

Research on Acquiring Emotional Experiences Based on Online Comments-A Case Study of Tents

Linpeng Zou^{1*}, Wei Yu¹

¹ School of Art Design and Media, East China University of Science and Technology, Shanghai, China

Email Address

772973340@qq.com (Linpeng Zou)

*Correspondence: 772973340@qq.com

Received: 2 July 2023; **Accepted:** 12 August 2023; **Published:** 18 September 2023

Abstract:

With the advancement of product development technologies, user experience has gradually become a crucial consideration for designers. As a result, various methods of affective engineering and user experience design have been employed to develop products that satisfy users' emotional experiences. Therefore, in the domain of affective engineering design methods, it is essential to understand how to capture design elements related to user emotional variables, which plays a significant role in product design. In this study, we propose a novel approach to extract emotional variables by analyzing online reviews, aiming to obtain insights into emotions associated with products. Specifically, we chose the top-selling tents on the Tmall marketplace as the experimental subject. Through our analysis, we identified four groups of emotional and functional lexicons. The research findings demonstrate that leveraging online reviews enables effective extraction and analysis of emotional experiences, thereby providing valuable support for subsequent product design processes.

Keywords:

Affective Engineering, Online Reviews, Affective Evaluation, Emotional Experience

1. Introduction

With the advancement of time and product development technologies, the issue of product homogenization has become increasingly apparent. Traditional differentiating indicators such as functional features, performance, and price are no longer sufficient for achieving product differentiation. Consequently, designers and engineers aspire to develop products that fulfill customers' emotional needs. The evaluation criteria for such products have shifted from objective attributes like functionality, size, and price towards more subjective and abstract expressions. This approach, which combines the analysis of human emotions with commercial technology, is known as "affective engineering" [1]. Since the inception of affective engineering, various products, especially automobiles and smartphones, have integrated its principles into different stages of the design process.

However, traditional affective engineering approaches face challenges due to their subjective nature and limited real-time feedback, making it difficult to meet the ever-growing demands for personalization [2]. To address this issue, researchers in affective engineering have conducted relevant studies. Initially, researchers used methods such as interviews, questionnaires [3], and literature reviews to gather user emotional variables. However, these methods are susceptible to subjective biases, gender differences, and cultural influences. Even when products have similar attributes, emotional variables can vary due to cultural disparities. Furthermore, literature reviews tend to provide concise vocabulary that may disconnect from everyday language.

Subsequently, researchers started incorporating physiological indicators such as brainwave signals [4] and eye-tracking signals [5] to capture more accurate user emotional variables [6]. However, these methods often produce objective information that users may not be aware of, leading to skepticism.

In the current era of online shopping, analyzing online reviews has gained significant attention among scholars. By examining online review data, researchers can gain insights into users' authentic needs, satisfaction levels, service quality, and consumer expectations [7]. This method of extracting user emotional variables from online reviews offers advantages over traditional approaches such as interviews, questionnaires, and literature reviews. It directly identifies the vocabulary used by users, ensuring that the chosen words for emotional evaluation do not cause any semantic confusion. Additionally, these words are easily understandable, facilitating evaluation and testing [8].

In the post-pandemic era, there has been a considerable increase in users' enthusiasm for nearby trips and self-driving camping adventures. Tents, serving as users' second "home" in outdoor settings, are no longer limited to professional outdoor enthusiasts. Therefore, the subjective evaluations of ordinary users hold significant relevance for tent design.

2. Related research

2.1. Affective Engineering

Affective Engineering, originated by Professor Mikiya Takagi at Hiroshima University in Japan, is a design approach that guides the design process by studying the relationship between users' affective impressions and product attributes. It transforms users' emotions and impressions into design elements. Professor Takagi identified four fundamental questions in the study of Affective Engineering: (1) How to understand consumers' emotional experiences of products from the perspective of affective evaluation? (2) How to identify design features from consumers' emotional experiences? (3) How to utilize Affective Engineering as a human-centered engineering technique? (4) How to adapt designs based on societal changes and individuals' preferences [9].

Affective Engineering finds extensive application in the field of design and has yielded numerous research achievements in various domains. Zhang et al. [10] applied Affective Engineering methods in furniture design and proposed an innovative design framework for furniture aesthetics based on users' affective responses to different structural elements. Chang et al. [11] employed Affective Engineering methods in the design of automotive steering wheels, constructing an emotional perception model

considering users' emotional preferences. Cucuk et al. [12] utilized Affective Engineering methods in desk design, determining product functionality and style based on users' subjective experiences.

The process of Affective Engineering is illustrated in Figure 1. In traditional Affective Engineering research, the common methods for collecting affective keywords are literature reviews and user interviews. Literature reviews extract relevant keywords from published papers and reports, providing highly reliable data that can be readily used without the need for data reconstruction. However, this method may not uncover new keywords, and the quantity of extracted keywords may be limited. User interviews, on the other hand, involve engaging target users in discussions to obtain affective keywords, offering in-depth insights into the genuine emotions of specific user groups. However, this method is limited by the number of interviewees and can be influenced by the interviewers' abilities.

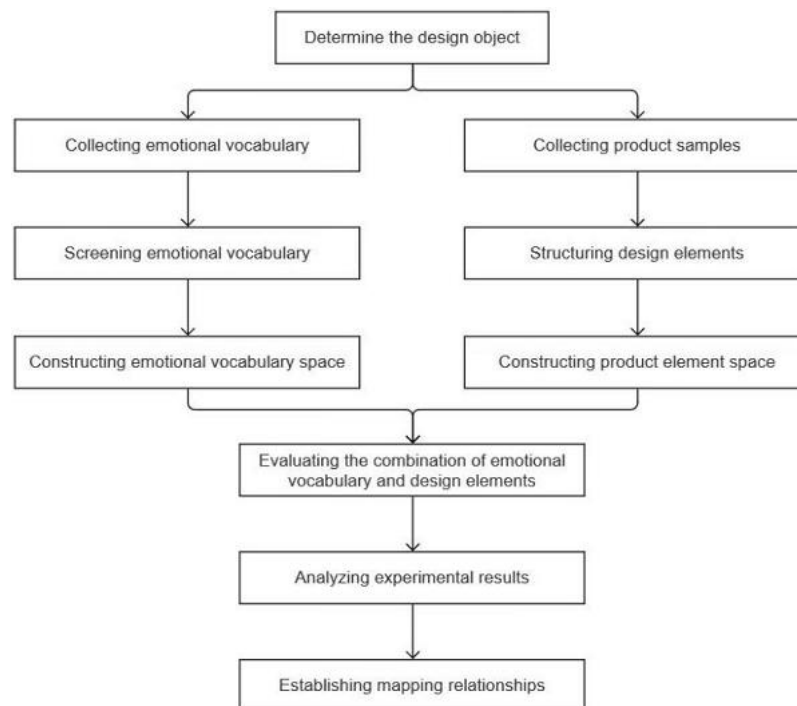


Figure 1. *Affective Engineering Process.*

The aforementioned limitations of traditional methods can be overcome by mining data from online reviews. With the rapid development of the Internet, users have various channels to express their opinions. Unlike traditional word-of-mouth communication, online reviews reach a wider audience, and users are more willing to share their experiences. Therefore, analyzing online reviews enables us to uncover users' latent needs and genuine perceptions of different products.

2.2. Online reviews

Online reviews, which are posted on company websites or third-party platforms, provide information related to the product as well as insights into the user's experience. In e-commerce platforms, users have the freedom to express their values and loyalty, making each valuable online review an effective user evaluation.

In the field of product design, user experience and emotional needs are increasingly valued by users. Many scholars have turned to online reviews to obtain affective

evaluations and support product design. Wang et al. [13] studied the relationship between preference scores and affective vocabulary based on user reviews from an online hotel information website. Decker and Trusov [14] developed a method for estimating product preferences based on online review data by improving the joint analysis of various attributes used to understand how people evaluate products or services. These studies further demonstrate that online reviews can be used to understand user emotions and gather product requirements.

3. Method

The overall process of this study is illustrated in Figure 2. Firstly, a suitable product is selected, and data collection is conducted. Using “tent” as the key term, the product with the highest number of reviews is chosen. The review data is then collected using data scraping software, such as Octoparse. Subsequently, the data is preprocessed (including deduplication, compression, and tokenization) and analyzed using RStudio. Finally, a set of usable affective vocabulary for product design is obtained.

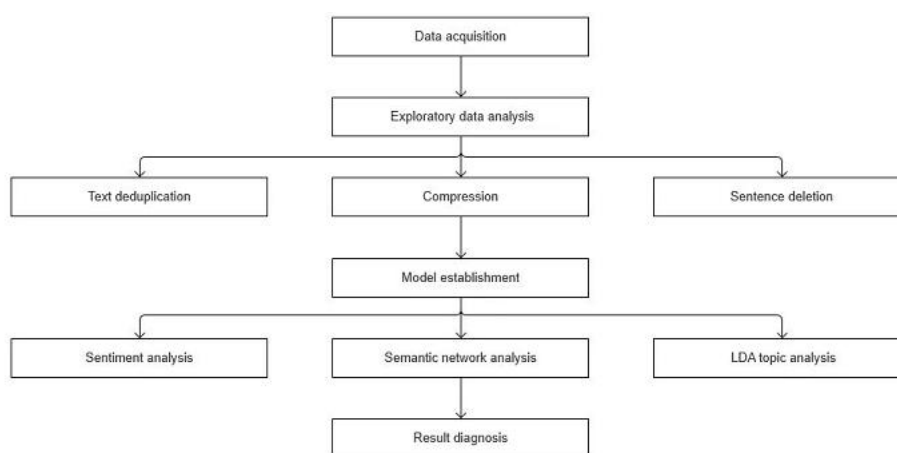


Figure 2. Research Process.

3.1. Product objectives and data sources

The purpose of this study is to extract affective vocabulary through mining online reviews, aiming to understand the emotions experienced by users when using a product and effectively incorporate affective engineering into product design. To achieve this, online reviews of tents were selected as the data source. Tents, being the users’ “second home” in outdoor settings, encompass various practical and emotional attributes.

Data collection for this study was conducted on the e-commerce website Tmall. After purchasing a product on Tmall, users have the freedom to express their experiences through product-related reviews, regardless of whether they are positive or negative. The primary data source for this study was the online reviews of the top-selling tents on Tmall. With the assistance of web scraping software, such as Octoparse, a total of 3,020 data entries were collected. After removing duplicate entries (100 records), a final dataset of 2,920 entries was obtained.

3.2. Data preprocessing

The data preprocessing of the Tmall online reviews was conducted through four steps, as shown in Figure 4: removal, tokenization, stop word filtering, and sentiment analysis. These four steps were completed using RStudio.

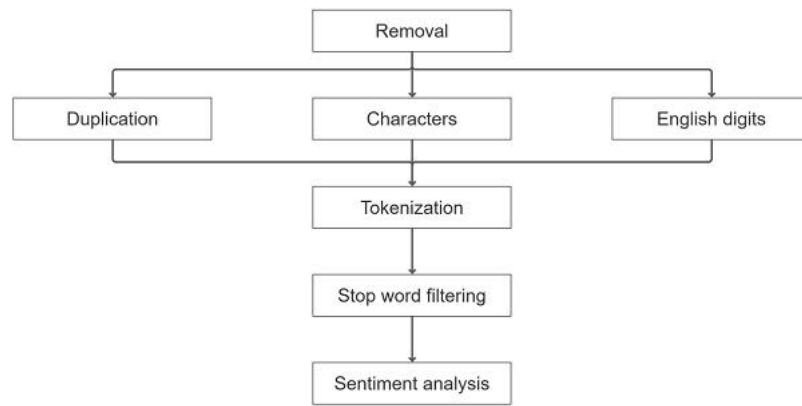


Figure 4. Data Preprocessing.

The “removal” step involved eliminating redundant content, characters, English words, numbers, and other irrelevant information that would not contribute to the data mining process. Failure to remove such content would have an impact on subsequent data analysis.

“Tokenization” is a crucial step in Chinese natural language processing. Unlike Western languages, Chinese words do not have clear boundaries or delimiters. Therefore, in Chinese text analysis, it is necessary to segment the text into meaningful word sequences. This segmentation serves as the foundation for further analysis and data processing. Resolving Chinese word segmentation is essential for effective data mining.

“Stop word filtering” is performed after tokenization, as it helps eliminate a large number of irrelevant and common words, such as “in,” “under,” “one,” and so on, which do not contribute much to the analysis and can be filtered out.

“Sentiment analysis” involves segmenting the reviews into categories based on positive sentiment, neutral sentiment, and negative sentiment. Statistical analysis is then conducted on each segment.

4. Analysis

4.1. Word Frequency Analysis of Online Tent Reviews

Frequency analysis was conducted based on the emotional vocabulary extracted from users’ online comments. A total of 84 groups of emotional vocabulary were summarized, as shown in Table 1. These emotional vocabulary include both the operational and functional aspects related to tents. Since the process of using a tent involves opening and storing it, emotional vocabulary related to the operation and functionality of tents are also included. From the table, it can be observed that the most frequently mentioned emotional term among the 84 groups is “convenient,” followed by “quality” and “good-looking”. “Portable”, “some drawbacks”, “well-known brand”, and “easy” are less frequently mentioned.

Table 1. Sentiment Words and Word Frequency.

Sentiment Words	Frequency	Sentiment Words	Frequency	Sentiment Words	Frequency	Sentiment Words	Frequency
Convenient	419	Experience	23	Value for Money	11	Spacious	8
Quality	151	Suitable	23	Breathabl	11	Five	7

				e		Stars	
Attractive	136	Enough	22	Ventilate d	11	Not Large	7
Satisfied	117	Spacious	21	Speed	11	Stuffy	7
Simple	106	Trustworth y	20	Essential	11	Reassuri ng	7
Worthy	78	Affordable	19	Convenie nt	11	Durable	7
Beautiful	78	Happy	17	High Aesthetic	11	Average	6
Good Review	61	Suitable	15	Automati c	10	Pleasant	6
Patience	43	Lightweig ht	14	Just Right	10	Thoughtf ul	6
Super	36	Great	14	Good Value for Money	10	User- friendly	6
Fast	36	Troubleso me	14	Attractiv e	10	Reasonab le	6
Cost- effectivene ss	33	Large	14	Perfect	10	Not Worth It	6
Sturdy	31	Problematic	13	Texture	9	High Aesthetic	6
Anticipati on	30	Comfortab le	13	Cute	9	Trash	6
Grateful	29	Sufficient	13	Impressi ve	9	Crowded	6
Useless	28	Cost- effective	13	Fresh	9	High Aesthetic Too	6
Practical	25	Effortful	12	Well	9	Assuranc e	5
Also Good	25	Quick	12	Discount	9	Convenie nt	5
Solid	24	Inexpensiv e	12	Defect	9	Well- known	5
Timely	23	In Place	12	Exquisite	8	Pros and Cons	5
Easy	23	Odor	11	Exactly Right	8	Portable	5

4.2. Sentiment Analysis of Tent Online Reviews

The methods for sentiment analysis mainly include lexicon analysis and machine learning. Machine learning relies on annotation and feature extraction, but it is difficult to extract commonalities. Therefore, this study primarily focuses on lexicon analysis for sentiment analysis of online comments. R packages such as “tidytext” and “Sentiment Analysis”, as well as Dalian University of Technology’s “Ontology-based Lexicon”, are used for the analysis. The main principle is to classify and assign values to words in the lexicon using R packages to calculate sentiment scores. A positive score indicates a higher probability of positive sentiment, a negative score indicates a more negative sentiment, and a score of 0 represents neutrality.

This study primarily analyzes positive sentiments (Table 2) and negative sentiments (Table 3). It can be observed that users express satisfaction by using words such as

"like," "very", and "beautiful." The main emotional expressions are related to the appearance and functionality of the tent. On the other hand, when users express dissatisfaction, they tend to use words like "poor", "garbage", and "troublesome", primarily related to product quality and usability.

Based on the compilation of emotional vocabulary, it can be concluded that users' emotional experiences when using a tent are expressed through positive emotional words such as "beautiful", "exquisite", "comfortable", and "portable". Negative emotional words such as "cheap", "poor", "troublesome", and "arduous" are also identified. By utilizing these corresponding emotional words in online comments, further text mining is conducted to identify positive emotional and functional vocabulary related to tents (Table 4), providing reference for future tent design.

Table 2. Positive Sentiments.

Sentiments Score	Online Reviews
71	Very good, love it, good value for money, love, love, love.
66	Double-door, four-window, four-sided ventilation, not stuffy, even in summer without opening, can enjoy refreshing breeze, big brand, quality is indeed different.
64	The tent I've been longing for has finally arrived. I really like it. The logistics is relatively fast. The tent is very beautiful, and it is relatively easy to set up.
63	The product quality is good. Received the goods quickly. It looks exactly the same as the picture. The starry sky design is very nice. The children like it very much.
61	It is very beautiful and just the way I like it. Looking forward to a new experience. Thanks to Sisi and Yixing for their patient service. Keep it up!
58	How good it is! It is really tall and of good quality. The design is scientific and reasonable. Opening and closing it is a breeze. The interior space of the tent is large enough.
56	It is really big, beautiful, and of good quality. Setting it up is also very easy. Customer service is also very prompt in handling issues. It's perfect.
55	The product is very fine and the details are really great. It can accommodate personal items, and even big brands can fit inside. The space is really large.
55	The product functions are great. It is convenient to open and fold. The material is also good, lightweight, practical, and satisfying.
54	The tent is lightweight, easy to set up and fold, the material is thick and of good quality, and the appearance is also good. The children like it. Xiaoxingchen provides good service. In short, I'm really happy.
54	I am honored to share my thoughts on this purchase experience. I have lost count of how many times I have bought things online. The items are cheap and of good quality.
53	The product functions are excellent. The tent is beautiful and has mesh windows on the top and all sides. The appearance and material are good. It's one of the best-looking tents I have seen.
50	The product functions are convenient to carry, and the installation is easy. The appearance and material are beautiful and generous. The brand's goods are indeed different and should withstand the test.
50	My friends and I all bought Camel tents. Let's compare. The colors are nice. I initially liked the starry sky version, but now it seems that the solid color looks better.
49	The product functions are convenient to operate and fold, and the appearance and material are good. The double-layer design is snug. The quality and charm of the brand are reflected in the details and service.
49	The quality is very good, it looks beautiful, thick, simple, and I'm really happy with this shopping experience. The brand's quality is really good, thumbs up!

47	I received the baby. I am a fan of your brand, whether it is your own products or recommended products. The quality, style, and workmanship of the items are all excellent.
47	It's great. It arrived the day before the May 1st holiday. We used it during the holiday. The child is happy, and I'm also happy.
46	The color is beautiful, and I really like it. However, if the sun is strong, it can get quite hot inside. It's orange, but I still like it. The ventilation effect is also very good.
46	Good, really good, very satisfied. The product quality is very good. The switch is simple to operate. The children love it. It's tall, atmospheric, and has a high cost-performance ratio.
45	The quality is good, recommended for purchase. The appearance is exquisite, thumbs up!
44	The product functions include windows and mosquito nets, which are quite good. The appearance and material are excellent. The space is spacious and the brand's quality is impressive.
44	Yixing's service is good. I really like it, and the baby likes it too.
43	The product is very good. I tried it once, and everyone said it's good. Very satisfied. Here, I give a thumbs up to Manni. The service is really in place. I finally got a satisfactory item.
43	Camel is a big brand, and the quality is good. The color is beautiful, and it is the style I like. The functionality is also powerful. It can accommodate a family of four.
43	The tent's color and quality are good. It is spacious and bright. I like it.
42	The product is really good, very convenient to set up, provides shade, and has a high aesthetic value. It is spacious enough. The only downside is that the delivery was slow due to the pandemic, and it took five days to arrive.
42	Very good, automatically opens, very convenient, and easy to store. The design is also nice. I love the starry sky top. I really like it.
41	The product is very good. It is essential for outdoor camping. In an instant, it brings happiness to going out to play. It has improved a lot.
41	The product functions are great. The opening and closing are easy, and the space is also good. The appearance and material of the starry sky version are very satisfying. The product quality is good, and the brand is reliable. The customer service of Beibei is also good.
41	I am quite satisfied with the product. The interior space is quite large, just like a 1.8-meter bed. What I'm not satisfied with is the frequent price changes by the seller.
46	The color is beautiful, and I really like it. However, if the sun is strong, it can get quite hot inside. It's orange, but I still like it. The ventilation effect is also very good.

Table 3. *Negative Sentiments.*

Sentiments Score	Online Reviews
-16	A bit thin with a smell. I opened it and left it for a week, but when I went inside, I got a headache.
-15	Used it once and it was terrible. I'm heartbroken.
-14	They claimed it was the lowest price, but when I looked again, it was discounted. They deceived me, and the quality is just average.
-13	The smell is too strong. Even children dare not go inside.
-13	The appearance and material are ordinary. It's not sunproof, and the quality is average. The waterproof material doesn't even include windproof pegs. When I took it out, it was impossible to use.
-12	When I bought it, the picture showed a sunproof symbol. I didn't check the model description, so I thought it was sunproof. But the product I received is not

	sunproof at all.
-11	I've always wanted to buy a tent. I spent a long time choosing and decided to buy the "Luolu" brand. After receiving the product, my child couldn't wait, so I opened it in the living room at home.
-11	This store is garbage. I ordered from their flagship store, but they didn't deliver the goods. Contact them and choose another store's products.
-11	The workmanship is rough. The zipper is sewn shut and cannot be used. It's also troublesome to open, and it easily gets folded. It seriously disappoints the expectations and trust of a "Camel" fan.
-10	The pegs for the lightweight tent are too thin. I had to prepare thicker pegs myself. The storage bag is a bit small, and it's a bit difficult to pack it back in.
-9	The space when opened is relatively large and can accommodate a person. It's convenient to open, but a bit inconvenient to store. There's a slight smell.
-9	The product functions are very simple, but for short girls, it's a bit difficult to pack the tent.
-8	The color is completely different from the picture. I'm speechless. Returning such a big item is also troublesome.
-8	The top of the inner layer is mesh, so it can only be used in summer. I guess it will be freezing in spring and autumn.
-7	It's easy to set up, but difficult to pack. I wanted to put it in the bag, but it's impossible. You need a man to help. I don't recommend it for those who have to manage with a child alone.
-7	It's relatively thick and easy to unfold, but it's a bit troublesome to pack it back into the bag.
-7	Many of our company's team-building activities buy from this store. But after buying, the price dropped by dozens. It deceives customers, what price difference?
-6	The bag is a bit small, and it's always troublesome to pack it every time.
-6	The size is suitable, and the quality is good. It's easy to assemble and disassemble. It's useful, but the sides cannot be fully opened, so it's not breathable.
-6	I watched the live stream and bought the sunproof military green color, but the delivered product is orange. It's very glaring under the sun.
-6	It was really difficult to pack it back up.
-5	It's pretty good, convenient to open and easy to store. The only problem is that the bag for the tent is small and it's hard to fit it back in. The quality of the bag is also average.
-5	The color in the picture is white, but the actual color is beige. I thought it would be suitable, but it attracts a lot of bugs. When I close the door, the small window on top doesn't allow air to pass through. It gets stuffy and uncomfortable.
-5	It's too hot. I think there should be more openings to let the heat out. It gets really hot inside.
-5	The tent is very convenient. It's easy to open and can be compressed down like a fitness arm exerciser.
-5	I bought the item, but the tent pegs were missing. They confirmed and said they would send them to me, but it's been half a month, and they still haven't shipped them. Now they're delaying without giving a specific shipping time.
-5	It's easy to open and convenient to store. It's spacious enough for two adults and doesn't feel cramped.
-5	It's a bit thin, and the so-called windows on both sides are just decorative. Let's just say, in Guangzhou, it can only be used on clear autumn days. It can't be used in rainy winters; it's too cold and gets wet.
-4	It gets stuffy and hot during summer camping.
-4	It's too big and difficult to store. Once it's opened, it's impossible to fit it back into the bag.

Table 4. *Summary Words.*

Dimension	Emotion Words	Functional Words
Appearance	Beautiful, upscale, lovely, sturdy	Various colors, fine craftsmanship
Function	Convenient, easy, technological, advanced	Ventilated, insect-proof, foldable, automatic, waterproof, moisture-proof, sun-proof
Fabric	Skin-friendly, comfortable	Thick, odorless, colorfast
Usage	Seamless, quick, convenient	Automatic, spacious, easy storage

5. Conclusions

The purpose of this study is to extract emotional experiences through mining online comments for application in affective design. In this study, online comments were obtained using the Octopus web crawler from the Tmall platform, specifically targeting the best-selling tent. The collected data was then analyzed using various packages in RStudio.

The main findings of this study are as follows: Firstly, the primary emotional variable identified by users when using the tent is “convenience”. Secondly, sentiment analysis was conducted on the online comments to identify positive and negative emotions expressed by users, along with their corresponding high-frequency vocabulary. Finally, a vocabulary compilation was performed based on four dimensions: “appearance”, “functionality”, “fabric”, and “usage”. It was confirmed that all four aspects significantly impact users' emotions when using a tent. Therefore, mining user emotional experiences through online comments is effective and can provide support for future product design.

It is important to note that there are different types of e-commerce platforms and tent varieties available. This study focused only on the comments related to one type of tent on the Tmall platform. Thus, further research is necessary to understand users' emotional experiences when using different types of tents on various e-commerce platforms. Additionally, the issue of fake reviews on e-commerce platforms is an important factor that can influence research outcomes. Therefore, future studies should consider addressing these issues in their investigations.

Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this article.

Funding

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

References

- [1] Li, Y. Design New Concept_Sensory Engineering. *New Art*, 2003, (4), 20-25.
- [2] Liu, Z.; Xie, Q.; Li, S., et al. User Needs Matching Based on Latent Semantic Analysis and Sensory Engineering. *Journal of Zhejiang University (Engineering Science Edition)*, 2016, 50(2), 224-233.

- [3] Zhu, S.; Luo, S.; Zhao, J. Study on the Scale of Styling Image of Numerical Control Machine Tools Based on Ergonomics. *Journal of Computer-Aided Design & Graphics*, 2000, (11), 873-875.
- [4] Yang, C.; Chen, C.; Tang, Z. Research on Product Image Inference Model Based on Electroencephalography. *Journal of Mechanical Engineering*, 2018, 54(23), 126-136.
- [5] Su, J.; Qiu, K.; Zhang, S., et al. Evaluation Method for Product Styling Design Elements Based on Eye Movement Data. *Machinery Design*, 2017, 34(10), 124-128.
- [6] Ding, M.; Cheng, Y.; Huang, X., et al. Research Status and Progress of Sensory Engineering Design Methods. *Machinery Design*, 2020, 37(1), 121-127.
- [7] Shi, X.; Liang, X.; Sun, X. Research on Evaluator Utility Mechanism Based on Online Ratings and Reviews. *China Management Science*, 2016, 24(5), 149-157.
- [8] Kim, W.; Ko, T.; Rhiu, I. Mining Affective Experience for a Kansei Design Study on a Recliner. Elsevier BV: 145-153.
- [9] Nagamachi, M. Kansei Engineering: A new ergonomic consumer-oriented technology for product development. Elsevier BV, (1), 3-11.
- [10] Zhang, Z.; Huang, K. Research on Innovative Design of Furniture Styling Based on Kansei Engineering. *Journal of Central South University of Forestry & Technology*, 2012, 32(11), 195-199.
- [11] Chang, Y.-M.; Chen, C.-W. Kansei Assessment of the Constituent Elements and the Overall Interrelations in Car Steering Wheel Design. Elsevier BV: 97-105.
- [12] Rosyidi, C.-N.; Susmartini, S.; Pratama, S.-A., et al. Mismatch Analysis of Elementary School Desk and Chair Using Monte Carlo Simulation. Trans Tech Publications, Ltd.: 323-327.
- [13] Wang, H.; Lu, Y.; Zhai, C. Latent Aspect Rating Analysis on Review Text Data. In Proceedings of the ACM Press, New York, New York, USA: ACM Press.
- [14] Decker, R.; Trusov, M. Estimating Aggregate Consumer Preferences from Online Product Reviews. Elsevier BV.



© 2023 by the author(s); licensee International Technology and Science Publications (ITS), this work for open access publication is under the Creative Commons Attribution International License (CC BY 4.0). (<http://creativecommons.org/licenses/by/4.0/>)