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The extraction method of the service improvement information from Guests' review

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Abstract

The online hotel reservation service becomes so popular that the number of transactions has been growing year by year. Before making such reservation, travelers would find it important to refer other guests' opinions about accommodations. In those reviews, both dissatisfied and satisfied impressions used to appear in the same comments. In order to analyze this tendency, we employ text mining and investigate dissatisfied topic from their expressions. We propose some ways to extract useful information from guest review for accommodation's service improvement.

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1. Introduction

With the widespread use of the Internet, most of hotel room booking are made by on-line. User can make hotel reservation by many ways. When making hotel room reservation on-line, user needs to choose and reserve a hotel room by himself unlike using travel agency. To make hotel reservation convincing, feature information of hotel is important for users. On-line hotel room reservation sites usually give users criterion of which accommodation to choose. Guests' review is one of those criteria.

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Review by guests consists of their profile, numerical evaluation and impression, which reflects guests' innocent opinion. And such reviews are useful for those who look for hotel room [1]. Managers of accommodation also pay more and more attention for such reviews, because of growing impact of on-line reviews [2]. Today, many hotels are getting to know that such guests' reviews contain useful information for analyzing their reputation and improving their service. In order to improve their service quality, hotels are required to find their unconscious problems and clues for improvement upon those reviews. However, the postings of the impression comment for a popular hotel sums up to enormous number. Therefore, efficient information-acquisition approach is necessary for analysis. This paper examines how to extract the useful information for service improvement from the review and comments written by the Accommodation users

2. Evaluation information on accommodations

There are some previous researches about the approach of finding evaluation and the improving point from on-line guests' review [3-6]. Ouchi et al. carried out the questionnaire to accommodations, and studied the technique for accommodations evaluation. Based on that study, they showed the provision-of-information approach to the guest [7]. Moreover, Tsujii et al. proposed the approach of extracting the characteristic expression of affirmative evaluation and negative evaluation, from the impression comment of guests' review. Their proposal showed the approach to express the characteristic of area, and the characteristic of accommodations by corresponding characteristic expression and numerical evaluation criteria. And they showed that a characteristic expression is strongly focused by guests' interests on numerical evaluation criteria. Also, they showed that the partially negative evaluation expression appears on affirmative evaluation expression [8-9].

The evaluation expression which appears in the sentence of an impression comment is based on the guests' experience. The evaluation expression consists of the subjects and words of evaluation. The evaluation expression is classified into an affirmative evaluation and a negative evaluation. However, affirmative evaluation and negative evaluation may be simultaneously written in the same sentence. Those expressions are written when partial comments differ from the conclusion as a whole. We call this "evaluation polarity change representation." From this analysis, we may clarify the item which accommodations should improve preponderantly. These can be useful information which offers an item required in order to carry out a service improvement.

In this paper, we try to find characteristic words that are useful for service improvement, by extracting "evaluation polarity change representation" within a sentence, which means affirmative and negative expression coexist in the same sentence.

3. Evaluation expression for service improvement

In order to extract the information which is the objective of service improvement, we will look into the impression comment of guests' reviews. And we extract an improvement target predicate eye from an impression comment. Therefore, we examine the extraction method of the evaluation expression using the text of the impression comment which an Accommodation user posts.

3.1. Extraction of evaluation expression

When observing an impression comment by sentence, evaluation expressions may differ from top and bottom of the sentence as follows.

- (1) Although the room was so small, I was satisfied with the inexpensive accommodation fee.
- (2) Food was good, but too much.

In (1), negative evaluation is written to a part in the first, and affirmative evaluation is written in the

second. In (2), affirmative evaluation is in the first and the negative evaluation appears in the second. As the Japanese language usually put conclusions in the tail, the last half expression is more significant than the first. Compared with the evaluation expression of the second half, the first half expression is not so important. However, the evaluation expressions of the first half may be the characteristic evaluation criteria for drawing the conclusion of the second half. Moreover, the combination of the object of an evaluation expression and evaluation may differ as follows.

- (3) The room is small, but the atmosphere of the room is good. (The subject for evaluation is the same)
 (4) A bath is not so large, but satisfied with the spacious room. (The subject for evaluation is different)

(3) is the evaluation expression, but the first half and the second half made the room to be subject, and is comparing and evaluating the evaluation property of "width" and the "atmosphere" about the room. In this case, an Accommodation user compares and evaluates the room as subject, which means he considers the room to be important. At (4), the subject of evaluation differ in the first half and the second half. Evaluation of the first half is about the bath and evaluation of the second half is about the room. In this case, an Accommodation user is considered to evaluate the hotel by overall experience. Moreover, the combinations of these subjects diverse. Therefore, adjustment of the candidate by dictionary is necessary.

3.2. Registration of Dictionary

Since an impression comment is a text freely described by the hotel guest, content with the same semantics may be indicated by different expression. Therefore, we build a synonym dictionary and unify an expression. Next, we specify an evaluation expression, and in order to judge affirmative and negative polarity, we build an evaluation-expression dictionary. In this paper, we utilize the sorting approach of a reputation expression by Kobayashi et al. for the configuration of an evaluation expression [10]. Then, we constituted the evaluation expression into three, a candidate, a property, and evaluation, and used the sorting approach. Then, the <object> made it correspond with a numerical evaluation criteria in consideration of cooperation with numerical evaluation, we made the <property> correspond with detailed evaluation things, such as a "large bathroom" and a "bed", and <evaluation> classified actual evaluation. The numerical evaluation criteria are classified into eight subjects, "meal", "bath", "service", "purity", "facilities", "room", "location", and "charge" which are well used at hotel reservation sites. The example of an evaluation-expression dictionary is shown in Table 1. Based on these approaches, we analyze the dependency of an impression comment.

Table 1. The example of an evaluation-expression dictionary

Subject	Property	Category	Evaluation	Category	Evaluation polarity
Service	Service	noun	good	adjective	+
Food	Food menu	noun	delicious	adjective	+
Room	Room	noun	Large	adjective	+
Bath	Bath	noun	good	adjective	+
Purity	Purity	noun	good	adjective	+
Location	Environment	noun	good	adjective	+
Room	Room	noun	small	adjective	-
Price	Fee	noun	expensive	adjective	-
Bath	Bathtub	noun	Small	adjective	-
Food	Food menu	noun	not + eat	verb	-
Food	Food item	noun	less	adjective	-
Hotel	Building	noun	Old	adjective	-

3.3. Extraction of combination of evaluation

We extract the combination of a subject for evaluation and used text mining.

First, we analyze a morpheme and classify words. Based on these approaches, we analyze the dependency of an impression comment. The difference in an expression of a hotel guest was summarized using the synonym dictionary at the time of a sort. Next, we analyzed dependency and extracted the combination of a subject for evaluation and evaluation itself. We extract the dependency of the noun used as a subject for evaluation, adjective, adjective verb and verb which describe evaluation. We applied the evaluation-expression dictionary in order to analyze the combination of those dependencies, and distinguished the polarity of the evaluation expression.

In this paper, we give most attention to affirmative evaluations and negative evaluations which appears in the same sentence. And we extract the sentence which changes from affirmative evaluation to negative evaluation. We extract an evaluation expression from the impression comment to which the event in which the user experience was written. We can obtain the present condition of the service which the guest felt, by classifying an evaluation expression into an affirmative expression and a negative expression. By finding the sentence in which evaluation changes, we can list up the item which leads to conclusive affirmation evaluation and negative evaluation. We summarize these evaluation expressions and show the characteristic. This results in giving material for the service improvement to accommodations.

4. Extraction of sentence which guest's evaluation changes

We extract the evaluation expression which guest's evaluation changes explained in the previous chapters. We verified our assumption by evaluating the guests' review appeared in the Japanese travel reservation site called "Jalan.net¹". First, we extract sentences with an adversative conjunction in the impression comment of a Guests' review. And we made morphological and dependency analysis in the impression comment. We extract only the sentence in which an evaluation expression changes in the first half and the second half as a result of a dependency analysis. With the results of dependency analysis, we only extract sentences whose head and tail evaluation expression are different. Totalling these sentences, we analyze the characteristic. Then, we collect those sentences and fully examine their characteristics.

4.1. Extraction for improvement

In this section, we consider the relationship of numerical evaluation criteria and evaluation polarity. A numerical evaluation criterion is major part of Guests' review which reflects their objective opinion for some typical subjects. Although these numerical evaluations are important decision criteria, an impression comment is the independent from those evaluations. Then, we try to find relationship between the numerical evaluation criteria and the evaluation criteria extracted from the impression comment, and analyze them. We find an evaluation polarity changes representation from the evaluation related information in a sentence. We sum up the frequency of changes, which appears within a sentence, from negative to affirmative evaluation. The summarized result is shown in Table 2. In the same way, the result of the pattern which changed from the affirmative evaluation to the negative evaluation is shown in Table 3.

¹ <http://www.jalan.net/>

Table 2 Changes to affirmative evaluation from negative evaluation.

	Hotel+	Room+	Food+	Bath+	Service+	purity+	Location+	Charge+	Total
Hotel-		3	4		4	3	1		15
Room-	3	18	2	10	1	17	6	6	63
Food-		1	18	2	1	1			23
Bath-	3	1	1	16	1	3	3	1	29
Service-	4	1			3				8
purity-	1					1			2
Location-		3			3	2	10	1	19
Charge-	1	1		2	2			1	7
Total	12	28	25	30	15	27	20	9	166

Table 3 Changes to negative evaluation from affirmative evaluation.

	Hotel-	Room-	Food-	Bath-	Service-	purity-	Location-	Charge-	Total
Hotel+		3	1		2	2	1		9
Room+	3	7	3	1		2	3	1	20
Food+	1	1	20		1	1		1	25
Bath+		1	1	12	1	4			19
Service+		2	1	1	1	2			7
purity+	1	1		1					3
Location+	1	3		2		1	7	2	16
Charge+		1	1	1		1		1	5
Total	6	19	27	18	5	13	11	5	104

The front side shows the evaluation to the numerical evaluation criteria of the first half, N shows a negative evaluation and P shows the affirmative evaluation. And the front head shows the evaluation to the numerical evaluation criteria of the second half. The result of Table 2 and Table 3 shows that changes from negative to affirmative evaluation appear more frequently than changes from affirmative to negative evaluation. And most of changes are observed in the same numerical evaluation criteria.

In Table 2, there are many changes from negative to affirmative expression concerning the room condition. Most of hotel guests evaluate the room condition negative in the first half, but affirmative in the second half. In this case, hotel guests expressed dissatisfaction in the numerical evaluation criteria of the first half, when writing an impression comment. But they changed their mind to be satisfied with the numerical evaluation criteria of the second half. This can be interpreted that by changing the evaluation property of the first half, the overall satisfaction of a hotel guest will be improved more.

Table 3 shows the changes to negative from affirmation expression. Compared with Table 2, the frequency of changes appears less. Changes of the evaluation about the room, bath and foods appeared occasionally. In this case, although hotel guests showed satisfaction in the first half, the second half evaluation made them dissatisfied. By considering Japanese characteristics that conclusion often appears in the last part of sentences, it is serious problem that their dissatisfaction is observed in the second half of sentence. In other words, the negative evaluation in the first half in Table 2, and the negative evaluation of the second half in Table 3 are important improvement items. However, this results in only totaling evaluation of the numerical evaluation criteria of a major division, and a detailed improvement item may not be shown. Therefore, in order to investigate which part to improve, it is necessary to observe the evaluation property relevant to a subject for evaluation. Subject for evaluation is classified into an evaluation property, and an evaluation expression with high frequency of a negative evaluation is shown in Table 4.

Table 4 Evaluation expression of negative evaluation of high frequency

Subject-Property	frequency	Subject-Property	frequency
Hotel	12	Purity	8
building	8	clean	3
space	2	beautiful	3
parking space	2	smell	2
Room	71	Location	18
room	69	scenery	7
bed	2	Place	6
Food	21	station	5
food	8	Price	9
number of the dish	8	charge	3
meal	5	price	2
Bath	36	reasonable price	2
bath	23	fee	2
open-air bath	13	Total	186
Service	11		
reception	4		
check-in	3		
service	2		
manner	2		

4.2. Characteristic by difference in usage purpose

This section considers the difference coming from the purpose of hotel guest. A user's purposes for using hotel can be broken down into business and leisure. This leads to different observation points for those who use hotels. Therefore, we classify the result of Table 2 and Table 3 into the accommodations of business usage and leisure usage. The result of a summarization of the changes to affirmative from negative evaluation is shown in Table 5.

Table 5 Changes to affirmation expression from negative expression by accommodation type

business area									
	Hotel+	Room+	Food+	Bath+	Service+	purity+	Location+	Charge+	Total
Hotel-		2	1		3	2	1		9
Room-	1	12		6	1	14	4	6	44
Food-			3						3
Bath-	1	1	1	2		1			6
Service-	1				1				2
purity-						1			1
Location-		3			1	1	7	1	13
Charge-	1			1				1	3
Total	4	18	5	9	6	19	12	8	81

leisure area

	Hotel+	Room+	Food+	Bath+	Service+	purity+	Location+	Charge+	Total
Hotel-		1	3		1	1			6
Room-	2	6	2	4		3	2		19
Food-		1	15	2	1	1			20
Bath-	2			14	1	2	3	1	23
Service-	3	1			2				6
purity-	1								1
Location-					2	1	3		6
Charge-		1		1	2				4
Total	8	10	20	21	9	8	8	1	85

In the accommodations of business usage, changes of the evaluation expression concentrated on the room condition. For example, even the guest does not satisfied with the width of the room, the expression with higher evaluation for other components are observed. When using accommodations on business, hotel guests are mostly interested in the room condition. On the other hand, on leisure usage, the numerical evaluation criteria used as a subject for evaluation diversified. Changes of the evaluation expression were observed in the numerical evaluation criteria of facilities, room, bath, and foods. Another property in the same subject for evaluation was evaluated at that time. The result of a summarization of the changes from affirmative to negative evaluation is shown in Table 6.

Table 6 Changes to negative expression from affirmative expression by accommodations type.

business area

	Hotel-	Room-	Food-	Bath-	Service-	purity-	Location-	Charge-	Total
Hotel+		3				2	1		6
Room+	3	5					2	1	11
Food+			3					1	4
Bath+				3	1				4
Service+		2		1					3
purity+	1	1		1					3
Location+	1			2			5	2	10
Charge+		1				1		1	3
Total	5	12	3	7	1	3	8	5	44

leisure area

	Hotel-	Room-	Food-	Bath-	Service-	purity-	Location-	Charge-	Total
Hotel+			1		2				3
Room+		2	3	1		2	1		9
Food+	1	1	17		1	1			21
Bath+		1	1	9		4			15
Service+			1		1	2			4
purity+									
Location+		3				1	2		6
Charge+			1	1					2
Total	1	7	24	11	4	10	3		60

In the accommodations of business usage, changes of the evaluation expression concentrated on the room condition and location. On leisure usage, changes of the evaluation expression were observed in the numerical evaluation criteria of bath and foods. The subject for evaluations differs in the case of business and leisure. As already found in the result of table5, the evaluations change for different property took place in the same

subject.

On the other hand, few changes of the evaluation expression from which a subject for evaluation differs were observed in both business usage and leisure usage. From these results, when accommodations try to improve their services, it is shown that their improvement should be carried out according to the purpose of using accommodations. Moreover, accommodations should concentrate on the improvement of evaluation of the property from which the same subject for evaluation differs. It is difficult for accommodations to improve various subjects for evaluations by various aspects. They should concentrate on the improvement of most significant subject of evaluation, and they will efficiently reshape their weakness for the future guests.

5. Conclusion

In this paper, we presented the extraction method for the representation that evaluation polarity changes, that is, affirmative evaluation and negative evaluation coexist in the same sentence of the Guests' reviews about the hotel impression. As a result, when evaluation polarity change occurs, representation tends to remain for the same subject. And the subject of evaluation varies upon the purposes of using accommodations. By finding the dissatisfaction from the change of the evaluation expression, we classified the subject being helpful for service improvement. In the future, we will continue to study for increasing the efficiency in acquiring evaluation information, and we will examine the information presentation method for better accommodations' services.

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