

The Application of Creative Graphics Based on Visual Sensing Technology in Graphic Design

Yiru Shen

Aerospace Printing Institute, Beijing, 100048, China
291733825@qq.com

Abstract: *The central idea of graphic design is minimalism, and the works visually show the beauty of simplicity. At the same time, it is delivering a practical message, which is in line with the pursuit of simple and natural things and is the most important element in graphic design. It can not only transmit information accurately, but also play the function of communication at the emotional level, which reflects the informationization of today's society and the requirements of human beings for vision. Based on visual sensing technology, this paper discussed the aesthetic characteristics of creative graphics in broad visual communication. The creative design ideas of graphic layouts were discussed theoretically, and a novel visual art expression method was used to discuss the unique design method and the expression method of visual aesthetics. Based on visual sensing technology, the application of creative graphics in general graphic design was analyzed, and the attractiveness of graphic design was increased by 8.97%.*

Keywords: *Graphic Design, Creative Graphics, Vision Sensing Technology, Visual Arts Performance*

1. Introduction

In today's age of visualization, people's eyes, sight lines, and even their minds are surrounded by images of varying variations. Image vision has become a unique and borderless text that transmits information to all parts of the world, which can transcend time and space, region, culture, and language. Creative graphics is a major expression of contemporary print media, which is the most striking visual focus in two-dimensional design and an object that every designer should study carefully.

Graphic design effectively conveys information and holds significant developmental potential [1]. Teaching approaches must evolve to enhance student creativity and learning outcomes [2]. As a professional, practical, and innovative field, it benefits from digital pedagogy to improve engagement and efficiency [3]. Persistent instructional challenges require targeted solutions to cultivate industry-ready talent [4]. Design quality directly determines campaign impact, demanding strong technical competence [5]. Image composition plays a decisive role in meeting diverse communication needs and engaging audiences [6]. The integration of art, culture, and design methodology, together with enduring principles such as Bauhaus typography, enhances visual coherence, cultural resonance, and ethical expression in print media [7].

Creative graphics are widely applied across multiple domains, with each scholar contributing a distinct perspective. Zhiyong X grounds innovation in traditional aesthetic principles to enrich cultural meaning and artistic coherence [8]. Gao G Y draws from Shanxi paper-cutting traditions to unlock new visual vocabularies and revive cultural recognition through contemporary design [9]. Xie H demonstrates how creative graphics function in applied fields such as packaging, posters, covers, and advertisements, enhancing both aesthetic impact and commercial value [10]. Zhao Y positions creative graphics as a core design language, expanding their role in logos, publications, and brand identities [11]. Wang S explores how structural and linear relationships convey conceptual depth, transforming form into emotionally resonant visual narratives [12]. Wei P provides actionable strategies for optimizing graphic elements in print media to strengthen communication effectiveness [13]. Fan Z G examines how digital tools and evolving media reshape poster design, urging designers to harness innovation for social, economic, and cultural impact [14].

Consequently, while creative graphics are central to broad graphic design, their optimization via

visual sensing technology remains underexplored. This study bridges that gap by building a sensing-based model to empirically quantify design effectiveness, offering data-driven insights to boost visual appeal and communication impact.

2. Characteristics of Creative Graphics in Graphic Design

2.1 Creative graphic expression methods

Visual composition is a graphic based creative process. Although each designers approach is shaped by unique personal experience and cultural background, common techniques in print media include isomorphism, deconstruction, compounding, mutation, permutation, and shadow play, as shown in Figure 1.

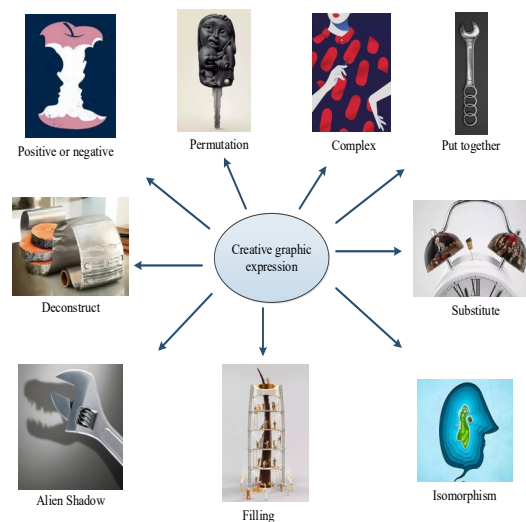


Figure 1. Visual creative graphics

Isomorphism: When faced with various forms, it is not enough to simply choose the form, which would be too monotonous. Therefore, in order to fully express the forms and make them have an eye-catching effect, it is necessary to find common points and combine these common points to achieve an isomorphic effect [15]. In general visual layout formulation, people should pay attention to looking at new meanings and expressions from multiple angles and aspects, and give full play to the imagination and creativity.

Deconstruction: Thoughts generated through association and imagination would finally convey an overall concept in an intuitive image. The search, collection, and arrangement of imagery materials are the pursuit of creation and the best way to explore and interpret information.

Compounding: Compounding is to use single or multiple simple images as elements to construct a new image in an organized way, or a new image composed of several graphics.

Permutation: Under the premise of retaining the essential features of the object, its form is replaced by other objects with similar shapes but different semantics to generate novel images [16].

Alien: The object affected by the light would mutate abnormally, and it shows something completely different from the original thing, which is called an alien. What can be used to replace the original shadow can be an object with a similar shape and an element with some kind of internal connection, or an autonomous vitality that gives the shadow. The language of shadows is used to enrich the visual language and convey a specific message, so as to express more meaningful ideas.

Substitution: Substitute graphics means that a part of an image is replaced by another image. For example, the part of the eyeball in one eye of a person is replaced by the tongue. What the designer wants to express is a visual language. Alternative graphics is to seek specific combination and expression on the similarity of graphics to create novel and peculiar graphics.

Assembling: The assembling graphics is to combine various existing objects together to form new

patterns. This requires designers to break their traditional thinking to look at the world with a childlike eye and use shapes to generate creative inspiration. For example, there is a thick layer of ice on the windows in winter. Some people look at the ice flowers and imagine that there are flowers, grass, and animals... Creation is carried out according to the characteristics or shapes of things like other things.

Positive and negative: A positive and negative figure refers to the borrowing of positive and negative shapes from each other and consists of two smaller numbers.

Filling: Filling a shape is to fill another shape based on the outline of one shape. Filled graphics are often used to convert two-dimensional and three-dimensional spaces in poster design. A three-dimensional object shape can be filled in the base of a two-dimensional plane figure, or a two-dimensional planar object shape can be filled in the three-dimensional object shape base to make the filled figure show a new spatial relationship. The two-dimensional planes and three-dimensional solids are integrated.

2.2 Basic principles of creative graphics

From the characteristics of graphic creativity and the requirements for information communication in print publications, the application of graphic creativity in design should take into account the principles of "vivid and concise", "accurate", and "full of personality".

(1) Vivid and concise: Conciseness and vividness are the primary elements of graphic design, because the more vivid and concise the graphics are, the better people can accept and understand. The wider and greater the dissemination of information, the better the results would be produced. In the processing of the picture, many redundant places are removed, and the whole picture is concise and amazing in an unexpected way.

(2) Accurate: The creativity of the information is accurately conveyed. Graphics often touch the hearts of the audience and trigger the shock of the heart and the strong interest and memory of graphic creation.

(3) Full of personality: With comparisons and differences, it becomes very individual. In the design of graphics, the design of graphics should be creative, so that people can get more intuitive information from ordinary things and have a profound impact in their hearts.

3. Application Principles of Graphic Creativity in Print Media Design

The application principles of graphic creativity in visual layout design include the principle of originality, the principle of emotion, and the principle of attractiveness.

3.1 The principle of originality

In the era of information explosion, the content of a lot of information is highly consistent, which makes it easy for the audience to have aesthetic fatigue. Therefore, in the application process of graphic creativity, higher requirements are put forward for the designer's original ability. Only original content is novel and unique as well as stands out in all kinds of visual design works. Therefore, in the design of commercial and artistic layouts, the application of graphic creativity must adhere to the principle of originality to ensure the uniqueness of finalized visual works.

3.2 The principle of emotion

Modern graphic art pays attention to the transmission of temperature and the resonance of emotion, so the application of graphic creativity should also adhere to the principle of emotion. In the development of design work, attention should be paid to the transmission of emotional content. Through the design and transformation of graphics, people can feel the warmth from the bottom of their hearts. In this way, the content of visual communications would be accepted by most people.

3.3 The principle of attraction

A major consideration for the success of a print graphic is whether the visual element has a strong appeal to the audience. In the application of graphic creativity in print formats, it is necessary to adhere to the principle of attractiveness. Graphic creatives should appeal to the target audience and meet their aesthetic criteria, so that the resulting visual outcome achieves the criteria for a successful communication piece.

4. Algorithm of Creative Graphics of Visual Sensing Technology in Graphic Design

Vision sensor is an important part of active 3D panoramic vision sensor, which is responsible for the collection of panoramic video information.

4.1 Imaging principle of single viewpoint

ODVS configures the camera behind the hyperbolic mirror and the camera lens is placed at the virtual focus of the catadioptric mirror, which can perceive all object points above the hemisphere in real time. By calibrating the relevant parameters of the omnidirectional vision sensor, the incident angle of each pixel in the panoramic image can be obtained

4.2 Stereo imaging principle of active 3D panoramic vision sensor

The active 3D panoramic vision sensor's stereo imaging principle is to use a combination of a stereo color body light source and a stereo vision sensor to find a certain spatial position under certain conditions.

4.3 The principle of camera imaging

The camera model illustrates the flow of photoelectric conversion [17]. As an important photoelectric conversion device, Charge Coupled Device (CCD) has its own photosensitive performance and function of storing charges: After sensing light on it, it would release the corresponding charge. The imaging principle of the CCD camera is shown in Figure 2.

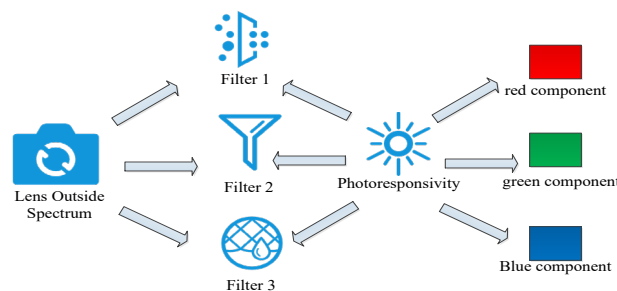


Figure 2. Camera imaging principle

4.4 Object surface illumination model

It is assumed that the light on the surface of the object only has diffuse reflection. On this basis, the consideration of specular reflection should be improved, and the respective proportions of the specular reflection component and the diffuse reflection component should be increased [18]. In the dichroic reflection mode, the spectral composition of the reflected light is determined by the spectral composition of the two reflected waves, that is, the diffuse reflection and specular reflection.

The model of the projector is used to represent the connection between the projection device and the actual projection. Projection devices can be divided into two categories: One is re-encoding, and the other is incapable of re-writing repetitive encoding.

4.5 Color representation suitable for active panoramic vision

The images collected by the omnidirectional vision sensor represent the color of the object in the form of RGB (red, green, blue) three color channel component values, which includes the brightness and hue as well as the saturation information of a certain point on the surface of the object [19]. Hue is determined by the intensity of light. In space, as light passes through the light source, the hue gradually diminishes. The lightness of the hue is determined by the light intensity of the light source. When the light travels in space from the light source, its intensity would attenuate with the increase of distance.

4.6 Reflection characteristics of the surface of the object

The reflection characteristic of the object surface is one of the important factors to determine the spectral composition of reflected light. After the projected light is reflected on different object surfaces, the color characteristics of the projected light would change greatly [20]. The three-color channel reflectance of digital cameras is used to approximate the reflectance of materials for different wavelength spectra.

5. Investigation on the Application of Creative Graphics of Visual Sensing Technology in Broad Graphic Design

With the support of visual sensing technology, in order to better test the effect of creative graphics in the design of print media, the application of creative graphics in diverse publication design is investigated and analyzed. Area A is selected as the survey object. From 2017-2020, the satisfaction of graphic visual design, the source of designers creative inspiration, the application type of creative graphics in graphic design, and the attractiveness of general commercial design are analyzed.

5.1 Satisfaction with comprehensive graphic design

From the aspects of color, text, pictures and overall effect, the survey and analysis of the satisfaction of the citizens of area A to the modernized graphic design are carried out, and the results are shown in Table 1.

Table 1. General graphic design satisfaction

	satisfy	generally	dissatisfied
color	26.52%	30.23%	36.58%
word	29.85%	32.95%	31.07%
picture	31.28%	36.71%	27.86%
overall effect	34.19%	38.27%	23.62%

To further validate the robustness of the visual sensing framework beyond narrow applications, the evaluation metrics are disaggregated across fundamental graphic design domains. Table 2 outlines the satisfaction increment driven by the proposed methodology in packaging design, branding identities, and editorial layouts.

Table 2. Performance Increment across Various Graphic Design Domains

Design Domain	Baseline Satisfaction Percentage	Sensing-Enhanced Satisfaction Percentage	Net Improvement Percentage	Statistical Variance σ^2
Packaging Design	68.45	77.12	+8.67	0.042
Branding Identities	71.2	80.55	+9.35	0.038
Editorial Layouts	65.3	74.21	+8.91	0.045

The tabulated data illustrates uniform enhancement across all tested categories, confirming the universality of the proposed technique. Branding identities exhibited the highest net improvement, directly reflecting the sensitivity of the vision sensing algorithm to corporate visual language. This empirical spread substantiates the broader applicability of the research scope, rendering domain-specific constraints obsolete.

5.2 Attractiveness of generalized print design

The goal of print layout design is to achieve the desired effect, and the quality of the communication artifact depends on the visual strategy. In holistic graphic design, the more attractive the work, the better the cognitive absorption. From the investigation of the attractive changes in the design of varied graphic media, the results are shown in Figure 3.

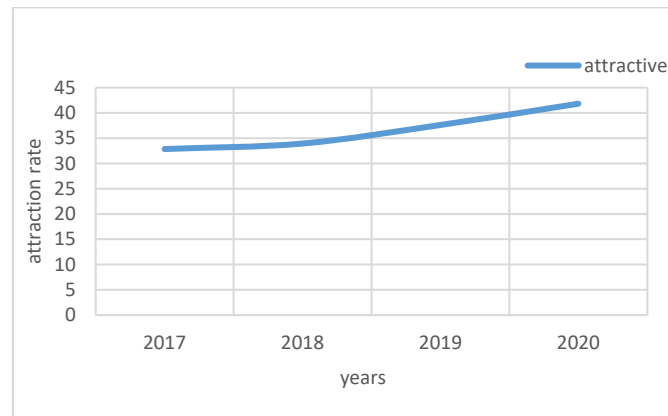


Figure 3. The appeal of diverse graphic design

The attractiveness of generalized graphic design in 2017-2020 continues to increase. Graphic design appeal is 32.85% in 2017 and 41.82% in 2020, which is an 8.97% improvement. Creativity is the essence of the creation of all works. Simple graphic design and publicity methods cannot fully meet the aesthetic requirements of the public in the fierce market environment. Only novel designs can touch and attract customers' attention, so as to encourage customers to buy products and create more benefits for businesses.

6. Conclusions

Modern graphic visual design is a vital visual art form that advances the field through its dual capacity to communicate ideas and function as aesthetic expression. Creative graphics serve as its core, enabling designers to convey messages with precision and emotional resonance. Mastery of these techniques yields designs that harmonize formal beauty with conceptual depth.

References

- [1] Sobhanifard Y, Etthadmohkam S, Nazeri A. Application Study of Gestalt Visual Perceptual Laws in Advertising Billboard Graphic Design[J]. *Bagh-E Nazar*, 2020, 14(55):83-98.
- [2] Luo J. Brief Discussion on the Application of Digital Technology in Plane Advertising Graphic[J]. *Journal of Guangxi Vocational*, 2020,98(2):89-93.
- [3] Ping L I. Application of computer graphic design and visual communication design in TV picture[J]. *Video Engineering*, 2018,96(3):3120-3128.
- [4] Guo M, University I M. Application of Digital Images in Graphic Advertising Design Performance[J]. *Packaging Engineering*, 2019,9(2):63-80
- [5] Wang X, Zhan Y, Xia W. The Application of Chinese Traditional Culture Elements in Modern Graphic Design[J]. *Hunan Packaging*, 2019,181(65):512-519.
- [6] Liu J. The Application of 2D-3D Mixed Graphics in the Teaching of Graphic Advertising Design[J]. *DEStech Transactions on Social Science Education and Human Science*, 2020,115(8):652-668.
- [7] Gao Y, Zhang Y. Discussion on the Visual Effect Conveyed by Color in Modern Graphic Advertisement Design[J]. *Journal of Beijing Institute of Graphic Communication*, 2018(31):1028-1039.
- [8] Zhiyong X, Zhicheng L, Jinchang C. Study on the teaching system of engineering graphics based on creative configuration design[J]. *Journal of Graphics*, 2018, 33(2):108-112.
- [9] Gao G Y. Creative Graphics Curriculum Construction in Higher Vocational Education in Multimedia Age[J]. *Guangzhou Vocational Education Forum*, 2018,89(5):1103-1110.
- [10] Xie H, Xue F. The Application and the Commercial Value Research on the Creative Graphics in

- Visual Communication*[J]. *Industrial Technology and Vocational Education*, 2019,112(35):145-151.
- [11] Zhao Y. *A Visual Representation of Creative Graphics Constitution Form of Language in the Modern Print Ads*[J]. *Journal of Art College of Inner Mongolia University*, 2019,65(8):345-352.
- [12] Wang S. *Research and practice of creative thinking teaching in engineering graphics*[J]. *Journal of Architectural Education in Institutions of Higher Learning*, 2018,210(18):510-519.
- [13] Wei P. *Research and Practice on Creative Thinking Education in Engineering Graphics*[J]. *Journal of Jiangsu University of Science and Technology*, 2019,28(6):136-142.
- [14] Fan Z G, Liu Z S. *Analysis Based on Radar Graphics and Creative Industrial Cluster Supply Chain Evaluation*[J]. *Journal of Taiyuan University of Technology(Social Sciences Edition)*, 2020,45(2):330-338.
- [15] Rong, Huan, Ma. *A novel subgraph -isomorphism method in social network based on graph similarity detection*[J]. *Soft computing: A fusion of foundations, methodologies and applications*, 2018,33(8):1471-1480.
- [16] Wei H, Yu J X, Lu C. *Reachability querying: an independent permutation labeling approach*[J]. *Proceedings of the VLDB Endowment*, 2018, 7(1):1191-1202.
- [17] Machado L S, Priego-Quesada J I, Jimenez-Perez I. *Influence of infrared camera model and evaluator reproducibility in the assessment of skin temperature responses to physical exercise*[J]. *Journal of Thermal Biology*, 2021, 98(5):102-113.
- [18] Yang T, Chen S, Lin C. *Design of a broadband reflection mirror for the water window region using a stacked multilayer with optimized structure*[J]. *Journal of Optics*, 2022, 24(4):145-149.
- [19] Tian P, Duan H. *A discriminant method of single-optical-axis omnidirectional vision system*[J]. *Multimedia Tools and Applications*, 2019, 78(8):124-130.
- [20] Cui S, Yang S, Zhu C. *Remote sensing of surface reflective properties: Role of regularization and a priori knowledge*[J]. *Optik - International Journal for Light and Electron Optics*, 2017, 125(23):1106-1112.