Evaluating Brand Value on the Web

Takuya Kobayashi, Hiroaki Ohshima, Satoshi Oyama and Katsumi Tanaka
Department of Social Informatics, Graduate School of Informatics, Kyoto University
Yoshida-Honmachi, Sakyo, Kyoto 606-8501, Japan
{tkoba, ohshima, oyama, tanaka}@dl.kuis.kyoto-u.ac.jp

ABSTRACT

The value of a brand name is an important factor that consumers often take into consideration when making their purchasing decisions. However, it is difficult for users to evaluate correctly the value of a brand name, especially when they encounter it for the first time. In reality, sometimes a brand's description or its use is purposely manipulated so as to give an impression of high value. In another way, a non-existing brand name may be used to attract consumers. We call such names "glorified terms." In this paper, we propose a method for evaluating a brand's value from texts on the Web. To this end, we first acquire candidates of attributes useful for evaluating whether a term is a brand name or a glorified term. The candidates are evaluated according to the idea whereby explanations about a real brand name often contain attributes describing its quality. We implemented a prototype system especially for agricultural and livestock products. The system judges whether a given one is a glorified term or a well-known brand name from several viewpoints. We conducted preliminary experiments and we achieved 74% - 85% accuracy rate.

Categories and Subject Descriptors

J.4 [**Social and Behavioral Sciences**]: Economics

General Terms

Algorithms, Economics, Reliability

Keywords

brand value, evaluation of brand names, obtaining attributes of products

1. INTRODUCTION

Many people take the liberty to post many kinds of content on the Web, and web users obtain such content everyday. However, it is difficult for users to correctly evaluate the content's credibility. One example of such a problem is "Buzz Marketing". Buzz marketing is a marketing strategy used to generate reputation. A company asks some consumers to promote its products by building its reputation. When users consider the reputability of a product, they should know whether the reviewer has received fees or product offers for his/her review from the company. If such information is not provided, it is quite difficult for users to know the truth about a product's reputation. Users often cannot assess the credibility of information such as reputation, so they need support in assessing it. In our previous work, we evaluated reviewers' biases in regard to reputation by focusing on the reviewers' regionality [5].

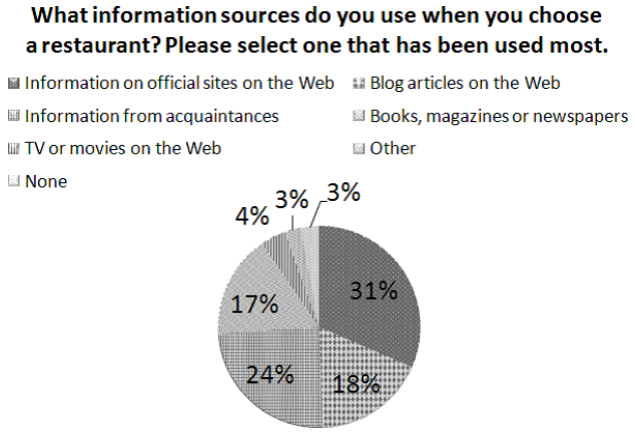

Figure 1: Question about information sources that users refer to when they choose a restaurant

Information that users obtain on the Web is not only what consumers publish but also what suppliers publish on their official sites. Figure 1 shows the results of a questionnaire about information sources that users refer to when they choose restaurants. This questionnaire was conducted online in September 2008 on a group of 1496 Web users in Japan. Subjects were divided into equal categories of 374 respondents depending on their age: 20-29, 30-39, 40-49 and 50-59 years old. In each category, half of the respondents were males and half were females. The results showed that many people get information from the web sites, such as official sites and blogs, to make their decisions.

That is, users utilize information that consumers post about products and services as well as information that suppliers publish. However, suppliers display a variety of brand

WICOW'09, April 20, 2009, Madrid, Spain.

information to attract users and sometimes use "glorified terms." A "glorified term" is an expression that is not an existing brand name but sounds attractive to users because of its possible association with a brand name. It is usually difficult for users to notice when a term is glorified. To overcome this difficulty, we developed a method for evaluating brand value, and we implemented it in a prototype system that can judge whether a term is glorified or not.

2. PROBLEM OF GLORIFIED TERMS

As mentioned above, users use not only information that consumers publish but also information that suppliers publish, and information from suppliers may contain glorified terms. In Section 2.1, we define the concept of glorified terms. In Section 2.2, we describe the reason why users are influenced by them.

2.1 Definition of Glorified Term

Here, we can think of two different kinds of value: real value and association value. A product has real value, which is a quantitative assessment of its quality. A brand name is accepted as a brand because its real value is high. On the other hand, the association value of a brand name is the value that users imagine from the sound of the term. There are three cases of relation between the association value and the real value:

Case 1. association value $\fallingdotseq$ real value

Case 2. association value $>$ real value

Case 3. association value $<$ real value

Case 1: When the real value is high, the term indicating the product is a brand name. In the case of well-known brand names such as "Matsusaka beef" [1], the association value is often the same as the real value. In this case, users do not face any loss in acquiring this product.

Case 2: The term indicating the product is a glorified term. Users usually experience a utility loss when buying the product.

Case 3: The term indicating the product is not well known. For example, a user might not think a product to be of especially good-quality but in reality it is a brand. Users can thus receive more utility than expected from the product.

2.2 Reason for "Glorified Terms"

Why are users influenced by glorified terms? There are roughly two cases in which the association value rises unjustifiably.

One case is that a fault in recognition heuristics, as reported by Goldstein [2], enhances the association value. A recognition heuristic is a heuristic by which users may highly evaluate a product that they have heard about before or the product seems to be accepted as a brand. Users may associate a high value with a glorified term because of their past experience, as they have encountered many brand names during the course of their lives.

In the other case, glorified terms enhance the association value by taking benefit from brand names. The relations by which glorified terms take benefit from brand names, can be broken down into the following cases:

[1]Matsusaka beef is a famous brand of beef in Japan.

a) There is an exploitable structural relation between the words of the brand name.

b) There is an exploitable regional adjacency or an inclusive geographical relations.

c) The term has a similar name to a brand name.

d) The term uses the regional name of a brand.

e) The term has an expression that conveys the same attribute as the brand names.

f) The term juxtaposes brand names.

Case a) The brand names of agricultural and livestock products often consist of a term referring to the production area and the class of the product term. In addition, the term indicating the production area comes before the class term. Take, for example, "Italian cheese." "Italian" is the term referring to the production area and it comes before the class term "cheese."

Case b) means that there are the regional adjacent or inclusive relations between the term and a brand name. The term can then be associated with the value of the brands. Consider a brand produced in a certain region. A glorified term can associate itself with the same region as if it were a brand name by using an inclusive or adjacent regional name. For example, a Milano style cutlet is a well-known cutlet, and Italy includes Milano. Hence, "Italian style cutlet" would be a glorified term.

An example of case c) is "Iperico pork" which is spelled similarly to the famous brand of Iberico pork.

Case d) means that a term borrows the popularity of a production area that brand names made well known. There is the possibility that users highly evaluate a product that is not a brand simply because its production area is famous. For example, Castile is an area in Spain famous for its soups. Hence, the term "Castilian stew" borrows from the popularity of Castile in regard to soups.

Case e) means that a term is a pretense to high worth. (The attribute of a product is not special.) Users associate the term with the same value as that of a brand name. For example, a producer couldpromote its beer by emphasizing that it is made of "malt." However, malt is not special in the context of beer.

Case f) means that a term suggests that an item is of the same rank as a brand name item. This is made possible by putting a coordinating particle between a brand name and a glorified term. For example, consider the phrase "Japanese wine or French wine". Japanese wine is not a brand but French wine is considered to be one. They are connected with "or." Therefore, users may think that Japanese wine has the same value as French wine.

3. FINDING CANDIDATES OF ATTRIBUTES FOR EVALUATION

The attributes of the product must be collected to evaluate the value of a brand name. For example, the attributes of digital cameras are color, pixel count, size, and so on. We can check for such attributes of product classes in the database of the Japanese Patent Office. To find candidate attributes, we can use a Ohshima et al.'s method for discovering coordinate terms with a Web search engine [8]. "Coordinate terms" are terms that have the same hypernym.

For example, when term X is a coordinate term of term Y, there exists a term Z that is the hypernym of both X and Y. *Tomato*, *potato*, and *carrot* are coordinate terms because they all have the same hypernym *vegetable*. The method for discovering coordinate term is based on two assumptions. One is that the conjunction "or" can connect two coordinate terms. The other is that when two terms "A" and "B" are coordinate, there must exist both "A or B" and "B or A" in the Web text. Our method incorporates their method and consists of the following six steps.

Step 1. The given word is a "production area" [2].

Step 2. Two Web search queries are made from the given word.

Step 3. The Web search results are obtained and analyzed.

Step 4. Candidates of attributes for evaluation are obtained.

Step 5. The candidates are treated as given words.

Step 6. For each candidate, execute Step 2 through Step 4.

We found that the attributes of agricultural and livestock products can be obtained by using the "production area" as a seed word. First, two Web search queries are made by connecting the given word and the conjunction "or" before and after the word. For example, two queries for a Web search engine are "**"production area or" beef**" and "**"or production area" beef**". Beef is the class of the given term. Yahoo! [3] allows phrase searches with quotation marks enclosing the query. Thus the quotation marks are contained in the queries.

Next, we get 100 result items for each of the Web queries and analyze a maximum of 200 titles and snippets. The snippet shows a small amount of page content and usually consists of sentences that contain the user's query words. From them, we obtain the candidates of attributes for evaluation. In addition, these candidates are considered to be given words. We make two queries again. For example, two queries for a Web search engine are "**"pedigree or" beef**" and "**"or pedigree" beef**". Thus, this boot strap technique can acquire a lot of candidate attributes.

However, these attributes are just candidates for evaluation. For example, color is an attribute of a digital camera's casing, but color is not important for evaluating the product's value in many cases. Therefore, it is necessary to discover useful attributes for evaluating a brand's value from these candidate attributes. The method of choosing them is described in the next section.

4. DISCOVERING USEFUL ATTRIBUTES FOR EVALUATING BRAND VALUE

To discover useful attributes for evaluating a brand's value, we use a hyperlink-induced topic search (HITS) based method. The HITS algorithm was proposed by Kleinberg [4]. Kleinberg modeled Web communities as hubs and authorities. Authorities are pages containing authoritative and useful resources, and good authorities have many links from good hub pages. Hubs are pages with links, and good hubs have many links to good authorities. The HITS algorithm is very effective for finding good authorities and hubs on the basis of link information. We consider the candidates of attributes to be hubs and elements to the brand list to be authorities, and apply the idea of HITS algorithm to a bipartite graph between them.

[2]Originally in Japanese.

[3]http://www.yahoo.com/

4.1 Hyperlink-Induced Topic Search (HITS)

HITS was designed for locating dense bipartite communities in a link structure. That is, the central idea is that authoritative pages can be identified as belonging to dense bipartite communities in link structures.

For the query "car manufacturer," the home pages of Toyota, Honda, and other car makers would be considered good authorities, while Web pages that list these home pages would be good hubs. The HITS algorithm can be run on a set of hyperlinked pages, and such a set is represented as a directed graph: $G = (V, E)$, where V is the set of pages in the environment, and the directed edge $(p, q) \in E$ represents the existence of a link from p to q.

Each page, $p \in V$, is associated with a non-negative authority weight, a_p, and a non-negative hub weight, h_p. Their values are updated using the algorithm described below. Note that the weights of each type are normalized so that their squares sum to 1. That is, $\Sigma_{p \in V} a_p^2 = 1$, and $\Sigma_{p \in V} h_p^2 = 1$.

The update algorithm is intuitively understandable. If p points to many pages with large a-values, it receives a large h-value; if p is pointed to by many pages with large h-values, it receives a large a-value. For this reason, Kleinberg defined two operations on the weights: I and O. The I operation updates the a-values:

$$a_p \leftarrow \sum_{q:(q,p) \in E} h_q \tag{1}$$

The O operation updates the h-values:

$$h_p \leftarrow \sum_{q:(p,q) \in E} a_q \tag{2}$$

As a result, the a- and h-values have a mutually reinforcing relationship. The pages with larger a-values are considered better authorities, and the pages with larger h-values are considered better hubs. In terms of spectral analysis of matrices, the HITS algorithm is rephrased as follows. Given a set of n Web pages, we can define an $n \times n$ adjacency matrix $\boldsymbol{A}$, whose (i, j)th-element is 1 if page i links to page j, and 0 otherwise. Let a be the vector whose pth element is a_p and $\boldsymbol{h}$ be the vector whose pth element is h_p. Operations (1) and (2) can then be written as

$$\boldsymbol{a}^{(t+1)} = \boldsymbol{A}^T \boldsymbol{h}^{(t)} = (\boldsymbol{A}^T \boldsymbol{A}) \boldsymbol{a}^{(t)} \tag{3}$$

$$\boldsymbol{h}^{(h+1)} = \boldsymbol{A} \boldsymbol{a}^{(t+1)} = (\boldsymbol{A} \boldsymbol{A}^T) \boldsymbol{h}^{(t)}. \tag{4}$$

Linear algebra says that $\boldsymbol{a^*} = \lim_{t \to \infty} \boldsymbol{a}^{(t)}$ and $\boldsymbol{h^*} = \lim_{t \to \infty} \boldsymbol{h}^{(t)}$ converge to the principal eigen vectors of $A^T A$ and $A A^T$ and satisfy

$$(\boldsymbol{A}^T \boldsymbol{A}) a^* = \lambda \boldsymbol{a}^* \tag{5}$$

$$(\boldsymbol{A} \boldsymbol{A}^T) h^* = \lambda \boldsymbol{h}^*, \tag{6}$$

where λ is the common principal eigenvalue of $\boldsymbol{A}^T \boldsymbol{A}$ and

$\boldsymbol{A}\boldsymbol{A}^T$. That is, HITS is equivalent to finding the principal eigen vectors of $\boldsymbol{A}^T\boldsymbol{A}$ and $\boldsymbol{A}\boldsymbol{A}^T$.

4.2 Applying HITS to Candidates of Attributes for Evaluation

To discover useful attributes for evaluating a brand's value, we create a bipartite graph between the brand list and the candidate attributes. The HITS algorithm is applied to the bipartite graph as follows.

1. Make a bipartite graph between the brand list and the candidate attributes.
2. Make an edge if a candidate appears in the sentences obtained by the Web search.
3. Apply the HITS algorithm to the bipartite graph.
4. Output the attributes with high h-values.

We obtained a brand list and candidate attributes from the Patent Office database, as described in Section 3. From these results, we made a bipartite graph: $G = (U, V, E)$, where U is a set of candidate attributes and V is a set of brand names. To make edges $(x, y) \in E$, we use a Web search engine. Two Web search queries are made. Consider a brand name y, and make two queries "y is" and "y stands for" [4]. For example, two specific queries are "iPod is" and "iPod stands for". We get 50 result items for each query and analyze a maximum of 100 snippets. From them, we obtain the sentences that begin with a brand name y and make edges in the bipartite graph. For example, if a candidate x appears in the sentences that begin with a brand name y, the edge (x, y) is made. Figure 2 shows an example of a bipartite graph for "beef." We can consider the candidate attributes to be hubs and the brand list elements to be authorities. By applying the HITS algorithm to the bipartite graph, we can obtain useful attributes for evaluation and high-worth brand names.

The HITS-based method for discovering useful attributes for evaluation is described as follows. Given a candidate x and a brand name y, we can define a matrix $hasAttr(x, y)$ as shown in equation (7). The brand value y is expressed as $BV(y)$, and the usefulness of an attribute x is expressed as $AV(x)$. Their values are updated using equation (8) and (9) normalized so that their squares add up to 1.

$$hasAttr(x,y) = \begin{cases} 1 & (\texttt{the attribute } x \texttt{ appears in the sentence begins with } y) \\ 0 & (\texttt{otherwise}) \end{cases} \quad (7)$$

$$AV(x) = \sum_y hasAttr(x,y)BV(y) \quad (8)$$

$$BV(y) = \sum_x hasAttr(x,y)AV(x) \quad (9)$$

If a brand name y is worth a lot, $BV(y)$ usually has a high value. We call $BV(y)$ the evidence score, which means how often a term is evaluated on the Web. A good product will likely have a lot of descriptions on the Web.

[4]The Web queries are originally in Japanese "yHa" and "yToHa", where the underlined part is a Japanese letter.

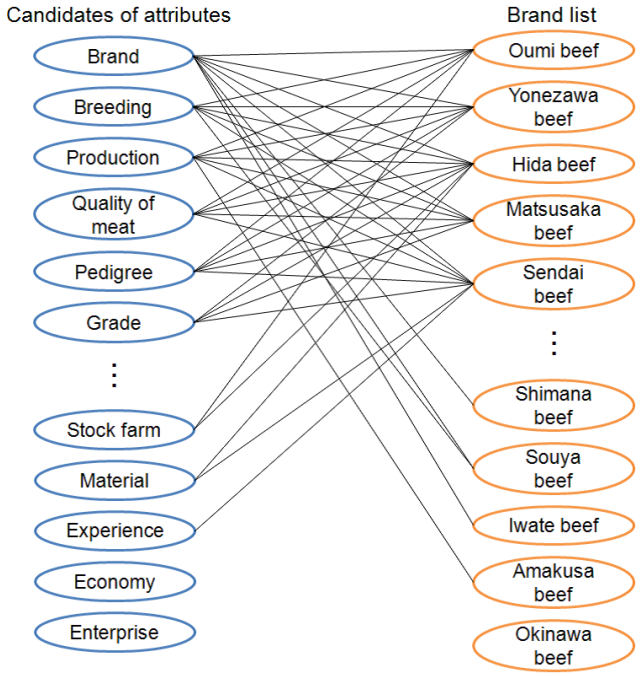

Figure 2: Bipartite graph for beef

5. EVALUATING A TERM

Using the values obtained in Section 4.2, we can evaluate a given term. The given term is evaluated as follows.

1. Make two Web search queries.
2. Obtain and analyze the Web search results.
3. Obtain the evidence score of a term from equation (9).
4. Judge whether a term has the same value as brand names.

Two Web search queries are made. For a given term z, the two queries are "z is" and "z stands for". We get 50 result items for each of the Web queries and analyze a maximum of 100 snippets. From them, we obtain the sentences that begin with z. $hasAttr(z, k)$ is obtained for each attribute k obtained in section 4.2. $BV(z)$ is then calculated by using equation (9).

To evaluate the evidence score $BV(z)$, we compare it with the evidence scores of the brand names. Whether a term has the same value as the brand names or not is judged by whether the evidence score of a term is larger than the lower limit of one-sigma range of the score lists of brand names. We call the lower limit of the one-sigma range of the score lists $Jline$. Although a two-sigma range is preferable, we use only a one-sigma range here because there are not enough brand names to compare evidence scores. If the number of brand names is n, $Jline$ is calculated as follows.

$$Jline = \frac{1}{n}\sum^{n} BV(y) - \sqrt{\frac{1}{n}\sum^{n}(\mu - BV(y))^2} \quad (10)$$

6. PROTOTYPE SYSTEM FOR JUDGING GLORIFIED TERMS

We made the prototype system for judging glorified terms. Figure 3 shows an example execution. The prototype system is simply operated by the user inputting a term and pushing the Search button.

6.1 Judgment Algorithm

The algorithm uses the following four judging criteria.

1) Trademark registration

2) Evidence score

3) Regional relation with brand names

4) Name likelihood

A glorified term is a term whose association value is higher than its real value. Criteria 1) and 2) are indicators of the real value, while 3) and 4) are indicators of the association value. The trademark registration means a term has the quality of the level to which the registration is authorized. The evidence score is calculated as described in Section 5. We used the service of Yahoo! Japan [5] as the Web search engine. Our system normalizes the evidence score so that the maximum score of a brand name becomes 100.0.

There is a possibility that users are influenced by the recognition heuristic if there is a production area of brands are near the production area of the given term. In addition, there is a possibility that a certain term will benefit from a brand name by displaying the regional name of the brand's production area. Therefore, the information as to whether a term has inclusive or adjacent relations with the region of the brand names is used as an indicator. We used the map retrieval service of Yahoo! Japan [6] to acquire the Japanese prefecture from the name of the production area.

In addition, because of the recognition heuristic, users might evaluate terms that they have heard before highly. Therefore, we considered the number of result pages when we input the production area as a query with a Web search engine as the name likelihood. Name likelihood means the degree that a term seems to be accepted as a brand. We tried to determine whether the number is large compared with the number of brand names. We used a one-sigma range as in the judgment of the evidence score. If the number of instances of a given term is larger than the lower limit of the one-sigma range of the number of brand names, we judge that the production area has as high name likelihood of being associated with brand names. If there is a possibility that a term is a glorified to some degree, it is preferable to judge that it is so because glorified terms lead users to a utility loss. Therefore, the association value judgment assumed the presence of a regional relation with brand names or high name likelihood.

The system applies Rules 1 through Rule 3 in order, and rules can produce the output.

Rule 1. The given term is a brand name when the trademark is registered or the evidence score is high.

Rule 2. The given term is a glorified when there is the regional relation with brand names or the name likelihood is high.

Rule 3. The given term is a general product term in other cases.

That is, a term is glorified when the trademark is not registered, the evidence score is low (the real value is low) and the recognition heuristic is applicable (the association value is high). In addition, our system provides users with not only a judgment but also the positioning of the given term compared with brand names and attributes for evaluating its class. Figure 3 shows an example for the target "beef."

6.2 Experiments on Prototype System

The prototype system is not intended to be a system that finds glorified terms automatically on the Web, but one that judges whether a given term is a glorified term or not. Therefore, we evaluated the system with a few terms. We collected two test sets from the Web and analyzed the system's accuracy when we gave it a test set. The system's accuracy would be high if it correctly judged a given glorified term (brand name) to be a glorified term (brand name).

6.2.1 Experiments Focusing on Beef

Table 1 shows results for "beef." The test set was manually collected from the Web and brand information about beef that was provided by Japan Meat Information Service Center [7]. This brand beef is not brand accurately because it is admitted just when the producer declares. However, the brand information shows a fixed quality. Whether a given term was actually a glorified term was judged by checking if the content that explained the quality of the term such as the beef's producers is posted on the Web. The accuracy was 84.8% per 33 given terms and *Jline* was 18.4. Therefore, our system judged a given term to be a glorified one if its evidence score was lower than 18.4.

For example, Miyagi beef was judged to be a glorified term (Figure 3). We could not learn the criterion for Miyagi beef even if we searched the Web. Perhaps, Miyagi beef only means that the production area is Miyagi prefecture. Sendai beef is a famous beef brand from Miyagi prefecture, and Sendai is the capital of Miyagi prefecture. "Miyagi beef" is a glorified term that uses a regional relation with Sendai beef. When we examined the text containing "Miyagi beef", there was a description that took the benefit from the famous Kobe brand of beef: "... Kobe beef or Miyagi beef ...".

Failures were often caused by low evidence scores. For example, Tosa beef is a brand name but it was judged to be a glorified term by our system. When the trademark of a term is not registered, if the evidence score is low, brand names are sometimes judged to be glorified terms. To avoid this, we will have to improve the evidence score calculation. The next section discusses a plan to make such improvements to the prototype system.

In addition, Kokusan beef was judged to be a brand name but is in fact a glorified term [8]. There are many descriptions in which Kokusan beef is not a brand name. The descriptions include attributes such as breeding and production.

[5] http://developer.yahoo.co.jp/webapi/search/websearch/v1/websearch.html

[6] http://developer.yahoo.co.jp/webapi/map/localsearch/v1/localsearch.html

[7] http://www.jmi.or.jp/info/brand.php (in Japanese)

[8] "Kokusan" means that the beef is domestically produced in Japanese.

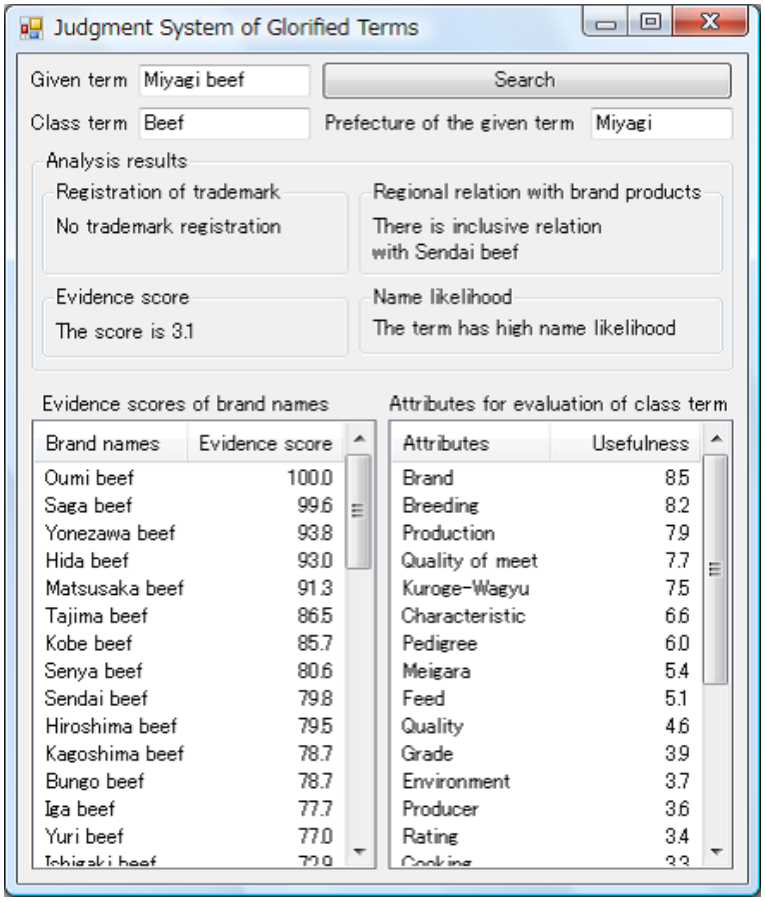

Figure 3: Execution example of prototype system (the given term is Miyagi beef)

Therefore, our system judged that "Kokusan beef" was a brand name. To avoid this problem, it is necessary to use not only attribute names but also attribute values.

6.2.2 *Experiments Focusing on Orange*

Table 2 shows analysis results for "orange." The test set was manually collected from the Web and Wikipedia [9]. If some Web pages explained the quality of a term or Wikipedia describes that the term is a brand, the term of the test set was considered to be a brand name. The accuracy was 74.1% per 27 given terms and *Jline* was 9.3. Our system judged that the given term was a glorified term if its evidence score was lower than 9.3. The causes of failure were similar to those for "beef."

6.2.3 *Other Experiments*

We gave the term "Sapporo ramen" to our system. Ramen is a Japanese noodle dish that originated in China. Sapporo prefecture is famous as a production area of ramen and Sapporo ramen is a brand name. However, our system judged it to be a glorified term. Thus, when the trademark of a term is not registered, brand names are sometimes judged to be glorified. The evidence score for Sapporo ramen was high, 68.3. However, *Jline* was 80.0. Therefore, only a term whose evidence score was higher than 80.0 was judged to be a brand name. *Jline* was too high, because all the evidence scores of the compared brand names were high.

As another example, we tried the term "Kyoto cibol". Cibol means Welsh onion. Actually Kyoto cibol does not existand the evidence score is 0.0. However, our system judged it to be a brand name because the *Jline* of cibol was -0.7. In this case, our system judged all given terms as brand names. If the evidence scores of compared brand names are not well calculated, our system cannot judge correctly.

Although our system determines glorified terms by focusing on production areas of agricultural and livestock products, it can also evaluate a term whose production area is unknown to some degree. For example, "Nijisseiki pear" was judged to be a brand name by our system. Nijisseiki pear is a brand name of pear in Japan. In this case, it was correctly judged it to be a brand name although a regional relation could not be determined. The systems judged correctly in this case because it calculated a suitable evidence score for a brand name.

6.3 Future Work

We believe that there are three reasons for our system's failure when the acquisition of the evidence scores of a given term or brand name does not go well:

- The attributes for evaluation were insufficient to evaluate the quality of a class term.

[9] http://ja.wikipedia.org/ (in Japanese)

Table 1: Analysis results for "beef"

Given term	Evidence score	Judgment result of system	Right or wrong judgment
Hayama beef	96.3	Brand name	Right
Yamato beef	83.1	Brand name	Right
Murakami beef	82.1	Brand name	Right
Iki beef	79.3	Brand name	Right
Awa beef	79.3	Brand name	Right
Wakasa beef	78.4	Brand name	Right
Kokura beef	67.4	Brand name	Right
Fukushima beef	66.6	Brand name	Right
Kumano beef	66.1	Brand name	Right
Ozaki beef	65.7	Brand name	Right
Kenran beef	64.9	Brand name	Right
Noto beef	59.5	Brand name	Right
Kokusan beef	58.3	Brand name	Wrong
Imari beef	54.4	Brand name	Right
Shiretoko beef	43.5	Brand name	Right
Awaji beef	43.4	Brand name	Right
Tottori beef	40.5	Brand name	Right
Fukaya beef	20.7	Brand name	Right
Echigo beef	20.7	Brand name	Right
Itoshima beef	13.2	Glorified term	Wrong
Fukuoka beef	11.8	Glorified term	Wrong
Kyushu beef	5.0	Glorified term	Right
Miyagi beef	3.1	Glorified term	Right
Tosa beef	3.0	Glorified term	Wrong
Mie beef	2.6	Glorified term	Right
Atsumi beef	1.5	Glorified term	Wrong
Hokkaido beef	0.0	Glorified term	Right
Ibaraki beef	0.0	Glorified term	Right
Yamanashi beef	0.0	Glorified term	Right
Gunma beef	0.0	Glorified term	Right
Asahi beef	0.0	Glorified term	Right
Oita beef	0.0	Glorified term	Right
Fukui beef	0.0	Glorified term	Right

- The amount of the sentences that begin with a given term obtained from the Web was insufficient.
- The number of brand names for comparison was insufficient.

A reasonable number of brand names is necessary for acquiring better results when calculating the usefulness of attributes for evaluation. If the attribute name appears, the evidence score is given the value in present our method. Our method is based on the idea that if the attribute name appears in sentences "*a given term* is ..." or "*a given term* stands for ...", the attribute value will appear at the same time. However, actual sentences often describe the attribute value without including the attribute name. Therefore, it is necessary to use not only the attribute name but also the attribute value for calculating the evidence score. For this, it is necessary to acquire the attribute values by using various methods. For example, it is possible to use the dictionary beforehand. In addition, it is possible to judge negative attributes by applying the HITS algorithm. If an attribute n is negative, $AV(n)$ will become low.

The prototype system analyzes only the sentences that can be acquired by two Web search queries of a given term. In the Web search queries, the given term is used as it is. However, production area and class terms might have, a term referring to something such as a local specialty between them. An example is "Italian *special* cheese". Our system cannot analyze a sentence with such a form in order to calculate the evidence score. This problem can be solved by applying the method that Ohshima et al. proposed [9]. By applying their method, we can acquire the term set that comes between the production area and class terms. The evidence scores calculation can be improved by making a dictionary of such term sets and using it in the Web search.

Table 2: Analysis results for "orange"

Given term	Evidence score	Judgment result of system	Right or wrong judgment
Ehime orange	80.0	Brand name	Right
Oocho orange	68.4	Brand name	Right
Nishikai orange	59.3	Brand name	Right
Shindo orange	51.5	Brand name	Right
Soho orange	46.8	Brand name	Right
Kumamoto orange	43.5	Brand name	Right
Yamakita orange	37.3	Brand name	Right
Nagasaki orange	36.7	Brand name	Right
Shizuoka orange	31.6	Brand name	Right
Oshima orange	29.6	Brand name	Right
Karatsu orange	17.1	Brand name	Right
Wakayama orange	14.8	Brand name	Wrong
Kawachi orange	13.5	Brand name	Right
Nanki orange	11.7	Brand name	Right
Nichinan orange	9.2	Glorified term	Wrong
Kumano orange	8.9	Glorified term	Right
Yugawara orange	7.1	Glorified term	Wrong
Sase orange	5.8	Glorified term	Wrong
Misumi orange	3.7	Glorified term	Wrong
Oobou orange	2.3	Glorified term	Wrong
Hamanako orange	0.0	Glorified term	Right
Innoshima orange	0.0	Glorified term	Right
Tanabe orange	0.0	Glorified term	Right
Kagawa orange	0.0	Glorified term	Right
Tachibana orange	0.0	Glorified term	Right
Kinan orange	0.0	Glorified term	Wrong
Awa orange	0.0	Glorified term	Right

We leave the discovery of attribute values and the ranking as future tasks. To get an accurate value for a brand name, it is necessary to judge not only the appearance of attributes but also which one is best for comparing the attributes for evaluation. In addition, brand lists should be collected to improve the judgment accuracy of the evidence scores. Lastly we think that our method can be applied to not only restaurant information but also to Internet advertisements. For example, when users browse online shopping sites, the application system can provide them the judgement result of a product and a product list that has comparable value to a product.

7. RELATED WORK

There are many studies that try to measure a product's value from its reputation. However, whether consumers like a product or not is only one element that measures the product's value. On the other hand, our method considers a lot of attributes of a product.

Suzuki et al. proposed to use semi-supervised learning methods to classify evaluative expressions, that is, tuples of subjects, their attributes, and evaluative words [10]. They

indicate either favorable or unfavorable opinions towards a specific subject. If users consider reputation of a product as the product value, their method can be applied.

Dave et al. proposed a method for automatically distinguishing between positive and negative reviews [1]. Their classifier draws on information retrieval techniques for feature extraction and scoring, and the results for various metrics and heuristics vary depending on the testing situation. When operating on individual sentences collected from web searches, the performance is limited by noise and ambiguity. However, in the context of a complete web-based tool and aided by a simple method for grouping sentences into attributes, the results are qualitatively quite useful.

Kokkoras et al. proposed MOpiS, a multiple opinion summarization algorithm that generates improved summaries of product reviews by taking into consideration metadata information that usually accompanies the on-line review text [6].

Liu et al. proposed a framework for analyzing and comparing consumer opinions on competing products [7]. Their system could reveal the strengths and weaknesses of all products in the minds of consumers in terms of various product features.

Hu et al. proposed the Brag-and-Moan model to determine whether and how reputation reveals the true quality of the product [3]. They reported that the average score of reviews does not necessarily reveal the product's true quality. Therefore, they assumed that users would only choose to write reviews when they were very satisfied with the products they purchased (brag), or very disgruntled (moan). They discussed the implication of the model on marketing practices.

8. CONCLUSION

We proposed a method for automatically evaluating brand value on the Web. Our method consists of three steps. First, we find candidates of attributes for evaluation by using a Web search engine. Next, we discover useful attributes for evaluation by using a method based on the HITS algorithm. Finally, we evaluate the given term by using attributes of the class term.

We defined the concept of glorified terms by referring to the ideas of cognitive psychology. Usage of glorified terms is a problem that is often seen on information suppliers' websites. We implemented a prototype system that can make judgments about whether terms are glorified or not in relation to agricultural and livestock products. We evaluated the prototype, and its accuracy was 84.8% for "beef" and 74.1% for "orange."

9. ACKNOWLEDGMENTS

This work was supported in part by the following projects and institutions: Grants-in-Aid for Scientific Research (Nos. 18049041 and 18049073) from MEXT of Japan, a MEXT project entitled "Software Technologies for Search and Integration across Heterogeneous-Media Archives," a Kyoto University GCOE Program entitled "Informatics Education and Research for Knowledge-Circulating Society," and the National Institute of Information and Communications Technology.

10. REFERENCES

[1] K. Dave, S. Lawrence, and D. M. Pennock. Mining the peanut gallery: opinion extraction and semantic classification of product reviews. In *WWW '03: Proceedings of the twelfth international conference on World Wide Web*, pages 519–528. ACM Press, 2003.

[2] D. G. Goldstein and G. Gigerenzer. The recognition heuristic: How ignorance makes us smart. *in G. Gigerenzer, P.M. Todd, and the ABC Research Group, Simple Heuristics that make Us Smart*, pages 37–58, 1999.

[3] N. Hu, P. A. Pavlou, and J. Zhang. Can online reviews reveal a product's true quality?: empirical findings and analytical modeling of online word-of-mouth communication. In *EC '06: Proceedings of the 7th ACM conference on Electronic commerce*, pages 324–330, New York, NY, USA, 2006. ACM.

[4] J. M. Kleinberg. Authoritative sources in a hyperlinked environment. *Journal of the ACM*, 46(5):604–632, 1999.

[5] T. Kobayashi, H. Ohshima, S. Oyama, and K. Tanaka. Modeling and analyzing review information on the web focusing on credibility. In *SAC '09: Proceedings of the 2009 ACM symposium on Applied computing*, New York, NY, USA, March 2009 (to appear). ACM.

[6] F. Kokkoras, E. Lampridou, K. Ntonas, and I. Vlahavas. Mopis: A multiple opinion summarizer. In *SETN '08: Proceedings of the 5th Hellenic conference on Artificial Intelligence*, pages 110–122, Berlin, Heidelberg, 2008. Springer-Verlag.

[7] B. Liu, M. Hu, and J. Cheng. Opinion observer: analyzing and comparing opinions on the web. In *WWW '05: Proceedings of the 14th international conference on World Wide Web*, pages 342–351, New York, NY, USA, 2005. ACM Press.

[8] H. Ohshima, S. Oyama, and K. Tanaka. Searching coordinate terms with their context from the web. In K. Aberer, Z. Peng, E. A. Rundensteiner, Y. Zhang, and X. Li, editors, *WISE*, volume 4255 of *Lecture Notes in Computer Science*, pages 40–47. Springer, 2006.

[9] H. Ohshima and K. Tanaka. High-speed extraction of related terms by bi-directional syntax patterns from web search engines. *DBSJ Journal*, 7(3):1–6, December 2008 (in Japanese).

[10] Y. Suzuki, H. Takamura, and M. Okumura. Application of semi-supervised learning to evaluative expression classification. In *Proceedings of CICLing-06, the 7th international conference on Computational Linguistics and Intelligent Text Processing*, pages 502–513, Mexico City, MX, 2006.