Quality Evaluation of Social Tags according to Web Resource Types

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ABSTRACT
In the social tagging system, users annotate different web resources according to their need of future information organization and retrieval, and users also annotate resources with different types of tags, such as objective tag, subjective tag, self-organized tag and so on. Because every web resource has its own characteristics, the tag types of each web resource are different. According to the web resource, the quality of each tag type is different. We should depend on resource types to evaluate the quality of tag types, in order to provide efficient tag recommendation service and design better user tagging interfaces. In this paper, we firstly selected five web resources, namely the blog, book, image, music and video, to explore the tag types when annotating different resources. Then we chose specific resource and tags to explore the quality of each tag type according to these five web resources and study the relationship between tag type and quality. The conclusion is that the quality of tag types for different web resources is different.

Categories and Subject Descriptors
H.3.3 [Information Storage and Retrieval]: Information Search and Retrieval, Information filtering, Selection process

Keywords
Social Tags, Quality Evaluation, Tag types, Web2.0

1. INTRODUCTION
With the development of internet, Web2.0 website becomes a convenient platform to generate, share and acquire web information. The information activity has transferred from acquiring information in a passive way to delivering information in an active way, which created numerous user-generated content, Tags are one kind of UGC. Tags can be used in classifying web resources, information retrieval, information recommendation and so on. Users can annotate web resources according to their own need. Currently, some famous social tagging systems include Delicious, Flickr, CiteUllike, Librarything and Youtube etc. Most of users annotate and share URL links, images, academics, books and videos via Delicious, Flickr, CiteUlike, Librarything and Youtube respectively. The emergence of social tagging systems provides a convenient platform for users to generate, share and access the information.

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In the social tagging system, users annotate different web resources according to their need of future information organization and retrieval. Users also annotate resources with different types of tags, such as objective tag, subjective tag, self-organized tag and so on. Because each web resource has its own characteristics, the tag types of each web resource are different. According to each web resource, the quality of each tag type is different. We should depend on resource types to evaluate the quality of tag types, in order to provide efficient tag recommendation service and design better user tagging interfaces. For example, users maybe consider blog tags describing content as high quality tags which are convenient for people to know the blogs content and retrieve blogs. In terms of music, tags of singer name or music genre may be considered as high quality. Evaluating standards are depending on different web resources. Currently, researchers only provide unified ways to evaluate the quality of tags, despite of various annotated resource types. So we need to find a more effective tag evaluating way that takes web resource types into consideration. Meanwhile the usage of tag types and the quality of the tag can be different to different users and for various purposes of using tags. For example, in the e-commerce websites, subjective tag can be used by customers to know the product quality, but in the book sharing websites, subjective tag will not help users understand the book content. We can see even the quality of the same tag types is different because of the various purposes of using tag at different application scenes. So we evaluate the tag types' usage and the tag types' quality not only based on tag independently but also on users' needs in order to rank the quality of tag types according to each web resources.
The paper is organized as follows: After a discussion of relevant previous work in Section 2, Section 3 provides a description of the research methods and tools which we use in our investigation. Section 4 focuses on our investigation's results. Finally, in section 5 we conclude and present ideas for future work.

2. RELATED WORK
We summarize tag quality evaluation research and tag type classification system as following:

2.1 Quality of social tags
Low quality tags reduce the effectiveness of information organization and retrieval in the social tagging system. So scholars have proposed some evaluation methods to research the problem of tag quality.
In 2007, Sen et al compared the different manual tag quality evaluation systems using the tag ranking and user survey method, and raised the interface improvement method of tagging system[1]. In 2007, Lee & Han developed Qtag system , which allows user to add the mark of support or oppose to the annotated resources [2]. In 2008, Krestel & Chen expressed the relation

among user, resource and tag with the graph structure, raised TRP-Rank algorithm based on PageRank to evaluate the tag quality [3]. In 2008, Van et al used the tag frequency, the agreement and TF*IDF to evaluate the tag quality and let the users evaluate the selected high quality tags, the result showed that the performance of tag frequency and TF* IDF were better than the tag agreement[4]. In 2009, Zhang & Farooq proposed three statics properties that can be used to measure the quality of tags. These three properties include centered property, frequency, and entropy. The result showed that frequency and entropy can evaluate tags quality effectively [5]. In 2010, Zhu and Wu used text mining and nature language processing methods to evaluate the quality of tags[6]. In 2010, Noh et al. multiply total daily visits of retrieval system, the probability of the query to be presented as a query and probability of resource queried by this query to evaluate the quality of tag, and then feedback the result of tag quality evaluation to the user, so that the user can update his tag to achieve satisfaction finally[7].

The current evaluation methods of the tag quality are mostly based on tag independently, without combining application needs and considering the different annotated web resources. The above-mentioned methods do not have the extensive applicability, so it would require to do deep research on this aspect.

2.2 Social tag type

The social tags have different types and functions in Web2.0, but not all the types of tag can play a positive role in the information organization and retrieval, at the same time the role of tag is also not the same in the different applications. Hence, we should evaluate the quality of social tags according to the tag types. The type of social tags is a basic question in tag application research. Currently, there have some research works on the tag type division, but still in lack of a uniform standard of type division.

Generally, We can see the tags can be classified into four types, based on other research results about tag type classification system [8-10], i.e. objective tag, used for describing the objective information of annotated web resources; subjective tag, used for annotate the subjective evaluation to the resources; self-organized tag, used for self-information organization and remind; others types of tag including the abbreviations and spam. Currently, researchers have no unified standard of further division of above-mentioned types. The vast majority of researches do not divide the social tag types in allusion to the practical application or annotating objects. So our goal is to divide the tag types effectively in advance, so as to improve the application effect of social tags.

3. METHODOLOGY

We have selected five types of annotated resources, namely blogs, books, images, music, and videos to start the research. Because we want to discover the tag type which is applicable to each web resources, according to the current research of tag type classification system, we have developed a classification system of tag type by combination with different kinds of annotated web resources. The detailed tag type classification system is provided by Table 1.

Table 1 Classification system of tag type with different annotated resources

Blog	vocabularies to describe the blog contents and showed up in the body
	vocabularies used in the blog title
	vocabularies used to describe blog type
	vocabularies used to self-organizing
	source of the blog (i.e. original, reprinted)
	self-feelings after reading the blog
	vocabularies to describe the blog contents, but did not show up in the body
	blog promulgator
	release time of the blog
	release location of the blog
Book	vocabularies to describe the book contents
	vocabularies to describe the book type
	vocabularies used to self-organizing
	vocabularies used in the book title
	self-feelings after reading the book
	book writer
	book language
	publish time
	publisher
	source of the book (knowing or getting the book, i.e. buying, getting as a present)
Image	vocabularies to describe the image contents
	vocabularies to self-organizing
	vocabularies to describe the image type
	vocabularies used in the image title
	self-feelings after watching the image
	source of the image (i.e. original, reprinted)
	release location of the image
	release time of the image
	image promulgator
	equipment used to take the image (i.e. Canon, Nikon)
Video	vocabularies to describe the video contents
	vocabularies used in the video title
	vocabularies to describe the video type
	vocabularies used to self-organizing
	self-feelings after watching the video
	leading role in the video
	director of the video
	source of the video (i.e. original, reprinted)
	video promulgator
	release location of the video
	release time of the video
Music	the singer
	vocabularies to describe the music type and genres
	vocabularies to describe the music contents
	vocabularies used in the music title
	vocabularies to self-organizing
	self-feelings after listening to the music
	language of the music
	release time of the music
	ways of knowing the music (i.e. recommended by friends)

Because the usage and the quality of the tag types can be different to different users and various purposes of using tags. The way that users distinguish the high quality of tag types for each web resources is different. Even the quality of the same tag types is different. Therefore, the quality evaluation on tag type should be done based on users' needs and the characteristics of different annotated resources. The unqualified tag type should be removed to increase the evaluation efficiency. We started from studying on the user's need of tag type when using tags to find out the similarities and differences of tag type of blogs, books, images, videos and music. Then we analyze people's interests on tag type and discover the quality of each tag type with different annotated web resources to understand the relationship between tag quality and type. We should explore whether users' favorite tag types is of high quality or not. The research methods are showed in Figure 1 as following.

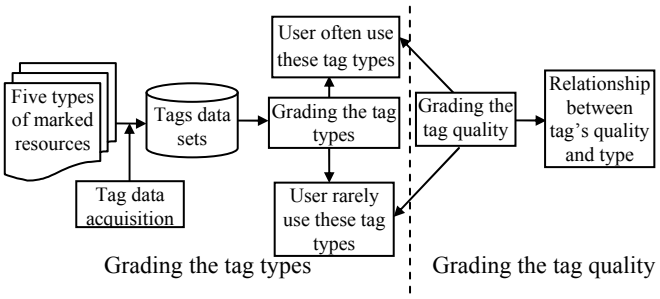

Figure 1. Discover the quality of each tag with different annotated web resources

3.1 Investigation of Tag Type

Firstly, we studied on the tag type of blogs, books, images, music and videos used by users. We sent messages to the users with blogs ranked within 5000 since 14th September, 2013 on the Web of Science. Inter mails were sent to 1000 of users with top comments on the Douban Book, Music and Movie. 500 of users with images on the Shooting website received questionnaires through internal mails. Check Table 2 for detailed information of the websites sent questionnaires (Questionnaires Website is located at: www.sojump.com/jq/2709468.aspx).We have received 721 questionnaires in total, including 707 valid questionnaires. The effective rate is 98%.

Table 2 The questionnaire website information

No	Name	Website	Resource type
1	Science web	blog.sciencenet.cn/	Blog
2	Douban Book	book.douban.com/	Book
3	Douban Music	music.douban.com/	Music
4	Douban Movie	movie.douban.com/	Video
5	Shooting web	www.yupoo.com/	Picture

We have adopted a 5-point Likert scale as the analysis method to study on the results. The questions were designed as whether users use these tag types to annotated resources or not. The user could choose Never, Occasionally, Sometimes, Often, and Always as the answer, given 1, 2, 3, 4, 5 points respectively according to his/her answer. The credit analysis of this research was finished by Cronbach α, in which a high α value meant close relation of the questions, leaded to a high internal consistency. We can know from Table 3 that Cronbach α of each annotated resources in the questionnaires is up to 0.79. Therefore, the survey shows good credibility, and is suitable for questionnaire.

The construct validity was done by factor analysis. The more suitable the data for factor analysis is, the better construct validity is. This research's construct validity was judged by KMO and Bartlett sphericity test. The KMO and Bartlett sphericity test value of each annotated resource was calculated through SPSS analysis. The result shows that the questionnaires have good construct validity. Check Table 3 for the results of credit analysis and validity test of different annotated web resources.

Table 3 The results of credit analysis and validity test

The dimension of the scale	Cronbach α	KMO	Bartlett sphericity test.
blog	0.790	0.787	2268.903
book	0.802	0.776	1167.392
image	0.802	0.720	453.697
video	0.865	0.804	1403.636
music	0.793	0.712	523.676

3.2 Investigation of Tag Quality

Then we made an investigation on the quality of various tag types, found out the relationship between tag type and tag quality. We researched on whether users' favorite tag types are the type of high quality or not. On the basis of five resources types we classified the type and graded the tag quality of two annotated web resources respectively which users are very familiar with. In the classification of tag type, it was the professional librarian that classified the tags of different annotated web resources according to the classification system in the Table 1 and made sure that all tag types were involved, so as to grade the tag quality in the next and analyze the quality of each tag type. To ensure the tag quality score credibility, we found 31 users who have the experience of using tags to grade each two annotated web resources of these five resources types. Then we worked out the average scores of each tag and counted out the scoring average and variance of the quality of different tag types. The number of tags for blog, books, images, videos and music in our investigation is 20, 26, 28, 24 and 22 respectively.

We also selected Likert5 as the analysis method to study on the quality grade results. The questions were designed as whether or not users use these tags to annotate this resource. The user could choose Never, Occasionally, Sometimes, Often, and Always as the answer, given 1, 2, 3, 4, 5 points respectively according to his/her answer. The following figure 2 is a scoring sample for image resources.

Forbidden City Museum (Beijing)

Museum	□1	□2	□3	□4	□5
Forbidden City	□1	□2	□3	□4	□5
Meridian Gate	□1	□2	□3	□4	□5
Inner Golden Water Bridge	□1	□2	□3	□4	□5
Square of Gate of Supreme Harmony	□1	□2	□3	□4	□5

……

Figure 2. Scoring sample for tags quality

4. RESULTS

4.1 Tag Type of Different Web Resources

By taking advantage of method referred in paragraph 3.1, we analyzed the users' choice of tag type in annotating five different resources, including blogs, books, images, and the music.

(1) The analysis of tag types that users annotate the blog

User-choosing tag types of blogs are showed in the Table 4. It can be seen from the Table 4 that users prefer to use tags that describe the content of the blog and are showed in the text, while tag types ranked top 2 or 3 are the words showed in the title of blog or described the type of the blog. The words used for self-organization are also used frequently so that the users can organize the blog individually. It is rare that user uses some words to describe the external information of the blog, such as the publisher of the blog, the publishing time, the publishing place.

Table 4 The blog tag type descriptive analysis

The Blog Tag Type	Tag Type M value	Tag Type SD value
vocabularies to describe the blog contents and showed up in the body	3.42	1.254
vocabularies used in the blog title	3.31	1.106
vocabularies used to describe blog type	3.20	1.088
vocabularies used to self-organizing	3.02	1.179
source of the blog (i.e. original, reprinted)	2.96	1.384
self-feelings after reading the blog	2.71	1.239
vocabularies to describe the blog contents, but did not show up in the body	2.62	1.104
blog promulgator	2.26	1.226
release time of the blog	2.10	1.232
release location of the blog	2.04	1.159

（2）The analysis of tag types that users annotate the book

Table 5 The book tag type descriptive analysis

The Book Tag Type	Tag Type M value	Tag Type SD value
vocabularies to describe the book contents	3.64	1.192
vocabularies to describe the book type	3.53	1.115
vocabularies used to self-organizing	3.53	1.166
vocabularies used in the book title	3.38	1.167
self-feelings after reading the book	3.25	1.273
book writer	2.94	1.219
book language	2.58	1.222
publish time	2.12	1.187
publisher	2.06	1.185
source of the book (knowing or getting the book, i.e. buying, getting as a present)	1.99	1.181

User-choosing tag types of books are showed in the Table 5. It can be seen from Table 5 that users' favorite tags in annotating books are those describing the content and the type of the book. The words used for self-organization are ranked top 3, it shows that user needs some self-organization words to describe the book, which provide convenience for users to find the book in the next time. It is seldom that users use external information of the book, such as the language, the publishing time, the publishing house and the way of knowing the book.

（3）The analysis of tag types that users annotate the pictures

Table 6 The image tag type descriptive analysis

The Image Tag Type	Tag Type M value	Tag Type SD value
vocabularies to describe the image contents	3.73	1.151
vocabularies to self-organizing	3.40	1.193
vocabularies used in the image title	3.37	1.166
vocabularies to describe the image type	3.34	1.112
self-feelings after watching the image	3.20	1.290
source of the image (i.e. original, reprinted)	2.95	1.362
release location of the image	2.63	1.290
release time of the image	2.51	1.244
image promulgator	2.47	1.165
equipment used to take the image (i.e. Canon, Nikon)	2.42	1.331

User-choosing tag types of pictures are showed in the Table 6.It can be seen from the Table 6 that users prefer to use tags in annotating images that describe the content of the image. The words used for self-organization and the words in the title of the image are ranked top 2 and top 3. It is seldom that users use external information of the image, such as the published location, the publishing time, the publisher or the equipment used to shoot the image.

（4）The analysis of tag types that users annotate the video

User-choosing tag types of videos are showed in the Table 7.It can be seen from Table 7 that the words used in annotating videos by the users are similar to the resource type mentioned above, which are the words used to describe the content, type, topic and for self-organization. The tags that users hardly use are the information describing about the publisher, the publishing place or the time of the video.

Table 7 The video tag type descriptive analysis

The Video Tag Type	Tag Type M value	Tag Type SD value
vocabularies to describe the video contents	3.56	1.249
vocabularies to describe the video type	3.42	1.196
vocabularies used in the video title	3.42	1.177
vocabularies used to self-organizing	3.23	1.334
self-feelings after watching the video	3.17	1.340
leading role in the video	3.08	1.182
director of the video	2.82	1.198
source of the video (i.e. original, reprinted)	2.65	1.370
video promulgator	2.38	1.280
release location of the video	2.30	1.322
release time of the video	2.28	1.361

（5）The analysis of tag types that users annotate the music

Table 8 The music tag type descriptive analysis

The Music Tag Type	Tag Type M value	Tag Type SD value
the singer	3.61	1.168
vocabularies to describe the music type and genres	3.61	1.212
vocabularies to describe the music contents	3.39	1.346
vocabularies used in the music title	3.32	1.271
vocabularies to self-organizing	3.23	1.328
self-feelings after listening to the music	3.15	1.376
language of the music	3.00	1.292
release time of the music	2.38	1.301
ways of knowing the music (i.e. recommended by friends)	2.33	1.286

User-choosing tag types of music are shown in the Table 8. In Table 8, there are some differences between the tags in annotating music and the resource types mentioned above. Users prefer to use the singer name as the favorite tag type. Then they choose the words used to describe the music styles and the contents. It was hardly seen that the users used the external description information, such as the musical language, the publishing time, the way of getting musical information to annotate the music.

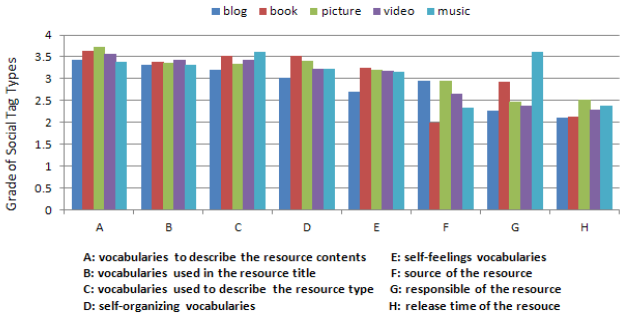

Figure 3. Comparison of Tag Types for Each Web Resource

Figure 3 shows the user choices of each public tag types according to web resources mentioned above. We can know the users' preference of each web resources' tag types, which can help social tag systems to recommend tags. Meanwhile, we can know the difference of each web resources' tag types, even if the difference is very slight. It can be seen that: except that users often use the singer's name as the musical marker mostly, users often use the words describing the resource content; the words appeared in the title or describe the resources type are used mostly by users; the words used for self-organization also are placed highly. Then the users can organize the resources according to their own necessity. The tag types that users seldom used are those tags describing the external information of the resources.

4.2 The quality of different Web resources

By taking advantage of the method referred in 3.2 we investigate the tag quality of each tag type of different resources, the analysis of each tag type quality is also carried out on the following five types, including blogs, book, images, videos and the music.

（1）The tag quality analysis for the blog

Table 9 shows the users' grading results of tag types of blog. It can be seen from Table 9 that, the highest grade is the words used to describe the content of the blog, which also appeared in the blog text. The words appeared in the topic of the blog and words for self-organization also have high scores. The quality score of the tag type describing the external information of blog is low. Above results are in accord with the results of user choices in tag type showed in the questionnaire. At the same time, it can be seen that the rank of words which describes the blog content but not in the text were raised higher than that in questionnaire, so that the users also think the words which don't showed in the blog but describe correctly the content are also of high quality.

Table 9 The quality of blog tag types descriptive analysis

The Blog Tag Type	Tag Quality M value	Tag Quality SD value
vocabularies to describe the blog contents and showed up in the body	4.47	0.483
vocabularies used to self-organizing	3.88	0.692
vocabularies used in the blog title	3.67	1.761
vocabularies to describe the blog contents, but did not show up in the body	3.07	0.965
vocabularies used to describe blog type	2.71	0.319
self-feelings after reading the blog	2.47	0.151
source of the blog (i.e. original, reprinted)	2.08	0.114
blog promulgator	2.02	0.160
release time of the blog	1.87	0.090

（2）The tag quality analysis for the book

Table 10 The quality of book tag types descriptive analysis

The Book Tag Type	Tag Quality M value	Tag Quality SD value
vocabularies used in the book title	4.73	0.023
book writer	4.45	0.091
vocabularies to describe the book contents	3.89	0.905
vocabularies to describe the book type	3.58	0.459
self-feelings after reading the book	3.08	0.726
vocabularies used to self-organizing	2.51	0.918
publisher	1.86	0.467
publish time	1.73	0.342
book language	1.61	0.068
source of the book (knowing or getting the book, i.e. buying, getting as a present)	1.57	0.236

Table 10 shows the users' grading results of tag types of book. It can be seen from Table 10 that the words appeared in the title of the book are considered to be the tags of the highest quality, because they directly describe the content of the book. The words used to describe the content of the book and the type of the book also get high grade but the ranks are lower than those of the questionnaire. The reason is that users will use the words describing the content or type of the book to annotate, but some words describing the content or type might not be correct. At the same time, the tag that annotates the author also ranked high, showing that the author of the book is also one of the relative tag types in describing a book. The grade of the tags in describing the external information is low, accorded with tags that users preferred in the questionnaire.

（3）The tag quality analysis for the picture

Table 11 shows the users' grading results of tag types of picture. It can be seen from Table 11 that the words appear in the images' title scored the highest, because they directly describe the content of the image. The words used to describe the content or type of the image also scored high .The grade of the tags in describing the external information scored low grades, accorded with tags that users preferred in the questionnaire. At the same time it can be seen that the type of publishing location is upgraded because one of the two selected images were images of well-known scenic spots. The location also could describe correctly the image's content. Therefore, it can be concluded that the quality judgment standard of different image type is different.

Table 11 The quality of picture tag types descriptive analysis

The Image Tag Type	Tag Quality M value	Tag Quality SD value
vocabularies used in the image title	4.17	0.739
vocabularies to describe the image contents	3.78	0.689
vocabularies to describe the image type	3.21	0.342
release location of the image	2.95	0.757
vocabularies to self-organizing	2.92	0.925
self-feelings after watching the image	2.78	0.167
image promulgator	1.63	0.114
source of the image (i.e. original, reprinted)	1.61	0.046
release time of the image	1.56	0.160
equipment used to take the image (i.e. Canon, Nikon)	1.48	0.228

（4）The tag quality analysis for the video

Table 12 The quality of video tag types descriptive analysis

The Video Tag Type	Tag Quality M value	Tag Quality SD value
vocabularies to describe the video contents	4.27	0.362
vocabularies used in the video title	4.07	0.613
leading role in the video	3.92	0.401
director of the video	3.65	0.219
vocabularies to describe the video type	3.30	0.388
self-feelings after watching the video	3.25	0.330
vocabularies used to self-organizing	3.21	0.753
release location of the video	2.87	0.274
source of the video (i.e. original, reprinted)	2.60	1.300
release time of the video	1.97	0.228
video promulgator	1.87	0.092

Table 12 shows the users' grading results of tag types of video. It can be seen from Table 12 that words used to describe the video content and words appeared in the video title are the types that got the highest quality scores. The grade of the tags in describing the external information scored low grades, accorded with tags that

users preferred in the questionnaire. At the same time, the rank of tags of the leading roles and directors are upgraded because one video in the two is a movie which is considered the leading roles and the director of the movie as tags of high quality. Therefore, it can be seen that the quality judgment standard of different video type is different.

（5）The tag quality analysis for the music

Table 13 shows the users' grading results of tag types of music. It can be seen from Table 13 that words in the title of the music, the content, the signer and the music styles are ranked high in the tag quality and the grade of the tags in describing the external information are low, accorded with tags that users preferred in the questionnaire.

Table 13 The quality of music tag types descriptive analysis

The Music Tag Type	Tag Quality M value	Tag Quality SD value
vocabularies used in the music title	4.64	0.342
vocabularies to describe the music contents	4.60	0.342
the singer	4.14	0.747
vocabularies to describe the music type and genres	2.76	0.247
vocabularies to self-organizing	2.42	0.032
self-feelings after listening to the music	2.27	0.052
language of the music	2.03	0.312
ways of knowing the music (i.e. recommended by friends)	1.87	0.267
release time of the music	1.71	0.086

Above all, for each resource type, the words in the title, describing the resource content and type have the high tag quality and the tags that describe the external information have low quality scores which accord with the tag types used that users preferred in the questionnaire. But different resources have different characteristic and don't accord with the questionnaire. For example, for blog, the tags describing the blog content but not in the text have high scores; for book, the tags containing the author of the book have high scores; for image, the tags containing the publishing place of the image have high quality; for video, the tags containing the leading roles and directors have high quality. At the same time, we can see that even in one type of resources, the quality of each tag type of one resource type is different.

4.3 The Analysis of Relationships between Tag Type and Tag Quality

Through the analysis of the tag type that users use to annotate different resources and the analysis of the quality of each tag type in 4.1 and 4.2, it can be seen that tag types preferred by users in annotating resources are different because of the different characteristics of annotated resources. Meanwhile, the tag types not preferred by users are not all of low quality tags. For example, for blogs, the tags which describe the content but don't occur in the text is of high quality, while for books, it is the words in the title that are of highest quality and that describe directly the content of the book; for images, the publishing place of the scenery images is of high quality; for movies, the leading roles and directors are the tags of high quality that describe the content of the video. Therefore, in the tag quality evaluation, we shall not only analyze the tag type, but also analyze the specific web resource type and consider the users' needs to evaluate the quality of social tags.

5. CONCLUSION AND FUTURE WORK

In this article, we firstly selected five web resource types, namely the blog, the book, the image, the music and the video, to explore the tag type used by users when annotating different resources. Then we selected specific resource and tags to explore the quality of each tag type according to these five resources and study the relationship between tag type and quality.

In conclusion, we can see that the quality of tag types for different web resources is different. When evaluating tags quality, we need to combine specific web resource types according to the application scenes. In the future we will carry out the social tag quality evaluation of each web resource to generate the tag quality evaluation models according to web resource types and the users' need.

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