AN ANALYSIS OF ONLINE REVIEWS ON ELECTRIC TOY ROBOTS

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ABSTRACT

Abstract—In recent years, research has advanced on the use of robots that effect healing through voice and touch capabilities. This study examines the customer ratings that were made on different electric toy robots in order to determine how to introduce such robots effectively in early childhood education in the future. The target of this study is the 12 types of robots with 20 or more customer reviews, which ranked within the top 100 selling electric toy robots on Amazon.co.jp as of January 2019. For each robot, not only the "rating level" judged by the customer reviewer but also his/her comment was considered. These comments were analyzed using text mining software.
Key Words: electric toy robot, evaluation, online review, text mining

1. Introduction

The healing effect of companion animals has been proved in previous studies. (Baun et al., 1984) The study clarifies that the effect of touching, greeting, and building a relationship between humans and animals leads to healing (Baun et al., 1984). However, because some people's allergic reactions and the cost of hygiene management for animals, the alternative of using robots has been studied (Celik, 2010)

In recent years, research has advanced on the use of robots that effect healing through voice and touch capabilities (Ohkura, 2004)

This study examines the customer ratings that were made on different electric toy robots in order to determine how to introduce such robots effectively in early childhood education in the future.

2. Methodology

The target of this study are 12 types of robots with 20 or more customer reviews, that ranked within the top 100 selling electric toy robots on Amazon.co.jp as of January 2019. They are shown in Figure 1.

Figure 1 – Robots used in this study. (Source: Amazon.co.jp <https://www.amazon.co.jp/>)

For each robot, not only the "rating level" (1 to 5) judged by the customer reviewer but also his/her comment was considered. These comments were analyzed using the text mining software "TRUSTIA / MiningAssistant" and "Text Mining Studio."

3. Results and Considerations

3.1 Reviewer rating level for each robot

First, as for the reviewer "rating level" for each robot, its numbers and average of rating are shown in Table 1.

Table 1 – Reviewer rating level for each robot.

Material	Num. of evaluations	(High←) Reviewer rating level (→Low)					Avg.	SD
		5	4	3	2	1		
1. Robot A	35	13	6	11	1	4	3.66	1.31
2. Robot B	68	37	21	2	4	4	4.22	1.14
3. Robot C	60	18	12	5	7	18	3.08	1.65
4. Robot D	68	29	24	3	6	6	3.94	1.27
5. Robot E	32	10	2	1	2	17	2.56	1.82
6. Robot F	70	16	16	7	13	18	2.99	1.54
7. Robot G	22	12	7	0	2	1	4.23	1.13
8. Robot H	24	10	5	1	1	7	3.42	1.71
9. Robot I	22	15	2	2	1	2	4.23	1.31
10. Robot J	23	10	1	4	2	6	3.30	1.68
11. Robot K	37	7	6	5	6	13	2.68	1.54
12. Robot L	41	23	7	4	3	4	4.02	1.35
Total	502	200	109	45	48	100	3.52	1.56

The "rating level" is expressed in five levels from 1 to 5, with 5 being the highest. According to the table, the average of reviewer rating ranges from 2.56 (Robot E) to 4.23 (Robots G and I), and the average of all 12 robots is 3.52. While there are 309 high ratings of 4 and 5, or 62% of total, the 100 lowest ratings of 1 account for 20% of total, which translates to 1/5 reviewers being dissatisfied.

3.2 Analysis of reviewers' comments

Next, reviewers' comments were analyzed. The top 50 nouns, adjectives and verbs and their frequency, as well as the top 50 word associations and the subject classification can be deduced by the software used in this research.

As an example, Table 2 shows the top 15 words and frequencies of nouns, adjectives, and verbs for Robots B and F which have the most and the 2nd most comments, respectively.

Table 2 – Top 15 words for Robots B and F.

	Noun				Adjective				Verb			
	Robot B		Robot F		Robot B		Robot F		Robot B		Robot F	
1	robot	30	voice	33	good (良い *yoi*)	15	good (良い *yoi*)	22	do	24	do	60
2	child	28	language	30	good (いい *ii*)	10	cute	17	rejoice	22	think	37
3	English	22	conversation	22	not	9	not	13	purchase	21	purchase	26
4	music	18	neck	16	good (よい *yoi*)	8	bad	11	think	20	become	24
5	remote controller	12	Robi jr.	13	happy	7	good (いい *ii*)	10	play	17	say	22
6	son	10	robot	13	cheap	7	cute	8	be	14	be	20
7	instructions	10	voice recognition	13	interesting	5	high	7	move	12	recognize	18
8	price	10	sound	12	fun	5	interesting	7	dance	10	chatter	16
9	present	10	monologue	10	unfortunate	5	good (よい *yoi*)	6	can	10	speak	16
10	charging	9	head	10	fond	5	many	6	enter	8	react	12
11	nephew	9	child	9	satisfied	4	fun	5	buy	7	talk	10
12	I	9	toy	9	terrific	4	promising	4	become	7	move	10
13	toy	9	price	8	bad	3	arbitrary	4	harmonize	6	broken	10
14	grandchild	8	eye	8	cool	3	unfortunate	4	understand	5	buy	9
15	birthday present	8	level	8	thankful	3	quiet	4	speak	5	use	8

For the most frequently rated Robots B and F, words related to language such as "English" for Robot B, and "language," "conversation" and "monologue" for Robot F are most frequently used nouns. In the case of adjectives, "good" is most used, and "interesting" and "enjoyable" are also frequently used for both robots. Moreover, it seems that while Robot B is considered a "cool" robot, Robot F is seen as a "cute" one. "Bad" is the 13th most used for Robot B, and the 4th most used for Robot F. As regards verbs, "dance" for Robot B and "recognize," "chatter" and "speak" for Robot F received high usage.

The results of the top 15 associations of "nouns and adjectives" and "nouns and verbs" respectively for Robots B and F are shown in Table 3. In the case of "nouns and

adjectives," Robot B is a "good" "educational toy," whose "operation method" is "intuitive" and "not difficult," and the "price" is "cheap."   Although Robot F, whose "voice" and "movement" are "cute," "performance" is "good," "price" is "cheap," is considered a "good" "robot," its "speech recognition" is "bad," which leads to "irrelevant" "response."

Table 3 – Top 15 word associations for Robots B and F.

	Noun－Adjective				Noun－Verb			
	Robot **B**		Robot **F**		Robot **B**		Robot **F**	
1	merchandise good (よい *yoi*)	2	voice cute	7	birthday present purchase	6	song sing	5
2	educational toys good (よい *yoi*)	2	voice good (よい *yoi*)	3	present purchase	5	present purchase	3
3	music cheap	2	performance good (よい *yoi*)	2	music harmonize	5	language chatter	3
4	music various	2	reaction good (よい *yoi*)	2	music stream	4	interlocutor become	3
5	operation method not difficult	2	reaction bad	2	child purchase	4	language speak	3
6	intuitive not difficult	2	voice high	2	nephew purchase	3	conversation not mesh	3
7	robot fond	2	support band	2	child rejoice	3	language recognize	3
8	procedure fun	2	what bad	2	song sing	3	talk do	3
9	design cool	2	reaction irrelevant	2	USB charging	3	answer do	2
10	operation easy	2	movement cute	2	son purchase	2	price rise	2
11	cost performance good (よい *yoi*)	1	voice recognition bad	2	nephew rejoice	2	KIROBO appear	2
12	concept good (よい *yoi*)	1	price cheap	2	remote controller operate	2	limbs move	2
13	glee good (よい *yoi*)	1	review many	2	music speak	2	neck move	2
14	nap happy	1	robot good (よい *yoi*)	1	box crush	2	language differ	2
15	child good (よい *yoi*)	1	Robi jr. good (よい *yoi*)	1	friend rejoice	2	voice not recognize	2

As for the associations of "nouns and verbs," Robot B's ability to "sing" a "song," and use "USB" "charging," "remote control" and "operation" attracted attention. Robot F can "move" "limbs" and "neck," and "sing" a "song." Although it can "speak" a "language" to "become" an "interlocutor," it may not "recognize" user's "voice," and its "conversation" may "not mesh."

Next, regarding the entire robot, the "rating levels" 4 and 5 are regarded as high rating group (HRG, 309 cases), 3 as middle rating group (MRG, 45 cases), and 1 and 2 as low rating (LRG, 148 cases), word occurrences in each group were examined. Tables 4 and 5 show the results of high and low ratings.

According to Table 4, as for the nouns, the 9th most frequently used word "sound" and the 12th, "battery" in the HRG, or, ratings, show up 3rd and 2nd in the LRG. In the LRG, "defective product" and "replacement" rank as the 12th, which do not appear at all in the HRG. Adjectives "good" and "cute" rank high in both groups, while "fun" and "interesting" can be seen only in the HRG. On the other hand, adjectives with negative nuances such as "regrettable," "noisy" and "worst," and verbs "broken" and "return" are used frequently in the LRG.

According to Table 5, if a robot's "voice" is "cute," or "reaction" is "good," or "movement" is "real," it is highly appreciated, while if its "motion" is "monotonous," or "sound" does not "come out," it is rated low. Even if the rating is high, that the "decrease" of "battery" is "fast" is pointed out.

Table 4 – Top 15 words for all robots

| | Noun | | | Adjective | | | Verb | | |
	High rating		Low rating		High rating		Low rating		High rating		Low rating	
1	child	111	child	37	good (良い *yoi*)	95	not	30	do	151	do	114
2	robot	48	battery	29	cute	52	regrettable	25	think	120	think	68
3	feeling	45	sound	29	good (いい *ii*)	37	good (良い *yoi*)	19	become	102	become	53
4	toy	43	Xmas present	28	good (よい *yoi*)	33	good (いい *ii*)	14	be	99	move	48
5	voice	42	voice	25	fun	30	high	13	purchase	79	be	41
6	movement	40	merchandise	24	interesting	26	bad	10	move	70	purchase	38
7	English	37	box	22	not	25	cute	10	play	67	say	36
8	music	37	language	20	cheap	20	cheap	7	rejoice	62	buy	33
9	sound	36	daughter	19	want	17	good (よい *yoi*)	7	buy	54	arrive	31
10	purchase	36	present	17	high	15	small	7	watch	47	broken	30
11	I	36	maker	17	many	14	many	7	enter	41	play	27
12	battery	35	defective product	16	small	14	clear	6	can	31	appear	19
13	button	31	replacement	16	fast	12	many	6	dance	31	replacement	16
14	language	31	instructions	15	fond	12	noisy	6	say	30	chatter	15
15	grandchild	30	first	15	bad	12	worst	5	push	26	return	13

Table 5 – Top 15 word associations for all robots.

| | Noun－Adjective | | | | | | Noun－Verb | | | | | |
	High rating			Low rating			High rating			Low rating		
1	voice	cute	7	sound	small	3	button	push	17	Xmas present	purchase	9
2	battery	fast	6	impression	good (よい *yoi*)	2	birthday present	purchase	13	sound	not come out	7
3	reaction	good (よい *yoi*)	6	performance	good (よい *yoi*)	2	present	purchase	11	box	crush	6
4	impression	good (よい *yoi*)	5	study	good (よい *yoi*)	2	song	sing	10	battery	replacement	5
5	shopping	good (よい *yoi*)	5	time	short	2	child	rejoice	8	defective product	arrive	5
6	merchandise	good (よい *yoi*)	5	daughter	pitiful	2	music	harmonize	8	Christmas use	purchase	3
7	movement	cute	4	review	many	2	child	purchase	7	child	play	3
8	child	good (よい *yoi*)	4	sound	same	2	grandchild	purchase	7	maker	inquire	3
9	movement	good (よい *yoi*)	3	appearance	cute	2	music	stream	7	child	rejoice	3
10	condition	good (よい *yoi*)	3	movement	cute	2	child	buy	6	Amazon	purchase	3
11	child	favorite	3	battery	new	2	sound	react	6	power source	put off	3
12	movement	real	3	shopping	high	2	voice	record	5	telephone	not connect	3
13	decrease	fast	3	child	favorite	2	Xmas present	purchase	4	grandchild	cry	3
14	robot	desiderative	3	what	bad	2	switch	push	4	button	push	3
15	cheek	red	3	movement	monotonous	2	I	push	4	one week	not do	3

The results of word associations of "nouns" and "adjectives, adverbs and verbs" in each group are shown in Figure 2. It can be seen that in both groups, many words co-occur with "think," "children" and "purchase." Moreover, in the case of the HRG, co-occurrence with "good" is also high; words such as "new," "function," "audio" and "price" co-occur with "good."
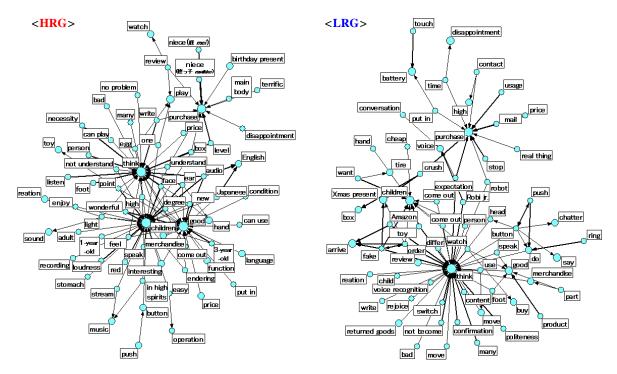

Figure 2 – Word associations in each group.

4. Conclusion

This study examines various evaluations made on electric toy robots by (adult) customers. In the future, it is planned to continue the study by having children use the robots and observe their actual reaction towards such toys.

5. References

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