

# A Study on Visual Innovation of Macau Souvenirs Packaging in the Context of Multicultural Communication

Yue Zheng\*, Xianlu Li, Caiyu Zhang, and Xuan Wang

Guangdong Technology College, Zhaoqing 526000, China

**Abstract:** This paper takes Macau souvenir packaging as the research object and explores the visual innovation of Macau souvenir packaging and its significance in cultural communication from the perspective of multicultural communication. The paper first introduces the background of Macau's multiculturalism and the cultural value of Macau souvenir packaging, followed by an analysis of the impact and driving role of multicultural communication on the visual innovation of Macau souvenir packaging. The visual innovation of Macau souvenir packaging is analyzed from aspects such as patterns, colors, and design elements, using AI algorithms for validation and conducting visual innovation design for souvenir packaging. This paper provides valuable insights and references for the design and development of Macau souvenir packaging, contributing to the promotion of Macau souvenir packaging in cultural communication and the tourism industry.

## 1 Introduction

Macau is a city that concentrates the cultural traditions and characteristics of both Chinese and Western cultures. As a Special Administrative Region in southern China, Macau's tourism industry is one of the most important economic pillars of the region. With the advancement of the Greater Bay Area construction in China, Macau's tourism industry is playing an increasingly important role and position. Macau not only has a rich historical culture and diverse tourism experiences but is also a unique and charming tourist destination, attracting more and more tourists to travel and consume.

The development of Macau's souvenir food industry has become one of the most representative and advantageous industries in the region due to the growth of the tourism industry. Macau's souvenir foods not only have unique flavors and quality but also serve as an important carrier for the inheritance of Macau's culture, representing its history and culture. However, behind these industries, the packaging design and brand image of souvenirs also play a crucial role[1]. They can not only enhance the recognition and acceptance of Macau tourism and souvenir foods among regional consumers but also promote consumption upgrades and cultural exchanges within the region [2]. Therefore, the connection between Macau souvenirs and the tourism industry is inseparable, and the inheritance and development of Macau souvenirs are an indispensable part of Macau's tourism industry.

## 2 Overview of Macau's Multiculturalism

Macau is a multicultural city that, due to its history, geography, and politics, has absorbed cultural elements from different regions and ethnic groups, forming a unique and diverse cultural landscape. In Macau, you can see European-style architecture from the Portuguese colonial period, such as Portuguese-style churches, castles, and squares, which reflect the influence of Portuguese culture on Macau. At the same time, you can also see many Chinese-style buildings, such as A-Ma Temple, Lou Kau Mansion, and Na Tcha Temple, which incorporate the essence of both Chinese and Western cultures, showcasing Macau's unique cultural charm.

In addition to architecture, Macau's culinary culture is also diverse. In Macau, you can taste cuisines from Portugal, China, Indonesia, and other regions. For example, Portuguese egg tarts and Portuguese-style chicken rice are famous Macau dishes, while Cantonese cuisine and Macau's unique blend of Portuguese-Chinese dishes also attract many tourists.

Furthermore, Macau boasts a wealth of cultural events and festivals, such as the Macau Grand Prix, the Drunken Dragon and Lion Dance Festival, and the Procession of Our Lady of Fatima. These events showcase the charm of Macau's multiculturalism and attract tourists from all over the world.

\* Corresponding author: [zhengyue@gdlgxy.edu.cn](mailto:zhengyue@gdlgxy.edu.cn)

### 3 Mutual Promotion of Macau's Tourism and Food Industries

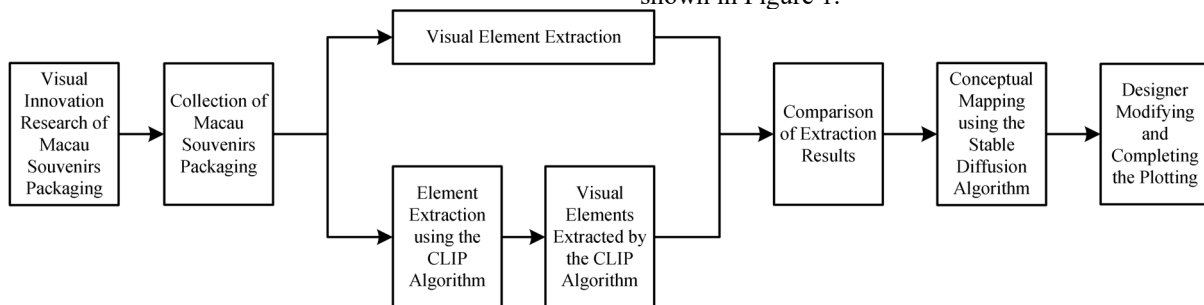
Macau is a vibrant and culturally appealing tourist destination with numerous historical and cultural attractions and is well-known for its unique souvenir foods [3]. Macau's souvenir food offerings are diverse, including famous Portuguese egg tarts, almond cookies, and beef jerky, among others. These delicacies have attracted countless tourists to come and taste.

At the same time, Macau's tourism industry has also promoted the development of the local souvenir food industry. As more and more tourists flock to Macau, the souvenir food industry has experienced significant growth, constantly innovating and improving. To meet the demands of tourists, local souvenir food manufacturers are continuously developing new varieties and flavors of souvenir foods to attract more tourists to purchase and taste [4]. It can be said that Macau's tourism and souvenir food industries have formed a

mutually beneficial interactive relationship. The development of the tourism industry drives the development of the souvenir food industry, while the innovation of the souvenir food industry attracts more tourists to visit Macau. This interactive relationship not only promotes local economic development but also enriches the tourists' travel experience [5].

### 4 Methodology

Under the backdrop of multicultural communication, Macau souvenirs, as a type of food product that blends unique cultural essence and regional characteristics, are widely appreciated by tourists and local residents alike. In this context, the importance of exploring visual innovation in the design of Macau souvenirs becomes increasingly prominent [6]. Based on this, the present study combines traditional methods with AI algorithms to develop an innovative visual design process, which is shown in Figure 1.



**Fig. 1.** Flowchart of visual innovation research of Macau souvenir packaging.

First, we collect and study Macau souvenir food packaging, extracting visual elements such as color, texture, shape, pattern, and so on. Then, we upload the collected souvenir food packaging images to an artificial intelligence platform, using image recognition technology to extract content and elements from the images, such as text, graphics, products, etc.

We correlate and compare the visual elements observed by the human eye and the extraction results from artificial intelligence to identify commonalities and differences between them. We then categorize and organize these findings into a collection of keywords. Next, we input these keywords into an AI design platform, employing AI algorithms to create a series of brand-new Macau souvenir food packaging design proposals. Designers then modify, optimize, and innovate based on these AI-generated design proposals to produce the final souvenir food packaging products.

This process can be iteratively and continuously optimized to achieve better design outcomes and market feedback. By utilizing artificial intelligence technology to extract content and elements from images, we can more quickly and accurately analyze and extract key information. This helps designers better understand consumer needs and trends, ultimately improving design efficiency and quality.

### 5 Diverse Visual Symbols of Macau

The diverse culture of Macau is extensively embodied in the design of souvenir packaging. By integrating Macau's unique architectural features, festivals, events, and folk elements into the packaging, the cultural value and regional brand image of the souvenir products are not only elevated, but consumer attention is also attracted, thereby promoting the dissemination of urban culture. The analysis of packaging with iconic features analyzed in this paper is shown in Table 1.

**Table 1.** Setting Word's margins.

Souvenir Brands	Produces	Innovation Visual Elements
PASTELARIA YENG KEE	Snoopy Almond Cake	Macau Tower
PASTELARIA YENG KEE	Snoopy Original Caramel Candy	Macau Grand Prix Circuit
KOI KEI BAKERY	Portuguese Cashew Cookie	The Ruins of St. Paul's in Macau
KOI KEI BAKERY	Black Sesame Peanut Crispy Candy	Largo do Senado

KOI KEI BAKERY	Peanut Crispy Candy	Na Tcha Temple
PALAEIO LISBOA	Almond Cookie	Hotel Lisboa Macau
PASTELARIA CHUI HEONG	Almond Cake	Vintage advertisement font

### 5.1 Macau's Iconic Color

The colors of the Macau Special Administrative Region flag are green and gold. These two colors carry symbolic meanings and market value in business, which can help brands establish stronger market competitiveness and brand culture while attracting more consumers and tourists, contributing to economic development [7]. Simultaneously, using the colors of the Macau flag for product packaging makes the products more prominent and easily recognizable in the market, helping to draw consumers' attention. Moreover, as Macau is a well-known tourist destination and gaming hub, utilizing the colors of the Macau flag can enhance brand awareness and recognition, strengthening the brand's market competitiveness [8], as shown in Figure 2(1).

### 5.2 Portuguese Charm

Macau is a place with a long history and rich culture, which includes the influence of Portuguese culture. In Macau's packaging design, many visual symbols related to Portuguese culture can be seen, such as Portuguese-style architecture, patterns, and color schemes.

The Portuguese color scheme has an international appeal, and using these colors can better attract the international market, expanding the product's sales channels and scope. Its unique color system can endow products with a distinctive image and characteristics, helping brands establish a unique image and style that sets them apart from competitors. For example, the Macau Portuguese egg tart flavored chocolate launched by the Feitoria do Cacao brand, as shown in Figure 2(2), breaks away from the conventional brownish-yellow impression of egg tart products. Instead, it features blue and white Portuguese-style tiles as the main image, and the internal food also adopts the shape of Portuguese-style tiles. This design better reflects Macau's cultural characteristics, showcasing its rich history and cultural heritage, and helps consumers better understand and recognize Macau.

### 5.3 Folk Elements

Macau is a part of China, and thus, many Chinese folk elements can be seen in Macau's packaging design, such as traditional Chinese patterns and color schemes featuring Chinese elements. For example, the Macau Koi Kei Bakery peanut candy series packaging, as shown in Figure 2(3), features a comprehensive scene depicting the old-time streetside sale of peanut candies and incorporates the Na Tcha Temple, a popular tourist

attraction in Macau. The Macau Lei Loi Bakery almond cake packaging, as shown in Figure 2(4), employs the outline drawing technique, combining the image of the Lei Loi Bakery store with the Ruins of St. Paul's and incorporating the store's specialty food products into the illustration, effectively promoting the brand and attracting customers to purchase [9].



Fig. 2. Macau souvenir packaging cases.

## 6 Visual innovation using artificial intelligence drawing

To verify the elements extracted from Macau souvenir food packaging as mentioned earlier, this study employs the CLIP (Contrastive Language-Image Pre-training) model for element extraction in Macau souvenir food packaging [10]. CLIP is a multimodal model based on contrastive learning, which is a pre-training method or model based on contrasting text-image pairs. In this model, the Text Encoder part uses a text transformer, while the Image Encoder part employs ResNet50 as the foundation for fine-tuning [11]. This approach enriches the categories recognizable by the model, including Portuguese and Chinese architectural design elements as well as relevant cultural symbols and more.

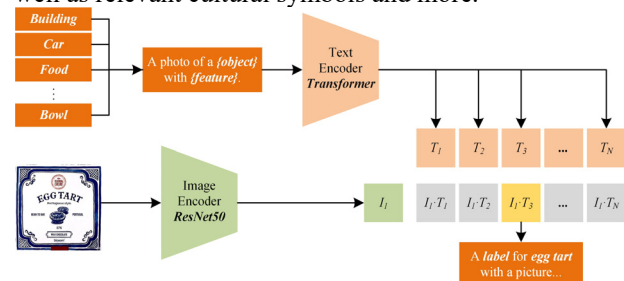


Fig. 3. Flowchart of data for extracting image design elements using CLIP model.

### 6.1 Design element extraction

After deploying the CLIP model, the output threshold is set to output at least 40 words. The selected souvenir packaging images are extracted sequentially. As shown in Figure 3, the extracted content of the souvenir packaging includes: a label for egg tart with a picture of a bowl of eggs on it and a blue ribbon around the bottom of the label, and a red ribbon around the bottom of the label, Art & Language, official art, Azulejo, an illustration of, modern European ink painting.

The CLIP model can reproduce the content of the image well, even accurately pointing out the use of Portuguese tiles - Azulejo. Subsequently, the extracted elements are refined and the statistical results are as follows: The most frequent vocabulary: Internationalist style, which is mentioned in 56% of the souvenir

packaging. This is followed by elements with local characteristics in the packaging, with 44% using Macau architecture, 28% using Portuguese design elements, and 24% using Chinese elements, for details, see Table 2. From this, it can be concluded that Macau souvenir packaging mainly starts from a modern style, with a high proportion of elements such as Macau architecture and Portuguese style. Iconic Macau buildings, such as the Ruins of St. Paul and Macau Tower, are often reused, and iconic buildings and figures are often combined. Most of the packaging is designed according to a formula: food name + food image + Macau elements, which is consistent with the previous analysis.

**Table 2.** Statistical table of Macau souvenir packaging design elements.

High-Frequency Words	Percentage	Common Combinations	Corresponding Colors
Internationalism Style	56	-	-
Macau Architecture	44	Characters, Multi-Language	-
Modern Illustration	36	-	-
Portuguese Design	28	Tiles, Regular Shapes	Blue and White
Chinese Elements	24	Chinese Architecture, Line Drawing Style	Red

### 6.2 Design with guidance

Under the guidance of relevant design elements, this study utilizes the Stable Diffusion model as an efficient design inspiration extractor [12]. With the prompt [Cake label with image of moon cake on top, Portuguese style ceramic tile in the middle, art and language, official art, illustrations of modern European ink painting, Internationalist style, Portuguese design elements], a large number of images were generated. Among the generated images, visually innovative ones were selected for detailed depiction. Figure 4(1) is the concept map directly generated by Stable Diffusion, and Figure 4(2) is the result of the author's secondary processing based on Figure 4(1).

The main color scheme of the image is blue and white, and the primary design style comes from Macau's unique Portuguese-style ceramic tiles. These patterns are full of the beauty of Western classical art. The main visual element is Macau's classic souvenir, the almond cake. The overall design embodies Macau's historical culture and local characteristics, allowing tourists to better understand Macau's history and culture while also bringing new momentum to the development of Macau's tourism industry. At the same time, the effectiveness of the method is validated, making it easy for relevant design practitioners to reproduce and design souvenir

packaging that conforms to Macau's characteristics and contemporary trends based on this foundation.



**Fig. 4.** Design under the guidance of AI.

## 7 Conclusion

In the context of multicultural communication, the study of visual innovation in Macau souvenir food is a field full of challenges and opportunities. By summarizing the design elements of Macau souvenir packaging and incorporating artificial intelligence for validation, this study has successfully proposed an effective method for visual innovation. This method not only enriches the cultural connotation of Macau souvenir food but also enhances its market competitiveness, making a positive contribution to the dissemination of Macau's culture.

However, this research is just a small beginning in the study of visual innovation in Macau souvenir food. In the future, we still need to continue exploring more cultural elements, more design innovations, and more applications of artificial intelligence to achieve a more comprehensive and in-depth development of Macau souvenir food. We hope that future researchers can make more breakthroughs and contributions in this field, allowing Macau souvenir food to become an even more unique and influential cultural brand.

## References

1. A. K. Agariya, A. Johari, H. K. Sharma, U. Chandraul, and D. Singh, "The role of packaging in brand communication," *International Journal of Scientific & Engineering Research*, vol. 3, no. 2, pp. 1-13, 2012.
2. E. S. Wang, "The influence of visual packaging design on perceived food product quality, value, and brand preference," *International journal of retail & distribution management*, 2013.
3. L. E. Wells, H. Farley, and G. A. Armstrong, "The importance of packaging design for own-label food brands," *International Journal of Retail & Distribution Management*, vol. 35, no. 9, pp. 677-690, 2007. doi:10.1108/09590550710773237.
4. J. Tang and T. Wang, "Development and develop strategy of Macau creative tourism souvenirs," in 2013 *International Conference on Engineering, Management Science and Innovation (ICEMSI)*, 2013: IEEE, pp. 1-4.

5. W. H. Kong and T.-Z. Chang, "The role of souvenir shopping in a diversified Macau destination portfolio," *Journal of Hospitality Marketing & Management*, vol. 21, no. 4, pp. 357-373, 2012.
6. A. L. Brody, B. Bugusu, J. H. Han, C. K. Sand, and T. H. McHugh, "Innovative food packaging solutions," *Journal of food science*, vol. 73, no. 8, pp. 107-116, 2008.
7. B. Mohebbi, "The art of packaging: An investigation into the role of color in packaging, marketing, and branding," *International journal of organizational leadership*, vol. 3, pp. 92-102, 2014. doi:10.33844/ijol.2014.60248.
8. B. Rundh, "Packaging design: creating competitive advantage with product packaging," *British food journal*, vol. 111, no. 9, pp. 988-1002, 2009. doi:10.1108/00070700910992880.
9. U. R. Orth and K. Malkewitz, "Holistic package design and consumer brand impressions," *Journal of marketing*, vol. 72, no. 3, pp. 64-81, 2008. doi:10.1509/jmkg.72.3.64.
10. A. Radford et al., "Learning transferable visual models from natural language supervision," in *International conference on machine learning*, 2021: PMLR, pp. 8748-8763.
11. Z. Kong et al., "Automated Maxillofacial Segmentation in Panoramic Dental X-Ray Images Using an Efficient Encoder-Decoder Network," in *IEEE Access*, vol. 8, pp. 207822-207833, 2020. doi: 10.1109/ACCESS.2020.3037677.
12. R. Rombach, A. Blattmann, D. Lorenz, P. Esser, and B. Ommer, "High-resolution image synthesis with latent diffusion models," in *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition*, 2022, pp. 10684-10695.