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Title	デザイン特徴と感情反応を用いた工芸製品の感情デザイン研究：中国電子市場プラットフォームにおける上位売上げ陶器製ティーポットを用いた探求
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Abstract

With the increasing emphasis on emotional design in product development, understanding how design features elicit specific emotional responses has become important for designers to create products that are popular among consumers. This dissertation focuses on the research on the emotional design of craft products. Taking the ceramic teapot in a Chinese e-commerce platform, a typical representative of craft products, as an example, it explores the relationship between the design features of craft products and emotional responses. To achieve this aim, the dissertation sets the following main research question (MRQ): How is emotional craft design produced based on the relationship between design features and emotional responses of ceramic teapots? For MRQ, the dissertation sets three sub-research questions: SRQ1: Which design features of ceramic teapots are associated with users' perceived impressions? SRQ2: How is the emotional quality of ceramic teapots evaluated? SRQ3: Based on images and online reviews, how do design features of ceramic teapots influence consumers' emotional responses?

The dissertation first addresses SRQ1 by decomposing teapot forms into morphological elements (body, lid, handle, spout) and encoding them as analyzable variables using morphological analysis. Perceived adjectives collected via surveys were reduced through factor analysis, revealing three higher-order impression factors—elegance, fashion, and practicality—that explain over 70% of the variance in consumer evaluations. Multiple regression with dummy variables then maps specific contour types and component configurations to these perceived factors, identifying positive and negative design elements for each emotional orientation.

To answer SRQ2, the dissertation constructs emotion quality classification models using facial emotion recognition data (Face Reader 9.1) and Self-Assessment Manikin (SAM) valence ratings collected from 60 participants viewing teapot images. After data preprocessing, four classifiers—logistic regression (LR), C5.0 decision tree (DT C5.0), random forest (RF), and neural network (NN)—are trained for binary, ternary, and quinary valence classification. The random forest model achieves the best performance (up to 91.0% accuracy in binary and 81.3% in ternary classification) and is selected as the core evaluation tool. The model is externally validated with a new experiment on three newly designed teapots (elegant, fashionable, and practical) whose forms are derived from the earlier feature–emotion mapping. Results show a marked increase in

positive valence compared with the original samples, supporting the generalizability of the proposed workflow.

Addressing SRQ3, the dissertation further extends the research from the laboratory to the e-commerce scenario, conducting text mining (such as word frequency and clustering) on 1,316 valid pieces of online reviews of the same batch of teapots, and using generalized linear mixed models (GLMM) and generalized estimating equations (GEE) to analyze and compares review-based emotional responses with emotional questionnaires-based emotional responses, thereby identifying the design features most likely to elicit emotional responses and assessing which features influence emotions both two contexts. Through analysis, specific design features of ceramic teapots, such as form, decoration, and usability-related attributes, have been identified as contributing to emotional satisfaction or dissatisfaction in the e-commerce environment. This analysis highlights design risk points where differences in emotional responses in online reviews-based and emotional questionnaires-based emotional responses, and translates them into specific design decisions.

The dissertation provides an empirical mapping relationship between the design feature of craft products and multi-level emotional responses, enriching the fields of emotional design and knowledge science. Furthermore, a replicable data-driven evaluation process is proposed that integrates semantic evaluation, morphological encoding, facial emotion recognition, machine learning, and text analysis to answer the main research question (MRQ) of this study. At a practical level, this study provides operational design guidance and evaluation tools for the design of ceramic teapots and other craft products. It provides a decision-making basis for designers to create craft products with market sales potential, thereby promoting the development of craft product design.

keywords: Emotional craft design, Design features of ceramic teapot, Emotional response, Facial emotion recognition, Text analysis