0043] The acoustic code pressing module 32 is further configured to log in a webpage or the push notification platform 4 by means of the link address to acquire the corresponding resource information when the link address is received.

[0044] In the embodiment, the relay base station 22 includes an acoustic code analysis module 221, a short address database 222, and a communication module 224. The short address database 222 is configured to pre-store the relationship between acoustic codes and link address. The communication module 224 includes a RF module and a bluetooth module which communicates with the mobile terminal 3. The acoustic code analysis module 221 is configured to acquire the corresponding link address from the short address database 222 according to the acoustic code uoloaded by the mobile terminal 3, and send the link address to the

acoustic code processing module 32 by the communication module 224. The acoustic code pressing module 32 is further configured to log in the webpage or the push notification platform 4 by means of the link address to acquire the corresponding resource information when the link address is received.

- 5 **[0045]** In the embodiment, the acoustic code pressing module 32 further includes a first acoustic wave receiving module, and a first acoustic wave DAC module. The first acoustic wave receiving module is configured to receive the acoustic signal sent by the acoustic code transmitting unit 1. The first acoustic wave DAC module is configured to convert the acoustic signal to acquire the corresponding acoustic
10 code by inverse fourier transformation.

[0046] In the embodiment, the relay base station 22 is further configured to process the acoustic signal to acquire the corresponding electric signal when the acoustic signals is received, and send the electric signal to another relay base station to send the electric signal to the mobile terminal in the preset range.

- 15 **[0047]** Referring to FIG. 2, in the embodiment, the acoustic code push-casting system 2 further includes a broadcast patch 21 communicating with the relay base station 22, and a beacon management system 23. The beacon management system 23 is configured to preset the relationship between acoustic codes and link addresses, set up and manage the broadcast patch 21 according to predefined rules.

- 20 **[0048]** The relay base station 22 further includes an acoustic code uoloading module 223, a second acoustic wave receiving module 225, and a second acoustic wave DAC module 226. The second acoustic wave receiving module 225 is configured to receive the acoustic signal sent by the acoustic code transmitting unit 1. The second acoustic wave DAC module 226 is configured to convert the acoustic
25 signal received by the second acoustic wave receiving module 225 to acquire the corresponding acoustic code by inverse fourier transformation, and send the acoustic code to the acoustic code uoloading module 223. The acoustic code uoloading module 223 is configured to acquire the acoustic code converted by the second acoustic wave DAC module 226, and embed the acoustic code into the
30 beacon information format by beacon coding function to form beacon information containing the acoustic code and beacon code corresponding to the broadcast patch.

The communication module 224 is configured to establish one-way communication with the broadcast patch 21 by means of bluetooth, and send the beacon information to the broadcast patch 21 corresponding to the beacon code in response to the instructions generated by the beacon management system 23. The instructions are generated according to the predefined rules by the beacon management system 23.

[0049] In the embodiment, the broadcast patch 21 is configured to receive the beacon information containing the acoustic code sent by the relay base station 22, and send the beacon information to the mobile terminal 3 within the preset range. The mobile terminal 3 is configured to process the beacon information to acquire the acoustic code by the acoustic code processing module 32 when the beacon information is received, and uoload the acoustic code to the relay base station 22.

[0050] In the embodiment, the information push-casting area is established corresponding to one or more merchants. Each information push-casting area includes at least one beacon management system, at least one relay base station, at least one acoustic code transmitting unit 1 and several broadcasting patches.

[0051] In the embodiment, the link address is URL or short address. The beacon management system 23 is BLE4.0 LAN management system. The push notification platform 4 includes a database for storing push-casting information content including acoustic codes as the main key content of the index table, short address bound to the acoustic codes, and information content corresponding to the short address. The information content corresponding to the short address includes one or more of the following: merchant type, merchant ID, product type, product ID, customer mobile phone number, geoLocation, coupon ID, coupon status, time stamp. The information content stored in the database are preset by the merchants.

[0052] Referring to FIG.3, in the embodiment, the protocol model for sending acoustic wave includes four layers of architecture, from bottom to top: a physical layer, a transport layer, a presentation layer, and an application layer.

[0053] The physical layer is at the bottom of the protocol model, which provides acoustic transmission medium and interconnection equipment for data communication between devices, reliable transmission environment for data transmission, and hardware support for acoustic transmission. The physical layer

mainly includes acoustic transmission equipment and acoustic receiving equipment. At the same time, the physical layer includes hardware requirements for transmitting and receiving devices, such as frequency range, sampling rate, intensity range, etc.

5 **[0054]** The transport layer is located on the physical layer for data transmission from the source to the destination, that is, the transmission equipment and media based on the physical layer, which sends acoustic waves from the acoustic transmission equipment to the acoustic receiving equipment. The transport layer supports for playing acoustic wave through the loudspeaker of the transmission end
10 and receiving acoustic wave through the microphone of the receiving end. During the transmission process, the acoustic wave can be played repeatedly according to the actual application scene in order to improve the accuracy. The transport layer further puts forward normative requirements on intensity, time length and non-overlapping of the transmitted acoustic wave.

15 **[0055]** The presentation layer is configured to define a general data format for acoustic communication, and provides a standard encoding and decoding rule for converting data. The presentation layer supports for string construction and check code generation of pre-sending data, encoding and generation of acoustic signal, processing and decoding after signal received, string parsing and check code
20 verification of data. The presentation layer is further configured to define general standard data construction, analysis rules, and acoustic code and decoding rules.

[0056] Referring to FIG. 4, before coding the string of data to be transmitted into the acoustic wave, the data structure needs to add information header and CRC check bits, in addition to the data content. A complete information segment
25 includes the data content, the information header, and the CRC check bits, which consists of seven bytes. The first byte of the information segment is the information header, which can be used as a separator to locate the initial byte of the received acoustic wave during the cycle, as a group identification to distinguish different groups of acoustic waves, and as a secret protocol between the acoustic transmitter
30 and the acoustic receiver. The 4 bytes in the middle of the information segment is valid data bits, that is, the actual information transmitted, such as the acoustic code.

The last 2 bytes are the CRC check bits to verify the correctness and completeness of the data transmitted by the ultrasonic code.

[0057] Referring to FIG. 5, in the embodiment, the bandwidth of the acoustic code information section is 18K-20K, which is divided into four channels. As shown in Fig. 5, the corresponding frequency ranges of channel A, channel B, channel C and channel D are set up, and the mapping relationship between them and the high and low level signals is established. A byte is used to represent a transmission sequence of the above four channels to form an information transmission sequence table. The byte is used as the information header to define the order of information transmission of four channels. For example, header A represents the order of information transmission, which is channel B, channel A, channel D and channel C. Header F represents the order of information transmission, which is channel A, channel C, channel D and channel B. The information transmission sequence table is stored in the acoustic transmitter and the acoustic receiver respectively to be called.

[0058] Referring to FIG.6, in the embodiment, the merchant in the present invention plays audio and video documents containing the USID through the acoustic code transmitting unit 1 in the information broadcasting area, or directly sends the acoustic signal converted by the USID. The second acoustic wave receiving module 225 of the relay base station 22 receives the acoustic signal sent by the acoustic code transmitting unit 1. The second acoustic wave DAC module 226 converts the acoustic signal to acquire the USID by inverse fourier transform. The acoustic code uoloading module 223 embed the USID and UUID into the beacon information format by beacon encoder to form beacon information. The PDU (Protocol Data Unit) payload of the beacon information format includes four-bytes acoustic code and UUID, which are determined whether to transmit data information or location information by the different parameters of Access Address. The relay base station 22 sends the beacon information to the broadcast patch 21 corresponding to the UUID. The beacon broadcast patch 21 broadcasts the beacon information.

[0059] During acoustic communication, the acoustic wave is modulated to 18K-

20K frequency, and further is decoded to acquire the corresponding acoustic code after FFT acoustic wave conversion. Embedding the acoustic code into the beacon information format can make the information transmission farther and more stable, and overcome the shortcoming of short transmission distance of acoustic wave. The beacon has the ability of accurate positioning and starting APP.

[0060] FIG. 7 shows a schematic diagram of data transmission information format of the acoustic Internet of things in accordance with an exemplary embodiment.

[0061] Ultrasonic ID(USID): acoustic code being embedded in acoustic waves or radio waves.

[0062] Short URL Address (SUA): configured to link to the information broadcasting service platform to acquire the corresponding information, and link to the Internet pages also. The information corresponding to the short address includes one or more of the following: merchant type, merchant ID, product type, product ID, customer mobile phone number, geoLocation, coupon ID, coupon status, time stamp, advertisement, activities, and public service information.

[0063] The information refers to audio, video, pictures, texts and webpages.

[0064] Merchant Type(MT): configured to distinguish the type of merchants;

[0065] Merchant ID(MID): configured to identify merchants;

[0066] Product Type(PT): configured to distinguish the type of products;

[0067] Product ID(PID): configured to identify products;

[0068] Mobile No.(MN): configured to bind customer mobile phone number;

[0069] GeoLocation(GL): configured to record the location or GPS longitude and latitude of the beacon or the acoustic code transmitting unit;

[0070] Coupon ID(CID): configured to record the use of coupons;

[0071] Coupon Status(CS): including used, unused or expired;

[0072] Time Stamp(TS): configured to record trading time;

[0073] FIG. 8 shows a flowchart of an acoustic internet of things information transmission method in accordance with a first exemplary embodiment.

[0074] In step S10, the acoustic code transmitting unit 1 sends an acoustic signal containing an acoustic code.

[0075] In step S11, the relay base station 22 processes the received acoustic signal

to acquire an electric signal containing the corresponding acoustic code, and sends the electric signal to the mobile terminal 3 within the preset range.

[0076] In step S12, the mobile terminal 3 acquires the electric signal so as to extract the corresponding acoustic code, and uploads the acoustic code to the relay base station 22.

[0077] In step S13, the relay base station 22 acquires a corresponding link address, and sends the link address to the mobile terminal 3. The relationship between acoustic codes and link addresses is pre-stored in the relay base station 22.

[0078] In step S14, the mobile terminal 3 logs in a corresponding webpage or the push notification platform 4 by means of the link address to acquire the corresponding resource information after the link address is received. Then, the process goes end.

[0079] The resource information corresponding to the acoustic codes and link addresses is pre-stored in the push notification platform 4.

[0080] FIG. 9 shows a flowchart of an acoustic internet of things information transmission method in accordance with a second exemplary embodiment.

[0081] In step S20, the acoustic code transmitting unit 1 sends the acoustic signal containing acoustic code.

[0082] In step S21, the mobile terminal 3 receives the acoustic signal sent by the acoustic code transmitting unit 1.

[0083] In step S22, the mobile terminal 3 converts the acoustic signal to acquire the acoustic code by inverse fourier transformation, and uploads the acoustic code to the relay base station 22.

[0084] In step S23, the mobile terminal 3 log in a corresponding webpage or the push notification platform 4 by means of the link address to acquire the corresponding resource information after the link address is received. Then, the process goes end.

[0085] FIG. 10 shows a flowchart of an acoustic internet of things information transmission method in accordance with a third exemplary embodiment.

[0086] In step S30, the acoustic code transmitting unit 1 sends the acoustic signal containing acoustic code.

[0087] In step S31, the relay base station 22 converts the acoustic signal to acquire the acoustic code by inverse fourier transformation when the acoustic signal is received.

[0088] In step S32, the relay base station 22 embeds the acoustic code into the beacon information format by beacon coding function to form beacon information. The beacon information contains the acoustic code and beacon code corresponding to the broadcast patch.

[0089] In step S33, the relay base station 22 sends the beacon information to the broadcast patch 21 corresponding to the beacon code in in response to the instructions generated by the beacon management system 23. The instructions are generated according to the predefined rules by the beacon management system 23.

[0090] In step S34, the broadcast patch 21 receives the beacon information containing the acoustic code sent by the relay base station 22, and sends the beacon information to the mobile terminal 3 within the preset range. Then, the process goes to step S35.

[0091] In the embodiment, the resource information pre-stored in the push notification platform 4 comprises acoustic codes as the main key content of the index table, short address bound to the acoustic codes, and information corresponding to the short address including one or more of the following: merchant type, merchant ID, product type, product ID, customer mobile phone number, geoLocation, coupon ID, coupon status, time stamp, advertisement, activities, and public service information. Wherein, the information refers to audio, video, pictures, texts and webpages.

[0092] For example, the predefined rules by the beacon management system 23 is set that merchant A broadcasts product type B and coupon ID C during 12:00-14:00 every day. According to the predefined rules, the beacon information is sent to the broadcast patch corresponding to the beacon code, such as the broadcast patch in the area where the merchant A is located. When the user with mobile terminal is within a certain range during 12:00-14:00, the signal is acquired from the broadcast patch through the acoustic code processing module 32 of the mobile terminal 3, and the coupon ID C issued by the merchant code B is accessed according to the

corresponding link address.

[0093] For example, the predefined rules by the beacon management system 23 is set that merchant A broadcasts product ID B and coupon ID C all day. According to the predefined rules, the beacon information is sent to each beacon broadcast patch. Users with mobile terminals can acquire signals from broadcast patches by means of the acoustic code processing module 32 at any location, and access the coupon ID C of product ID B issued by the merchant A according to the link address.

[0094] FIG. 11 shows a flowchart of an acoustic internet of things information transmission method in accordance with a fourth exemplary embodiment.

[0095] In step S40, the relay base station 22 receives the acoustic signal containing acoustic code sent by the acoustic code transmitting unit 1.

[0096] In step S41, the relay base station 22 processes the acoustic signal to acquire the electric signal containing the acoustic code.

[0097] In step S42, the relay base station 22 sends the radio signal to the mobile terminal 3 within the preset range.

[0098] In step S43, the relay base station 22 receives the acoustic code uploaded by the mobile terminal 3, and acquires the corresponding link address from the short database.

[0099] In step S44, the relay base station 22 sends the link address to the mobile terminal 3 to log in the webpage or the push notification platform 4 by means of the link address to acquire the corresponding resource information.

[0100] In the embodiment, the acoustic code uploaded by the mobile terminal 3 is acquired by processing the electric signal received by the mobile terminal 3. The resource information corresponding to the acoustic codes and the link addresses is pre-stored in the push notification platform 4.

[0101] In the embodiment, after processing the acoustic signal to acquire an electric signal containing the acoustic code, the relay base station 22 sends the electric signal to another relay base station.

[0102] FIG. 12 shows a flowchart of an acoustic internet of things information transmission method in accordance with a fifth exemplary embodiment.

[0103] In step S50, the relay base station 22 receives the acoustic signal sent by the acoustic code transmitting unit 1.

[0104] In step S51, the relay base station 22 converts the acoustic signal to acquire the acoustic code by inverse fourier transformation.

5 **[0105]** In step S52, the relay base station 22 embeds the acoustic code into the beacon information format by beacon coding function to form beacon information. The beacon information contains the acoustic code and beacon code corresponding to the broadcast patch.

10 **[0106]** In step S53, the relay base station 22 sends the beacon information to the broadcast patch 21 corresponding to the beacon code in in response to the instructions generated by the beacon management system 23, and the broadcast patch 21 sends the beacon information containing the acoustic code to the mobile terminal 3 within the preset range. The instructions are generated according to the predefined rules by the beacon management system 23.

15 **[0107]** In step S54, the relay base station 22 receives the acoustic code uploaded by the mobile terminal 3, and acquires the corresponding link address from the short address database.

20 **[0108]** In step S55, the relay base station 22 sends the link address to the mobile terminal 3 so as to log in the webpage or thepush notification platform 4 by means of the link address to acquire the corresponding resource information.

25 **[0109]** Provided by the embodiments of the present invention, in the acoustic Internet of Things information transmission system, relay base station and method, an information push area is set up with a merchant as a unit, and a plurality of merchants correspond to a plurality of information push areas. Each information push area includes at least a beacon management system, at least a relay base station, at least an acoustic transmitting unit and several brocast patches. The customer binds the acoustic code and push information link address URL according to the demand of information broadcasting, stores the acoustic code in the relay base station, inserts the acoustic code into the audio and video document, plays the
30 audio and video document through the acoustic code transmitting unit in the information broadcasting area, or sends the acoustic signal directly. After the relay

base station receives the acoustic code, the encapsulated beacon information is relayed to the corresponding broadcasting patch, and then the acoustic codes are transported by the 2.4 GHz BLE4.0 high frequency radio signal (carrier) transmitted by the beacon broadcasting patch. By using the stable and fast transmission characteristics of the beacon broadcasting patch, the shortcomings of short transmission distance and unstable signal can be compensated, and the beacon can be used widely. The performance of indoor positioning of the broadcasting patch, locking the mobile terminal entering the preset range to broadcast the acoustic codes, facilitating the precise setting of the crowd for information dissemination, and the mobile terminal receiving the acoustic codes upload the acoustic codes to the relay base station to obtain the corresponding link address URL of the broadcasting information, and log in to the Internet through the link address URL of the push information. The present invention applies the acoustic wave information transmission technology to the user access terminal of the Internet of Things, combines the acoustic wave transmission technology with the Internet of Things, not only simplifies the user operation, makes the information resources acquisition more convenient and fast, but also utilizes the richer information resources of the Internet of Things, and not only improves the whole Internet of Things. The user experience of the Internet of Things expands the commercial use of the Internet of Things, and transmits and propagates the acoustic code to the user through the BLE4.0 high frequency radio signal, which solves the problem that the acoustic wave can not carry a large amount of information. In addition, the present invention sets the information propagating area for the unit of the customer (e.g. the merchant) to facilitate the off-line real-time setting of the customer. Binding and updating the information that needs to be pushed, and the URL of the link address of the pushing information is distributed stored in the client, which reduces the cost of storage and information interaction of the information pushing service platform. The information pushing service platform emphasizes the collection of large data and the prediction results of various trends. It realizes the commercial value of the Internet of Things.

[0110] It is to be understood, however, that even though numerous characteristics

and advantages of the present disclosure have been set forth in the foregoing description, together with details of the structure and function of the present disclosure, the present disclosure is illustrative only, and changes may be made in detail, especially in matters of shape, size, and arrangement of parts within the
5 principles of the present disclosure to the full extent indicated by the broad general meaning of the terms in which the appended claims are expressed.

Claim

What is claimed is:

1. An acoustic internet of things information transmission system comprising
5 an acoustic code transmitting unit, an acoustic code push-casting system, a mobile terminal, and a push notification platform, wherein:

the acoustic code transmitting unit configured to send an acoustic signal containing an acoustic code;

the acoustic code push-casting system comprises a relay base station,
10 configured to process the received acoustic signal to acquire an electric signal containing the corresponding acoustic code, and send the electric signal to the mobile terminal within a present range;

the mobile terminal comprises an acoustic code processing module configured to acquire the electric signal so as to extract the corresponding acoustic
15 code, and uoload the acoustic code to the relay base station;

the relay base station further configured to acquire a corresponding link address according to the acoustic code uoloaded by the mobile terminal, and send the link address to the mobile terminal, wherein a relationship between acoustic codes and link addresses being pre-stored in the relay base station;

20 the acoustic code processing module further configured to log in a webpage or the push notification platform by means of the link address so as to acquire the corresponding resource information when the link address is received, wherein the acoustic code and the resource information corresponding to the link address are pre-stored in the push notification platform.

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2. The system as described in claim 1, wherein the relay base station comprising:

a communication module configured to communicate with the mobile terminal;

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a short address database configured to pre-store the relationship between

acoustic codes and link addresses, wherein the link address are short address;

an acoustic code analysis module configured to acquire the corresponding link address from the short address database according to the acoustic code uoloaded by the mobile terminal, and send the link address to the acoustic code
5 processing module by the communication module.

3. The system as described in claim **1**, wherein the acoustic code processing module comprising:

a first acoustic wave receiving module configured to receive the acoustic
10 signal sent by the acoustic code transmitting unit;

a first acoustic wave DAC module configured to convert the acoustic signal to acquire the corresponding acoustic code by inverse fourier transformation.

4. The system as described in claim **1**, wherein the acoustic code push-casting
15 system further comprising:

a broadcast patch communicating with the relay base station;

a beacon management system configured to preset the relationship between acoustic codes and link addresses, set up and manage the broadcast patch according to predefined rules;

20 the relay base station further comprising:

a second acoustic wave receiving module configured to receive the acoustic signal sent by the acoustic code transmitting unit;

a second acoustic wave DAC module configured to convert the acoustic signal to the corresponding acoustic code by inverse fourier transformation;

25 an acoustic code uoloading module configured to acquire the acoustic code converted by the second acoustic wave DAC module, and embed the acoustic code into the beacon information format by beacon coding function to form beacon information containing the acoustic code and beacon code corresponding to the broadcast patch;

30 a communication module configured to establish one-way communication with the broadcast patch through bluetooth, and send the beacon

information to the broadcast patch corresponding to the beacon code in response to the instructions generated by the beacon management system, wherein the instructions being generated according to the predefined rules by the beacon management system;

- 5 the broadcast patch further configured to receive the beacon information containing the acoustic code sent by the relay base station, and send the beacon information to the mobile terminal within the preset range.

10 **5.** The system as described in claim **1**, wherein the relay base station is further configured to send the electric signal to another relay base station, the another relay base station is configured to send the electric signal to the mobile terminal which in the preset range.

15 **6.** The system as described in any of claim **1**, **3**, **4**, **5**, wherein the mobile terminal is further configured to pre-store the relationship between acoustic codes and link addresses, which is preset by the acoustic code processing module, or downloaded from the relay base station;

20 the acoustic processing module is further configured to acquire the acoustic code from the electric signal when it is received, and acquire the corresponding link address according to the relationship pre-stored in.

7. The system as described in any of claim **1~5**, wherein the beacon management system is BLE4.0 LAN management system.

25 **8.** The system as described in claim **1**, wherein the resource information pre-stored in the push notification platform comprises acoustic codes as the main key content of the index table, short address bound to the acoustic codes, and information content corresponding to the short address including one or more of the following: merchant type, merchant ID, product type, product ID, customer mobile
30 phone number, geoLocation, coupon ID, coupon status, time stamp, advertisement, activities, and public service information, wherein the information content is videos,

audios, pictures, texts, or webpages.

9. An acoustic internet of things information transmission relay base station comprising:

- 5 a short address database configured to pre-stored a relationship between acoustic codes and link addresses, wherein the link address being short address;
- a receiving module configured to receive an acoustic signal containing acoustic code, and process the acoustic signal to acquire an electric signal containing the acoustic code;
- 10 a communicating module configured to send the electric signal to a mobile terminal within a preset range; and
- an acoustic analysis module configured to acquire a corresponding link address from the short address database according to the acoustic code uoloaded by the mobile terminal, and send the link address to the mobile terminal to log in a
- 15 webpage or a push notification platform by means of the link address to acquire the corresponding resource information; wherein the acoustic code uoloaded by the mobile terminal is acquireed from the electric signal received, and the resource information corresponding to the acoustic code and the link address being pre-
- stored in the push notification platform.

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10. The relay base station as described in claim **9**, further comprising:

- a second acoustic wave DAC module configured to convert the acoustic signal to acquire the corresponding acoustic code by inverse fourier transformation;
- an acoustic code uoloading module configured to acquire the acoustic code
- 25 converted by the second acoustic wave DAC module, and embed the acoustic code into the beacon information format by beacon coding function to form beacon information containing the acoustic code and beacon code corresponding to broadcast patch;
- the communication module further configured to establish one-way
- 30 communication with the broadcast patch through bluetooth, and send the beacon information to the broadcast patch corresponding to the beacon code in response to

the instructions generated by a beacon management system, that the broadcast patch sends the beacon information to the mobile terminal within the preset range; wherein the instructions being generating according to predefined rules by the beacon management system.

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11. The relay base station described in claim **9**, wherein the communication module is further configured to send the electric signal to another relay base station.

12. An acoustic internet of things information transmission method
10 comprising:

sending an acoustic signal containing an acoustic code by an acoustic code transmitting unit;

processing the received acoustic signal by a relay base station to acquire an electric signal containing the corresponding acoustic code, and sending the electric
15 signal to a mobile terminal within a preset range;

acquiring the electric signal so as to extract the corresponding acoustic code by the mobile terminal, and uploading the acoustic code to the relay base station;

acquiring a corresponding link address by the relay base station, and sending the link address to the mobile terminal, wherein a relationship between acoustic
20 codes and link addresses is pre-stored in the relay base station;

logging in a corresponding webpage or a push notification platform by means of the link address so as to acquire the corresponding resource information after the link address is received by the mobile terminal, wherein the acoustic code and the resource information corresponding to the link address are pre-stored in the push
25 notification platform.

13. The method as described in claim **12**, further comprising:

receiving the acoustic signal containing the acoustic code by the mobile terminal sent by the acoustic code transmitting unit;

30 converting the acoustic signal to the acoustic code by inverse fourier transformation by the mobile terminal, and uoloading the acoustic code to the relay

base station.

14. The method as described in claim **12**, wherein after sending an acoustic signal containing an acoustic code by an acoustic code transmitting unit, further comprising:

receiving the acoustic signal by the relay base station, and converting the acoustic signal to the acoustic code by inverse fourier transformation;

embedding the acoustic code into a beacon information format by beacon coding function to form beacon information containing the acoustic code and the beacon code corresponding to a broadcast patch;

sending the beacon information to the broadcast patch corresponding to the beacon code in response to the instructions generated by a beacon management system, wherein the instructions being generated according to the predefined rules by the beacon management system;

receiving the beacon information containing the acoustic code sent by the relay base station by the broadcast patch, and sending the beacon information to the mobile terminal within the preset range.

15. The method as described in any of claim **12~14**, wherein after acquiring the electric signal so as to extract the corresponding acoustic code by the mobile terminal, further comprising:

acquiring the corresponding link address according to the relationship between acoustic codes and link addresses pre-stored in and preset by the mobile terminal or downuoloaded from the relay base station.

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16. The method as described in claim **12**, wherein the resource information pre-stored in the push notification platform comprises acoustic codes as the main key content of the index table, short address bound to the acoustic codes, and information content corresponding to the short address including one or more of the following: merchant type, merchant ID, product type, product ID, customer mobile

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phone number, geoLocation, coupon ID, coupon status, time stamp, advertisement, activities, and public service information.

5 **17.** An acoustic internet of things information transmission method comprising:

receiving an acoustic signal containing acoustic code sent by an acoustic code transmitting unit;

processing the acoustic signal to acquire an electric signal containing the acoustic code;

10 sending the electric signal to a mobile terminal within a preset range;

acquiring a corresponding link address from a short address database according to the acoustic code uoloaded by the mobile terminal, and acquired from the electric signal by the mobile terminal;

15 sending the link address to the mobile terminal to log in a webpage or a push notification platform by means of the link address to acquire the corresponding resource information, wherein the acoustic code and the resource information corresponding to the link address are pre-stored in the push notification platform.

20 **18.** The method as described in claim **17**, wherein after receiving an acoustic signal containing acoustic code sent by an acoustic code transmitting unit, further comprising:

converting the acoustic signal to the acoustic code by inverse fourier transformation;

25 embedding the acoustic code into a beacon information format by beacon coding function to form beacon information containing the acoustic code and the beacon code corresponding to a broadcast patch;

30 sending the beacon information to the broadcast patch corresponding to the beacon code in response to the instructions generated by a beacon management system, wherein the instructions being generated according to the predefined rules by the beacon management system.

19. The method as described in claim **17**, wherein after processing the acoustic signal to acquire an electric signal containing the acoustic code, further comprising: sending the electric signal to another relay base station.