

Content recommendation method and apparatus

Technical field

[01]The multiple embodiments disclosed herein relate to the technical field of the internet, in particular to a content recommendation method and apparatus.

5 Background art

[02]As internet technology develops, people are browsing content information provided by network platforms ever more frequently. For example, they browse goods information on online shopping platforms, or hot information on news platforms, or finance management news on finance management platforms, or payment service information on payment platforms, etc.

10 [03]When different users use the same network platform, the demand for content information provided thereon varies to a greater or lesser degree from user to user. Furthermore, the colossal growth of information on network platforms often makes it difficult for users to make a choice. At present, content information recommended to users struggles to meet users' personalized demands due to not being precise enough and other shortcomings. Thus, there is a need to
15 provide a rational method, to meet the various demands of users when browsing content information provided on network platforms.

Summary of the invention

[04]A content recommendation method and apparatus are described herein; by determining a specific field corresponding to content information and field knowledge information
20 corresponding to a feature field, a feature tag of the content information is determined, and this is then combined with an attribute tag of a user to recommend more precise content information to the user.

[05]In a first aspect, a content recommendation method is provided. The method comprises:

[06]acquiring content information from a content information library, and determining keyword
25 information of the content information;

[07]determining a specific field corresponding to the content information;

[08]acquiring field knowledge information corresponding to the specific field;

[09]determining a feature tag of the content information from the keyword information

according to the field knowledge information;

[10]determining content recommendation information for recommendation to a user from the content information library according to an attribute tag of the user and the feature tag.

5 [11]In one possible embodiment, the field knowledge information comprises field level knowledge; the field level knowledge comprises a field name, a category name corresponding to the field name, and a feature individual term corresponding to the category name.

[12]In one possible embodiment, the feature individual term is obtained by training on the basis of content language material in a content corpus.

10 [13]In one possible embodiment, the step of determining a feature tag of the content information from the keyword information according to the field knowledge information comprises:

[14]determining a specific category corresponding to the content information;

[15]determining, in the field level knowledge, a specific category name corresponding to the specific category, and a feature individual term corresponding to the specific category name;

15 [16]determining the feature tag of the content information from the keyword information according to the feature individual term.

[17]In one possible embodiment, the content information comprises a category tag, and the step of determining a specific category corresponding to the content information comprises:

20 [18]determining a specific category corresponding to the content information according to the category tag.

[19]In one possible embodiment, the step of determining a feature tag of the content information from the keyword information according to the feature individual term comprises:

[20]using keyword information matched to the feature individual term from amongst the keyword information as the feature tag.

25 [21]In one possible embodiment, the keyword information comprises multiple keywords and ordering information of each keyword, and the step of determining a feature tag of the content information from the keyword information according to the feature individual term comprises:

[22]reordering the multiple keywords according to the state of matching of each keyword in the keyword information with the feature individual term, and the ordering information;

30 [23]using keyword information located within a predetermined order range after the reordering

as the feature tag of the content information.

[24]In one possible embodiment, the field knowledge information comprises a field knowledge graph; the field knowledge graph comprises an entity term corresponding to the field at a first layer thereof, and comprises a related term corresponding to the entity term at a second layer thereof, wherein the entity term and the related term are combined to form a feature combination term.

[25]In one possible embodiment, the step of determining a feature tag of the content information from the keyword information according to the field knowledge information comprises:

[26]determining a feature combination term included in the field knowledge graph corresponding to the specific field;

[27]determining the feature tag of the content information from the keyword information according to the feature combination term.

[28]In one possible embodiment, the step of determining a feature tag of the content information from the keyword information according to the feature combination term comprises:

[29]using keyword information matched to the feature combination term from amongst the keyword information as the feature tag.

[30]In one possible embodiment, the keyword information comprises multiple keywords and ordering information of each keyword, and the step of determining a feature tag of the content information from the keyword information according to the feature combination term comprises:

[31]reordering the multiple keywords according to the state of matching of each keyword in the keyword information with the feature combination term, and the ordering information;

[32]using keyword information located within a predetermined order range after the reordering as the feature tag of the content information.

[33]In one possible embodiment, the attribute tag is determined on the basis of the historical browsing content of the user.

[34]In one possible embodiment, the step of determining content recommendation information for recommendation to the user from the content information library comprises:

[35]using content information corresponding to a feature tag matched to the attribute tag as candidate content information for recommendation to the user;

[36] ranking each item of content information in the candidate content information according to a preset rule, and using content information with a ranking within a preset range as the content recommendation information.

[37] In a second aspect, a content recommendation apparatus is provided. The apparatus
5 comprises:

[38] a first acquisition module, for acquiring content information from a content information library;

[39] a first determining module, for determining keyword information of the content information;

10 [40] a second determining module, for determining a specific field corresponding to the content information;

[41] a second acquisition module, for acquiring field knowledge information corresponding to the specific field;

15 [42] a third determining module, for determining a feature tag of the content information from the keyword information according to the field knowledge information;

[43] a processing module, for determining content recommendation information for recommendation to a user from the content information library according to an attribute tag of the user and the feature tag.

20 [44] In one possible embodiment, the field knowledge information acquired by the second acquisition module comprises field level knowledge; the field level knowledge comprises a field name, a category name corresponding to the field name, and a feature individual term corresponding to the category name.

[45] In one possible embodiment, the feature individual term acquired by the second acquisition module is obtained by training on the basis of content language material in a content corpus.

25 [46] In one possible embodiment, the third determining module specifically comprises:

[47] a first determining sub-module, for determining a specific category corresponding to the content information;

30 [48] a second determining sub-module, for determining, in the field level knowledge, a specific category name corresponding to the specific category, and a feature individual term corresponding to the specific category name;

[49] a third determining sub-module, for determining the feature tag of the content information from the keyword information according to the feature individual term.

[50] In one possible embodiment, the content information acquired by the first acquisition module comprises a category tag, and the first determining sub-module is specifically for:

5 [51] determining a specific category corresponding to the content information according to the category tag.

[52] In one possible embodiment, the third determining sub-module is specifically for:

[53] using keyword information matched to the feature individual term from amongst the keyword information as the feature tag.

10 [54] In one possible embodiment, the keyword information determined by the first determining module comprises multiple keywords and ordering information of each keyword, and the third determining sub-module is specifically for:

[55] reordering the multiple keywords according to the state of matching of each keyword in the keyword information with the feature individual term, and the ordering information;

15 [56] using keyword information located within a predetermined order range after the reordering as the feature tag of the content information.

[57] In one possible embodiment, the field knowledge information acquired by the second acquisition module comprises a field knowledge graph; the field knowledge graph comprises an entity term corresponding to the field at a first layer thereof, and comprises a related term
20 corresponding to the entity term at a second layer thereof, wherein the entity term and the related term are combined to form a feature combination term.

[58] In one possible embodiment, the third determining module specifically comprises:

[59] a second determining sub-module, for determining a feature combination term included in the field knowledge graph corresponding to the specific field;

25 [60] a third determining sub-module, for determining the feature tag of the content information from the keyword information according to the feature combination term.

[61] In one possible embodiment, the third determining sub-module is specifically for:

[62] using keyword information matched to the feature combination term from amongst the keyword information as the feature tag.

30 [63] In one possible embodiment, the keyword information determined by the first determining

module comprises multiple keywords and ordering information of each keyword, and the third determining sub-module is specifically for:

[64]reordering the multiple keywords according to the state of matching of each keyword in the keyword information with the feature combination term, and the ordering information;

5 [65]using keyword information located within a predetermined order range after the reordering as the feature tag of the content information.

[66]In one possible embodiment, the attribute tag included in the processing module is determined on the basis of historical browsing content of the user.

[67]In one possible embodiment, the processing module is specifically for:

10 [68]using content information corresponding to a feature tag matched to the attribute tag as candidate content information for recommendation to the user;

[69]ranking each item of content information in the candidate content information according to a preset rule, and using content information with a ranking within a preset range as the content recommendation information.

15 [70]In a third aspect, a computer-readable storage medium is provided, having a computer program stored thereon. When the computer program is executed in a computer, the computer is caused to execute the method provided in any embodiment in the first aspect above.

[71]In a fourth aspect, a computing device is provided, comprising a memory and a processor. An executable code is stored in the memory, and when the processor executes the executable
20 code, the method provided in any embodiment in the first aspect above is implemented.

[72]In the content recommendation method and apparatus provided herein, first of all, content information is acquired from a content information library, and keyword information associated with the content information is determined. Furthermore, a specific field corresponding to the content information is determined, and field knowledge information corresponding to the
25 specific field is acquired. Next, a feature tag of the content information is determined from the keyword information according to the field knowledge information. Content recommendation information for recommendation to a user is then determined from the content information library according to the feature tag and an attribute tag of the user. This method enables more precise content information to be recommended to the user.

Brief description of the drawings

[73] In order to explain more clearly the technical solution of the multiple embodiments disclosed herein, a simple description is given below of the drawings that need to be used in the description of the embodiments, but obviously, the drawings in the following description are merely the multiple embodiments disclosed herein; other drawings could be obtained by those skilled in the art on the basis of these drawings, on condition that no creative effort is expended.

[74] Fig. 1 is a flow chart of a content recommendation method provided in an embodiment disclosed herein.

[75] Fig. 2 is a schematic diagram of field level knowledge provided in an embodiment disclosed herein.

[76] Fig. 3 is a schematic diagram of a field knowledge graph provided in an embodiment disclosed herein.

[77] Fig. 4 is a structural diagram of a content recommendation apparatus provided in an embodiment disclosed herein.

Detailed description of the invention

[78] Multiple embodiments disclosed herein are described below in conjunction with the drawings.

[79] Fig. 1 is a flow chart of a content recommendation method provided in an embodiment disclosed herein. A body for executing the method may be a device having processing capability: a server or system or apparatus. As shown in fig. 1, the method specifically comprises:

[80] Step S110, acquiring content information from a content information library, and determining keyword information of the content information.

[81] Specifically, the content information library may comprise content information within a validity period. The validity period may be set according to a service attribute (e.g. a requirement for time-sensitivity) of a service corresponding to the content information. For example, the validity period of content information corresponding to a news service may be set to 1 day. As another example, the validity period of content information corresponding to a popular science knowledge service may be set to 1 month.

[82] The content information may comprise graphic/textual information (e.g. pictures, articles,

etc.) or audio/video information (e.g. audio and video advertisements, etc.).

[83]The step of determining keyword information of the content information may comprise: determining text information of the content information, and determining keyword information according to the text information.

5 [84]In one embodiment, the content information comprises a video advertisement, in which case, it is possible to extract script information from the video and convert audio information therein to script information, and determine keyword information of the video advertisement according to the script information therein; or the content information comprises a video advertisement and text introduction information of the video advertisement, in which case,
10 keyword information of the video advertisement can be determined according to the text introduction information.

[85]In another embodiment, the content information comprises an article, in which case, text information in the article can be determined directly.

[86]Furthermore, the step of determining keyword information according to the text
15 information may comprise: subjecting the text information to at least one type of preprocessing, selected from structural analysis, word division processing, disabled word removal processing, word nature marking and named entity recognition. Moreover, a keyword extraction algorithm is used to determine keyword information from the preprocessed text information.

[87]Structural analysis may comprise analysis of paragraph structure in the text information,
20 e.g. determining headings and main text in the text information, and paragraph structure in the main text; word division processing may comprise unigrams, bigrams and trigrams, etc.; disabled word removal may comprise removing disabled words (e.g. functional words with no practical meaning: this, that, of) from the text information according to a preset disabled word table; word nature marking may comprise marking the word nature (e.g. noun, adverb, adjective,
25 etc.) of expressions in the text information; named entity recognition (NER for short) may comprise identifying entities (e.g. personal names, place names, mechanism names, proper nouns, etc.) having a specific meaning in the text information; and the keyword extraction algorithm may comprise the TextRank algorithm and the TF-IDF (Term Frequency – inverse Document Frequency) algorithm, etc.

30 [88]In one example, the preprocessed text information comprises multiple expressions, and the positions of all the expressions in the text information (e.g. located in a heading or in the main text), the marked word nature thereof, etc. Correspondingly, the keyword extraction algorithm

may be used for weighted identification of keyword information from the preprocessed text information.

[89]Step S120, determining a specific field corresponding to the content information.

[90]In one embodiment, the content information may comprise a field tag. Correspondingly, the step of determining a specific field corresponding to the content information may comprise: determining a specific field corresponding to the content information according to the field tag. The field tag may be defined and generated by a creator of the content information so that the content information can be easily searched by a user.

[91]In one example, the field tag included in the content information is “travel services”, and correspondingly, it is possible to determine that the specific field corresponding to the content information is travel services.

[92]In another embodiment, it is possible to further determine a specific field corresponding to the content information according to the keyword information determined in step S110. In one example, the keyword information comprises field information, and correspondingly, a specific field corresponding to the content information can be determined according to the field information.

[93]After determining the specific field corresponding to the content information in step S120, next, in step S130, field knowledge information corresponding to the specific field is acquired.

[94]Specifically, preset field knowledge information may be stored in the server; the field knowledge information may comprise at least one of field level knowledge and a field knowledge graph. The field level knowledge may comprise a field name, a category name corresponding to the field name, and a feature individual term corresponding to the category name; the field knowledge graph may comprise, at a first layer thereof, an entity term corresponding to the field, and at a second layer thereof, a related term corresponding to the entity term; and the entity term and the related term corresponding thereto may be combined to form a feature combination term.

[95]It must be explained that the field name and category name included in the field level knowledge may be set on the basis of a knowledge system currently in common use (e.g. the knowledge system may comprise division of fields and branches of learning). In addition, the feature individual term included in the field level knowledge may be obtained by training on the basis of a large amount of content language material in a content corpus.

[96] The field knowledge graph may be obtained by processing on the basis of a large amount of content language material in a content corpus. More specifically, first of all, an entity term (e.g. a proper noun, etc.) corresponding to a field may be identified by NER; for example, the proper noun “driving licence”, etc. corresponding to the field “travel services” may be identified.

5 A related term corresponding to the entity term can then be determined by template extraction, inter-word correlation and mutual information entropy, etc. Template extraction may comprise setting a template (e.g. the introduction of driving licence XX), and then using the template to extract a related term (e.g. new rule) from content language material; inter-word correlation may comprise using a sliding window of length equal to a predetermined number of characters
10 (e.g. 5 characters) to extract expressions which appear in the sliding window at the same time as the entity term, and using expressions whose frequency of appearance reaches a predetermined number of times (e.g. 10 times) from amongst these expressions as related terms; mutual information entropy may comprise determining a degree of similarity between the entity term and expressions included in the content language material, and using expressions for which
15 the degree of similarity is higher than a preset value (e.g. 0.6) as related terms.

[97] In one embodiment, the field level knowledge and/ field knowledge graph corresponding to the specific field determined in step S120 may be acquired.

[98] In one embodiment, the acquired field level knowledge corresponding to the specific field may comprise multiple category names corresponding to the specific field, and multiple feature
20 individual terms corresponding to each of the multiple category names.

[99] In one example, the specific field determined in step S120 is travel services, and on this basis it is possible to acquire field level knowledge corresponding to travel services as shown in fig. 2. In fig. 2, the field name is travel services, and the category names corresponding to travel services include: cars, aeroplanes, trains and subways, etc. The feature individual terms
25 corresponding to cars include: maintenance, refuelling, car wash, etc., and the feature individual terms corresponding to aeroplanes include: mileage, economy cabin, first class cabin, etc. (feature individual terms corresponding to other categories such as subways and trains are not shown in fig. 2).

[100] In one embodiment, a single field may comprise multiple entity terms, and
30 correspondingly, there may be multiple field knowledge graphs corresponding to this field. Each field knowledge graph may comprise an entity term at a first layer thereof, and may comprise multiple related terms corresponding to the entity term at a second layer.

[101] In one example, the specific field determined in step S120 is travel services, and on this basis it is possible to acquire multiple field knowledge graphs corresponding to travel services. For example, the multiple field knowledge graphs that are acquired may include the field knowledge graph shown in fig. 4. In fig. 4, the entity term is driving licence, and the related terms corresponding to the entity term include points deduction, new rule, query violation, licence replacement, annual inspection, etc.

[102] After the keyword information of the content information is determined in step S110 and the field knowledge information corresponding to the specific field is acquired in step S130, in step S140 a feature tag of the content information is determined from the keyword information according to the field knowledge information.

[103] Specifically, amongst the keyword information, keyword information that is matched to the field knowledge information is used as the feature tag of the content information. Alternatively, the keyword information is ranked according to the field knowledge information, and keyword information that is ranked within a preset range is used as the feature tag of the content information.

[104] In one embodiment, the field knowledge information acquired in step S130 may at least comprise field level knowledge, and the step of determining the feature tag of the content information from the keyword information according to the field level knowledge may comprise: determining a specific category corresponding to the content information; in the field level knowledge, determining a specific category name corresponding to the specific category, and a feature individual term corresponding to the specific category name; and determining the feature tag of the content information according to the feature individual term.

[105] In one example, the content information may comprise a category tag. Correspondingly, the step of determining a specific category corresponding to the content information may comprise: determining a specific category corresponding to the content information according to the category tag. The category tag may be defined and generated by the creator of the content information so that the content information can be easily searched by the user. For example, the category tag included in the content information is “cars”, and correspondingly, it is possible to determine that the specific category corresponding to the content information is cars.

[106] In another example, it is possible to further determine a specific category corresponding to the content information according to the keyword information determined in step S110. In one example, the keyword information comprises category information, and

correspondingly, a specific category corresponding to the content information can be determined according to the category information.

[107] In one example, the determined specific category corresponding to the content information is cars, and the field level knowledge acquired in step S130 is as shown in fig. 2.

5 On this basis, in the field level knowledge it is possible to determine that the specific category name corresponding to the specific category (cars) is cars, and the feature individual terms corresponding to the category name (cars) include: maintenance, refuelling and car wash, etc.

[108] In one example, the step of determining the feature tag of the content information according to the feature individual term may comprise: using keyword information matched to the feature individual term from amongst the keyword information as the feature tag. For
10 example, the feature individual terms determined include: maintenance, refuelling, car wash, etc., and on this basis it is possible to determine feature tags including maintenance and car wash from the keyword information (e.g. including maintenance, car wash, etc.).

[109] In another example, the keyword information may comprise multiple keywords and
15 weighting information of each keyword. Correspondingly, the step of determining the feature tag of the content information according to the feature individual term may comprise: updating weightings of the multiple keywords according to the state of matching of each keyword with the feature individual term; and using a keyword whose updated weighting is greater than a preset threshold as the feature tag of the content information. For example, when a keyword
20 (e.g. car wash) is perfectly matched to a particular feature individual term (car wash), a weighting value of this keyword can be increased by a first preset value (e.g. 0.1); when a keyword (e.g. automatic car wash) is partially matched to a particular feature individual term (car wash), the weighting value of this keyword can be increased by a second preset value (e.g. 0.05); when a keyword is not matched to any of the feature individual terms, the original
25 weighting value of this keyword can be retained. In this way, the weighting values of all of the keywords can be updated. For the keywords with updated weightings, a determination is made as to whether the final weighting thereof is greater than the preset threshold (0.5), and a keyword whose weighting value is greater than the preset threshold is used as the feature tag.

[110] Furthermore, in another example, the keyword information may also comprise
30 multiple keywords, and ordering information corresponding to each keyword (e.g. ordering may be carried out according to weighting). Correspondingly, the step of determining the feature tag of the content information according to the feature individual term may comprise:

reordering the multiple keywords according to the state of matching of each keyword with the feature individual term, and original ordering information; and using keyword information located within a predetermined order range after the reordering as the feature tag of the content information. The predetermined order range may be set in advance or amended in real time.

5 [111] For example, the ordering information may comprise a weighting value of each keyword, and the weighting value of the keyword may be updated according to the state of matching (e.g. matched or not) of each keyword with the feature individual term. The way in which the weighting values are updated may be as described in the example above. The multiple keywords are then ordered according to the updated weighting values, and keyword information
10 located within the predetermined order range (e.g. the first ten places) is used as the feature tag.

[112] In another embodiment, the field knowledge information acquired in step S130 may at least comprise a field knowledge graph, and the step of determining the feature tag of the content information from the keyword information according to the field knowledge graph may comprise: determining a feature combination term included in the field knowledge graph; and
15 determining the feature tag of the content information from the keyword information according to the feature combination term. In one example, the field knowledge graph shown in fig. 4 may be acquired and included in step S130. The entity term in fig. 4 is driving licence, and the related terms corresponding to driving licence include: points deduction, new rule, query violation, licence replacement and annual inspection, etc. Correspondingly, it can be determined that the
20 feature combination terms therein include: “driving licence - points deduction”, “driving licence - new rule”, “driving licence - query violation”, “driving licence - licence replacement” and “driving licence - annual inspection”, etc.

[113] In one example, the step of determining the feature tag of the content information according to the feature combination term may comprise: using keyword information matched
25 to the feature combination term from amongst the keyword information as the feature tag. For example, the determined feature combination terms include: driving licence - points deduction, driving licence - new rule, driving licence - query violation, driving licence - licence replacement and driving licence - annual inspection, etc., and on this basis it is possible to determine feature tags including driving licence - points deduction, driving licence - new rule
30 and driving licence - annual inspection from the keyword information (e.g. including: driving licence, points deduction, new rule, driving licence annual inspection, etc.).

[114] In another example, the keyword information may comprise multiple keywords and

weighting information of each keyword. Correspondingly, the step of determining the feature tag of the content information according to the feature combination term may comprise: updating weightings of the multiple keywords according to the state of matching of each keyword with the feature combination term; and using a keyword whose updated weighting is greater than a preset threshold as the feature tag of the content information.

[115] In another example, the keyword information may comprise multiple keywords, and ordering information corresponding to each keyword (e.g. ordering may be carried out according to weighting). Correspondingly, the step of determining the feature tag of the content information according to the feature combination term may comprise: reordering the multiple keywords according to the state of matching of each keyword with the feature combination term, and original ordering information; and using keyword information located within a predetermined order range after the reordering as the feature tag of the content information.

[116] For example, the ordering information may comprise a weighting value of each keyword, and the weighting value of the keyword may be updated according to the state of matching (e.g. matched or not) of each keyword with the feature combination term. For example, when a keyword (e.g. driving licence - points deduction) is perfectly matched to a particular feature combination term (driving licence - points deduction), a weighting value of this keyword can be increased by a first preset value (e.g. 0.1); when a keyword (e.g. driving licence) is partially matched to a particular feature combination term (driving licence - points deduction), the weighting value of this keyword can be increased by a second preset value (e.g. 0.05); when a keyword is not matched to any of the feature combination terms, the original weighting value of this keyword can be retained. The multiple keywords are then ordered according to the updated weighting values, and keyword information located within the predetermined order range (e.g. the first five places) is used as the feature tag.

[117] After determining the feature tag of the content information in step S140, next, in step S150, content recommendation information for recommendation to the user is determined from the content information library according to an attribute tag of the user and a feature tag.

[118] Specifically, the attribute tag of the user may be determined on the basis of the historical browsing content of the user. In one embodiment, the attribute tag of the user may be determined according to a feature tag of the historical browsing content of the user. The feature tag may be obtained by performing steps S110 - S140 above, except that in step S110, historical browsing content of the user is acquired instead of acquiring content information from the

content information library.

[119] In one embodiment, the step of determining content recommendation information for recommendation to the user from the content information library may comprise: using content information corresponding to a feature tag matched to the attribute tag as content recommendation information.

[120] In another embodiment, further screening is performed according to a preset rule in order to determine final content recommendation information from the content information for which the feature tag is matched to the attribute tag. Specifically, in one example, the step of determining content recommendation information for recommendation to the user from the content information library comprises using content information corresponding to a feature tag matched to the attribute tag as candidate content information for recommendation to the user; and ranking each item of content information in the candidate content information according to a preset rule, and using content information with a ranking within a preset range as the content recommendation information.

[121] In one example, the preset rule may comprise a weighting value of the feature tag, and the step of ranking each item of content information in the candidate content information according to the preset rule may comprise: on the basis of a feature tag corresponding to each item of content information in the candidate content information and a weighting value of the feature tag, determining a score of the content information by weighted summation, and ranking each item of content information according to score.

[122] In one example, the preset range may be set according to a service rule associated with the content information; for example, the content information is science and technology news, and the service rule thereof may comprise recommending content information with a ranking in the first five places to the user. As another example, the content information is a music section, and the service rule thereof may comprise recommending content information with a ranking in the first ten places to the user.

[123] It must be explained that after determining the attribute tag of the user according to steps S110 - S140, the content recommendation information for recommendation to the user may be determined directly from the content information library. Specifically, it is possible to determine degrees of similarity among multiple users according to the attribute tags of multiple users including a first user, and determine multiple second users whose degree of similarity to the first user is within a preset threshold range from the multiple users. Next, content

recommendation information for recommendation to the first user is determined from the content information library according to browsing histories of the multiple second users with regard to content information in the content information library.

[124] In addition, a single item of content information may be associated with multiple fields.

5 Correspondingly, in step S120, multiple specific fields corresponding to the content information may be determined in step S120, and field knowledge information (e.g. field level knowledge and/or a field knowledge graph) corresponding to each specific field may then be acquired in step S130.

10 [125] In one embodiment, field level knowledge corresponding to each specific field may be acquired in step S130, then in step S140, a specific category to which the content information corresponds in each specific field, and a feature individual term corresponding to each specific category, are determined, and a feature tag of the content information is determined according to the feature individual term.

15 [126] In another embodiment, a field knowledge graph corresponding to each specific field may be acquired in step S130, then in step S140, a feature combination term included in each field knowledge graph is determined, and a feature tag of the content information is determined according to the feature combination term.

20 [127] In addition, the main differences between the field level knowledge and the field knowledge graph included in the field knowledge information are: firstly, the feature individual term in the field level knowledge comprises a single expression, whereas the feature combination term in the field knowledge graph comprises an expression formed by combining at least two individual terms. Secondly, the feature individual term in the field level knowledge is mainly an expression that is strongly correlated with category (i.e. one or more categories to which the expression belongs can be clearly conjectured according to the expression) (e.g. the
25 feature individual term “car wash” generally belongs to the cars category), but certain expressions which exist in all categories but have different semantic meanings in different categories (e.g. new rule) might not be set as feature individual terms. On the other hand, based on the field knowledge graph, feature information having a clear semantic meaning in the field can be determined by extracting combination words (e.g. driving licence - new rule). Clearly,
30 in the above method, it is not only possible to use field level knowledge alone or a field knowledge graph alone, but also possible to use field level knowledge and a field knowledge graph in combination, in order to determine a feature tag of the content information, and in turn

determine content recommendation information for recommendation to a user.

[128] It can be seen from the above that in the content recommendation method provided in multiple embodiments disclosed herein, first of all, content information is acquired from a content information library, and keyword information associated with the content information is determined. Furthermore, a specific field corresponding to the content information is determined, and field knowledge information corresponding to the specific field is acquired. Next, a feature tag of the content information is determined from the keyword information according to the field knowledge information. Content recommendation information for recommendation to a user is then determined from the content information library according to the feature tag and an attribute tag of the user. This method enables more precise content information to be recommended to the user.

[129] Corresponding to the content recommendation method, multiple embodiments disclosed herein also provide a content recommendation apparatus; as shown in fig. 4, the apparatus 400 comprises:

[130] a first acquisition module 410, for acquiring content information from a content information library;

[131] a first determining module 420, for determining keyword information of the content information;

[132] a second determining module 430, for determining a specific field corresponding to the content information;

[133] a second acquisition module 440, for acquiring field knowledge information corresponding to the specific field;

[134] a third determining module 450, for determining a feature tag of the content information from the keyword information according to the field knowledge information;

[135] a processing module 460, for determining content recommendation information for recommendation to a user from the content information library according to an attribute tag of the user and the feature tag.

[136] In one possible embodiment, a keyword extraction algorithm in a determining sub-module comprises at least one of the TF-IDF algorithm and the TextRank algorithm.

[137] In one possible embodiment, the content information acquired by the first acquisition module 410 comprises a field tag, and the second determining module 430 is specifically for:

[138] determining a specific field corresponding to the content information according to the field tag.

[139] In one possible embodiment, the field knowledge information acquired by the second acquisition module 440 comprises field level knowledge; the field level knowledge comprises a field name, a category name corresponding to the field name, and a feature individual term corresponding to the category name.

[140] In one possible embodiment, the feature individual term acquired by the second acquisition module 440 is obtained by training on the basis of content language material in a content corpus.

[141] In one possible embodiment, the third determining module 450 specifically comprises:

[142] a first determining sub-module 451, for determining a specific category corresponding to the content information;

[143] a second determining sub-module 452, for determining, in the field level knowledge, a specific category name corresponding to the specific category, and a feature individual term corresponding to the specific category name;

[144] a third determining sub-module 453, for determining a feature tag of the content information from the keyword information according to the feature individual term.

[145] In one possible embodiment, the content information acquired by the first acquisition module 410 comprises a category tag, and the first determining sub-module 451 is specifically for:

[146] determining a specific category corresponding to the content information according to the category tag.

[147] In one possible embodiment, the third determining sub-module 453 is specifically for:

[148] using keyword information matched to the feature individual term from amongst the keyword information as the feature tag.

[149] In one possible embodiment, the keyword information determined by the first determining module 420 comprises multiple keywords and ordering information of each keyword, and the third determining sub-module 453 is specifically for:

[150] reordering the multiple keywords according to the state of matching of each keyword in the keyword information with the feature individual term, and the ordering information;

[151] using keyword information located within a predetermined order range after the reordering as the feature tag of the content information.

[152] In one possible embodiment, the field knowledge information acquired by the second acquisition module 440 comprises a field knowledge graph; the field knowledge graph comprises an entity term corresponding to the field at a first layer thereof, and comprises a related term corresponding to the entity term at a second layer thereof, wherein the entity term and the related term are combined to form a feature combination term.

[153] In one possible embodiment, the third determining module 450 specifically comprises:

[154] a second determining sub-module 452, for determining a feature combination term included in the field knowledge graph corresponding to the specific field;

[155] a third determining sub-module 453, for determining a feature tag of the content information from the keyword information according to the feature combination term.

[156] In one possible embodiment, the third determining sub-module 453 is specifically for:

[157] using keyword information matched to the feature combination term from amongst the keyword information as the feature tag.

[158] In one possible embodiment, the keyword information determined by the first determining module 420 comprises multiple keywords and ordering information of each keyword, and the third determining sub-module 453 is specifically for:

[159] reordering the multiple keywords according to the state of matching of each keyword in the keyword information with the feature combination term, and the ordering information;

[160] using keyword information located within a predetermined order range after the reordering as the feature tag of the content information.

[161] In one possible embodiment, the attribute tag included in the processing module 460 is determined on the basis of historical browsing content of the user.

[162] In one possible embodiment, the processing module 460 is specifically for:

[163] using content information corresponding to a feature tag matched to the attribute tag as candidate content information for recommendation to the user;

[164] ranking each item of content information in the candidate content information according to a preset rule, and using content information with a ranking within a preset range as the content recommendation information.

[165] It can be seen from the above that in the content recommendation apparatus provided in multiple embodiments disclosed herein, first of all, the first acquisition module 410 acquires content information from a content information library, the first determining module 420 determines keyword information associated with the content information, the second determining module 430 a specific field corresponding to the content information, and the second acquisition module 440 acquires field knowledge information corresponding to the specific field. Next, the third determining module 450 determines a feature tag of the content information from the keyword information according to the field knowledge information. The processing module 460 then determines content recommendation information for recommendation to the user from the content information library according to the feature tag and an attribute tag of the user. This apparatus enables more precise content information to be recommended to the user.

[166] Those skilled in the art will realize that in one or more of the examples above, the functions described in the multiple embodiments disclosed herein may be implemented using hardware, software, firmware or any combination thereof. When software is used for implementation, these functions may be stored in a computer-readable medium, or transmitted as one or more instructions or codes on the computer-readable medium.

[167] The particular embodiments above have explained in further detail the object, technical solution and beneficial effects of the multiple embodiments disclosed herein, but it should be understood that the above are merely particular embodiments of the multiple embodiments disclosed herein, and are not intended to limit the scope of protection of the multiple embodiments disclosed herein; any amendments, equivalent substitutions or improvements, etc. which are made on the basis of the technical solution of the multiple embodiments disclosed herein should be included in the scope of protection of the multiple embodiments disclosed herein.

Claims

1. A content recommendation method, characterized by comprising:
acquiring content information from a content information library, and determining
keyword information of the content information;

5 determining a specific field corresponding to the content information;
acquiring field knowledge information corresponding to the specific field;
determining a feature tag of the content information from the keyword information
according to the field knowledge information;
determining content recommendation information for recommendation to a user from the
10 content information library according to an attribute tag of the user and the feature tag.

2. The method as claimed in claim 1, characterized in that the field knowledge information
comprises field level knowledge; the field level knowledge comprises a field name, a category
name corresponding to the field name, and a feature individual term corresponding to the
category name.

15 3. The method as claimed in claim 2, characterized in that the step of determining a feature
tag of the content information from the keyword information according to the field knowledge
information comprises:

determining a specific category corresponding to the content information;
determining, in the field level knowledge, a specific category name corresponding to the
20 specific category, and a feature individual term corresponding to the specific category name;
determining the feature tag of the content information from the keyword information
according to the feature individual term.

4. The method as claimed in claim 3, characterized in that the content information
comprises a category tag, and the step of determining a specific category corresponding to the
25 content information comprises:

determining a specific category corresponding to the content information according to the
category tag.

5. The method as claimed in claim 3, characterized in that the step of determining a feature
tag of the content information from the keyword information according to the feature individual
30 term comprises:

using keyword information matched to the feature individual term from amongst the
keyword information as the feature tag.

6. The method as claimed in claim 3, characterized in that the keyword information
comprises multiple keywords and ordering information of each keyword, and the step of

determining a feature tag of the content information from the keyword information according to the feature individual term comprises:

reordering the multiple keywords according to the state of matching of each keyword in the keyword information with the feature individual term, and the ordering information;

5 using keyword information located within a predetermined order range after the reordering as the feature tag of the content information.

7. The method as claimed in claim 1, characterized in that the field knowledge information comprises a field knowledge graph; the field knowledge graph comprises an entity term corresponding to the field at a first layer thereof, and comprises a related term corresponding to the entity term at a second layer thereof, wherein the entity term and the related term are combined to form a feature combination term.

8. The method as claimed in claim 7, characterized in that the step of determining a feature tag of the content information from the keyword information according to the field knowledge information comprises:

15 determining a feature combination term included in the field knowledge graph corresponding to the specific field;

determining the feature tag of the content information from the keyword information according to the feature combination term.

9. The method as claimed in claim 8, characterized in that the step of determining a feature tag of the content information from the keyword information according to the feature combination term comprises:

using keyword information matched to the feature combination term from amongst the keyword information as the feature tag.

10. The method as claimed in claim 8, characterized in that the keyword information comprises multiple keywords and ordering information of each keyword, and the step of determining a feature tag of the content information from the keyword information according to the feature combination term comprises:

reordering the multiple keywords according to the state of matching of each keyword in the keyword information with the feature combination term, and the ordering information;

30 using keyword information located within a predetermined order range after the reordering as the feature tag of the content information.

11. A content recommendation apparatus, characterized by comprising:

a first acquisition module, for acquiring content information from a content information library;

a first determining module, for determining keyword information of the content information;

a second determining module, for determining a specific field corresponding to the content information;

5 a second acquisition module, for acquiring field knowledge information corresponding to the specific field;

a third determining module, for determining a feature tag of the content information from the keyword information according to the field knowledge information;

10 a processing module, for determining content recommendation information for recommendation to a user from the content information library according to an attribute tag of the user and the feature tag.

12. The apparatus as claimed in claim 11, characterized in that the field knowledge information acquired by the second acquisition module comprises field level knowledge; the field level knowledge comprises a field name, a category name corresponding to the field name, 15 and a feature individual term corresponding to the category name.

13. The apparatus as claimed in claim 12, characterized in that the third determining module specifically comprises:

a first determining sub-module, for determining a specific category corresponding to the content information;

20 a second determining sub-module, for determining, in the field level knowledge, a specific category name corresponding to the specific category, and a feature individual term corresponding to the specific category name;

a third determining sub-module, for determining the feature tag of the content information from the keyword information according to the feature individual term.

25 14. The apparatus as claimed in claim 13, characterized in that the content information acquired by the first acquisition module comprises a category tag, and the first determining sub-module is specifically for:

determining a specific category corresponding to the content information according to the category tag.

30 15. The apparatus as claimed in claim 13, characterized in that the third determining sub-module is specifically for:

using keyword information matched to the feature individual term from amongst the keyword information as the feature tag.

16. The apparatus as claimed in claim 13, characterized in that the keyword information

determined by the first determining module comprises multiple keywords and ordering information of each keyword, and the third determining sub-module is specifically for:

reordering the multiple keywords according to the state of matching of each keyword in the keyword information with the feature individual term, and the ordering information;

5 using keyword information located within a predetermined order range after the reordering as the feature tag of the content information.

17. The apparatus as claimed in claim 11, characterized in that the field knowledge information acquired by the second acquisition module comprises a field knowledge graph; the field knowledge graph comprises an entity term corresponding to the field at a first layer thereof,
10 and comprises a related term corresponding to the entity term at a second layer thereof, wherein the entity term and the related term are combined to form a feature combination term.

18. The apparatus as claimed in claim 11, characterized in that the third determining module specifically comprises:

a second determining sub-module, for determining a feature combination term included in
15 the field knowledge graph corresponding to the specific field;

a third determining sub-module, for determining the feature tag of the content information from the keyword information according to the feature combination term.

19. The apparatus as claimed in claim 18, characterized in that the third determining sub-module is specifically for:

20 using keyword information matched to the feature combination term from amongst the keyword information as the feature tag.

20. The apparatus as claimed in claim 18, characterized in that the keyword information determined by the first determining module comprises multiple keywords and ordering information of each keyword, and the third determining sub-module is specifically for:

25 reordering the multiple keywords according to the state of matching of each keyword in the keyword information with the feature combination term, and the ordering information;

using keyword information located within a predetermined order range after the reordering as the feature tag of the content information.