Retraction

Retracted: Ecological Concept of Basic Computer Vision and Visual Communication of Advertising under the Concept of Ecological Design

Security and Communication Networks

This article has been retracted by Hindawi, as publisher, following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of systematic manipulation of the publication and peer-review process. We cannot, therefore, vouch for the reliability or integrity of this article.

Please note that this notice is intended solely to alert readers that the peer-review process of this article has been compromised.

Wiley and Hindawi regret that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

References

[1] A. Zhang and J. Wenyue, "Ecological Concept of Basic Computer Vision and Visual Communication of Advertising under the Concept of Ecological Design," *Security and Communication Networks*, vol. 2022, Article ID 8392918, 11 pages, 2022.

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Research Article

Ecological Concept of Basic Computer Vision and Visual Communication of Advertising under the Concept of Ecological Design

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With the importance people attach to the harmony of ecosystem in modern society, the concept of ecological design has been adopted in some industries and is gradually being valued and recognized by people. In real life, advertising design and production is an important field of art design. With the rapid development of society and the continuous updating of network information technology, network advertising and visual communication design inevitably collide. As a new form of advertising, network advertising had become a part of people's network life. This paper analyzes the technical characteristics of image transformation, image enhancement, image restoration, image coding, and image recognition in computer vision processing. Through the image processing algorithm and program of computer, the advertising image can be processed to realize the functions of recognition, restoration, coding, enhancement, and transformation of advertising image. This thesis had studied the visual communication design in modern online advertising under the concept of ecological design. Using computer vision processing technology, this thesis had studied how to process the ecological concept and advertising visual communication content through computer vision technology, which will help to better improve the configuration of online advertising and create a more pleasant visual environment. It is of great significance to promote the rapid development of online advertising industry.

1. Introduction

In today's environmental pollution problem which is increasingly serious, we have to think independently about how to flexibly use the limited resources provided, of course, to promote the social and economic development of physical and mental health and sustainable development concept. Ecological design with ecological environment protection and environmental resource protection as the core value should emerge and become a development trend. Ecological design is also known as emerald green design, life cycle design, or natural environment design [1]. Integrating environmental factors into the design is conducive to clarifying the direction of decision design. The requirement of ecological design is to take into account environmental factors in all stages of new product development, reduce the role of all commodity life cycle on the environment, and finally form a more sustainable demand and supply management system [2]. In real life, along with the prosperity of people's life and the development of network technology, modern advertising design and production is an indispensable work of wide attention. Modern advertising also grew rapidly, becoming part of the environment they grew in. As an advertising designer, advertising design should pay attention to everyone's healthy lifestyle and apply the core concept of greener ecological design to the design and creation of modern advertising, which is also the responsibility of advertising designers to nature and society.

With the rapid development of network information technology, make full use of the role of the network,

advertising, and promotion of information content, and gradually form an important way of contemporary corporate image publicity and marketing. With the rapid development of Internet technology and the rise of the Internet, the contemporary Internet advertising, visual communication design, and design research are of important practical significance. The research on the effect of visual communication design of modern online advertising will help to create a more pleasant visual environment and effectively promote the rapid development of the online advertising industry. The current industry survey of advertising visual communication is shown in Figure 1, which reflects the current education and training, media, clothing, real estate, interior decoration, and other industries related to advertising visual communication, and gives the approximate proportion of industries. In the current industries involved in advertising visual communication, real estate and interior decoration account for about 15%, traditional advertising and media account for nearly 10%, and other industries such as the Internet, clothing, education, and training account for less than 7%.

Meanwhile, the continuous popularization of computer technology has been developing. Computer technology has become an indispensable part of the development trend of [3]. In order to realize the artificial intelligence of computer, in order to make the computer can better process and show the image information, must computer visual processing technology. At present, computer technology has been able to analyze and process 2D images and 3D structures, and identify and analyze 2D image content. In practical application, the computer can carry out a deep analysis of the three-dimensional structure, to meet people's intelligent requirements. Considering the concept of green ecological design, this paper discusses how to use computer vision technology to solve the green ecological concept and visual communication design of advertising [4].

2. Technical Status Analysis

2.1. Value of Ecological Design Concept.
Environment is what people survive and develop in. In recent years, due to the rapid development of society and economy and the rapid development of ecological resources, China's ecological environment has been damaged, seriously endangering people's lives and harming people's health. As a result, more and more people begin to pay attention to the harmony of the ecosystem and realize the importance of protecting the environment. The green ecological design idea has penetrated into all fields of social development and life, and has been recognized and highly valued by the public. Important use value of green and environmental protection design is shown in Figure 2. In the circle of ecological design, production, use, and reuse are the main links to achieve the goal of reducing the environmental burden.

2.2. Ecological Concept and Advertising Visual Communication.
The design and production of the current advertising and its design and production should be integrated into the ecological concept, so as to produce huge advertising utility. Advertising is a way of promoting information to users. The essential element of advertising is to convey information. Contemporary advertising design and production are in conveying the content and form of advertising, and we should pay more attention to the visual effect communication and emotional communication, resulting in the empathy of the audience. From the perspective of market sales, advertising has a certain guiding role, but this guiding effect is based on the ability to grasp the psychological state of the audience. Advertising interior designers should predict and analyze the audience's psychological reaction after watching the advertisement and capture this psychology reasonably, so as to guide the advertising design specifically. People pay more and more attention to green ecology and health. If the ecological concept is combined in advertising, the public will know that the product is green and pollution-free, and can meet the personal needs of users while improving environmental awareness. The design content of advertising visual communication under ecological concept is mainly shown in Figure 3. The leaflets, catalogues, posters, business cards, e-mails, advertising, and other methods involved in advertising communication under the ecological concept obtained from the investigation.

In the process of modern advertising design and production, it is very meaningful to combine the ecological concept of advertising design. The subject of advertising design is human, and the recipient of advertising is also human. Therefore, in the process of ecological advertising design, we should also pay attention to the people-oriented design principle and consider the inner appeal of the audience, so as to gain the audience's recognition. At present, eco-concept advertisements advocate the concept of green development when displaying corresponding product contents, aiming to provide the audience with better quality, and more intuitive and more intelligent comprehensive media communication services. Incorporating ecological civilization design concept [5] into advertising design and production process can not only effectively promote products, but also effectively promote the concept of ecological civilization, green development, environmental morality, environmental rule of law, and environmental literacy of the whole people.

2.3. Computer Vision Technology.
In the advertising design of communication content through visual media design, the publisher of information is the interior designer, and the participant of information is the goal of information transmission. The rapid development of multimedia not only affects the traditional visual transmission method, but also adds great challenges to visual transmission, from a single news media to multimedia, from static data to dynamic, from the surface to multi-dimensional, from information virtualization technology [6], dynamic integrated advertising design to the comprehensive direction. With the improvement of advertising forms, digital information advertising, multimedia electronic device display, multimedia communication, and other ways have been widely used in advertising.
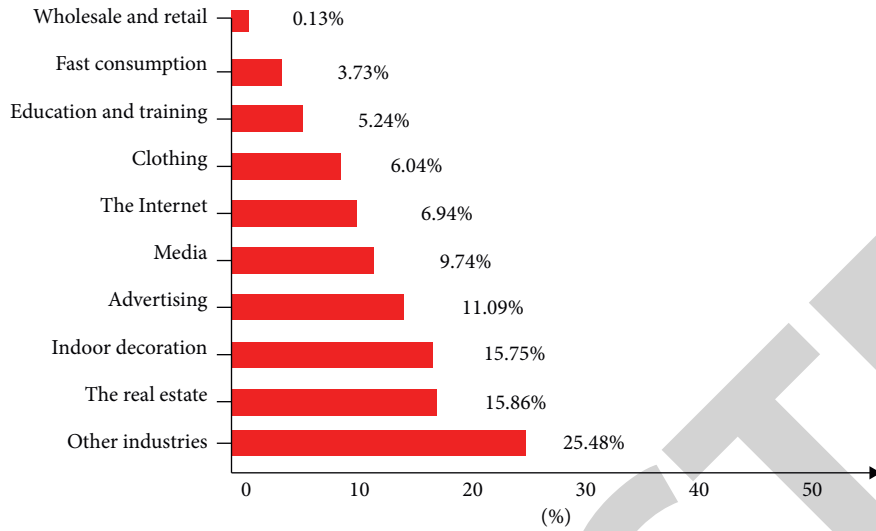
Figure 1: Proportion of industries involved in advertising visual communication.
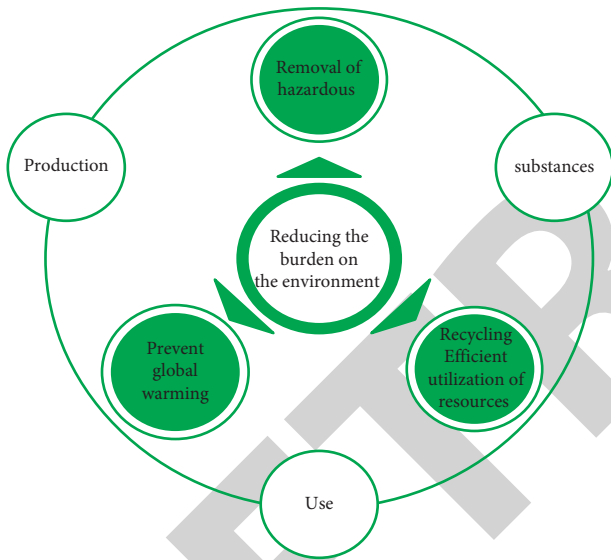

Figure 2: Main values of ecological design.

Computer vision technology refers to the whole process of observing and analyzing images by using computers to simulate human vision [7]. It stipulates that the electronic computer has the image identification level of artificial intelligence technology process, simulates the whole process of human vision effect, and completes the intelligent system of related image processing. The software system architecture is shown in Figure 4. This paper describes the acquisition and processing of image data, image characteristic positioning and segmentation, and image professional knowledge matching and learning.

Electronic computer technology is an artificial intelligence technology that simulates the whole process of our cognitive environment. Therefore, the technology integrates digital image processing, artificial intelligence technology, data technology [8], and other disciplines and technologies. This technique is different from the machine vision

techniques, as shown in Table 1. Machine vision technology is not only suitable for computer development and design, but also has a certain application in mechanical automation production. In the future automated machinery production, this technology can obtain objective things for the detection and control technology in production. Compared with the traditional automatic control system, it can achieve rapid, more information, and more manipulation of [9].

2.4. Computer Vision Technology Analysis. From Figure 5, the relevant information of the object image is collected first, and then the appropriate background photo object image is selected, so that the background of all objects is consistent and prevents the influence of background factors in the later image processing. In image collection, a process of printing out an image cannot be controlled, so it will also be affected by external factors. The expression form is more noisy, and the collected images should be effectively denoised to prevent the follow-up work and the accuracy of the test results.

The perimeter is the length of the entire area around the edge of the object in the image, which is the circumference of the object. The contour information of the object in the figure is extracted, all pixels of the object boundary are calculated to obtain the sum of pixels, and the result of the object's perimeter feature can be obtained. Here, the perimeter should be calculated in accordance with

$$L = \sum_{x=0}^{N-1} \sum_{y=0}^{M-1} f(x, y). \tag{1}$$

If the object has been through area information extraction, it can be learned that the roundness of the object is inversely proportional to its circumference. At this time, after the area and circumference of the object are calculated, the roundness of the object can be calculated to determine which quality level the shape of the object is in. At this point, the relationship between circumference and radius of the
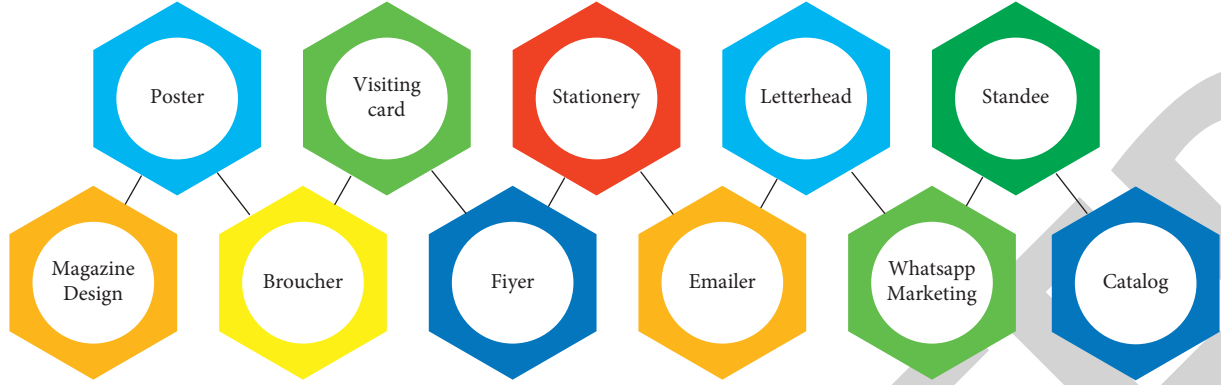
FIGURE 3: Main components of advertising visual communication.

object can be calculated according to Formula (2) and Formula (3).

$$L = 2\pi r_1,$$

$$r_1 = \frac{L}{2\pi},$$

$$S = \pi r_2^2, \quad (2)$$

$$r^2 = \sqrt{\frac{S}{\pi}}.$$

Because the actual shape of the object is not a standard circle, there will be some difference between the calculated value of the radius of the object in the above formula and the actual value of the radius of the object. At this point, the ratio of the two sets of radius solution results can be squared to measure the roundness of the object itself. The closer the ratio is to 1, the more standard the shape of the object itself is. At this point, we can deduce formula (4) for calculating the roundness of the object.

$$c = \left(\frac{r_2}{r_1}\right)^2 = \frac{S/\pi}{L^2/\left(4\pi^2\right)} = \frac{4\pi S}{L^2}. \quad (3)$$

The size of the plane that the image of the object occupies, that is, the area we are talking about here, is the object obtained by removing the background.

At the initial stage of the image binarization process, the foreground of the image object has been processed as a white part, and the background color has been processed as a black part. To solve the object area here, we need to get the additive income of all white pixels in the foreground, that is, to find the solution within the boundaries of all pixels. In order to calculate the number of maps $f(x, y) = 1$, the relationship between the pixel points and the area is solved according to the following formula:

$$S = \sum_{x=0}^{N-1} \sum_{y=0}^{M-1} F(x, y)|_{f(x,y)=1}. \quad (4)$$

Image processing operations, steps, and experimental results are shown in Table 2.

The specific process of image segmentation is shown in Figure 6. The necessary defect characteristics should also be obtained according to the calculation. Observe the object image and understand the segmented image information content of the difference in the normal area in the image. According to the environment removal, observe the color change of the object image, and find that many pixels are different. At this point, the target image was tested to obtain a modest threshold cut-off. The relationship between pixels and threshold is resolved for all pixels in future gray-value image resolution. If the pixel itself is below the threshold value, use a specific pixel. The number is gray and black, and the number is 255 in white. At this time, assigned from the pixel to the defect, the white image on the surface is part of the defect.

3. Modern Advertising Visual Communication Solutions

3.1. Application of Computer Vision Technology. In the visual communication of modern advertising, the application of computer vision technology involves industries as shown in Figure 7.

The application of computer vision technology is mainly divided into the following parts: this is also the basic content of machine vision technology in image processing. This technology is designed to achieve fast image resolution and analysis. This uses [10] to convert the image of a special space into a linear function and shows it in different spaces and ways. In addition, special computer optimization algorithms, image processing, and image transformation are also applied to convert the image into the initial image space, and the processed and modified images can show specific actual effects as shown in Figure 8.

3.1.1. Image Enhancement. Image enhancement refers to the process of image processing and refers to modifying and processing the original image with the help of a series of algorithms, so as to change all kinds of information in the original image and provide better visual effects for human beings. The most common image enhancement application is what people call beauty function, which is to use a series of image enhancement means to continuously
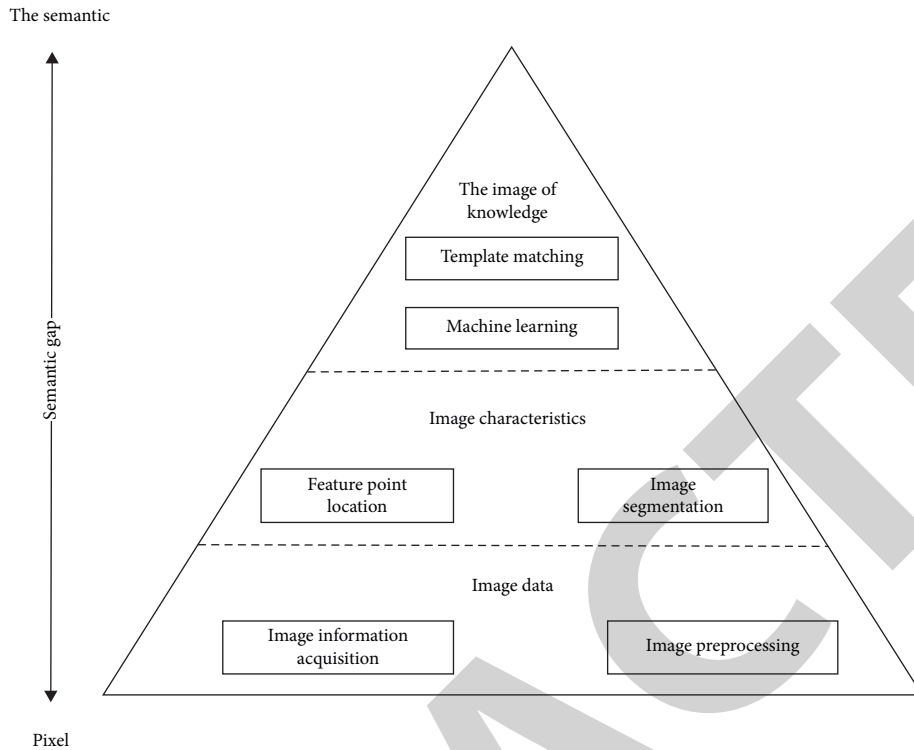
Figure 4: Computer vision technical framework.

Table 1: Differences between computer vision and machine vision.

|	Computer vision contrasts machine vision with connection	
	Industrial machine vision (MV)	Consumer computer vision (CV)
Category	Artificial intelligence (AI)	
Discipline	Systems engineering	Computer science
Constitute	Hardware and software	Software dominated
Perception	Single sensor is the main and is moving to multi-sensor fusion	Combined use of multiple types of sensors and fusion technology
Application focus	More emphasis on generalized image signal (laser, camera) and automatic control (production line)	More attention is paid to the (2/3D) image-related interdisciplinary research
Content	Algorithms such as image acquisition, lens control, and image processing.	Image processing algorithms
Controllability	More controllable	The uncertainty is greater
Core	Technology that allows robots to identify according to their tasks	Techniques for how to perform image analysis
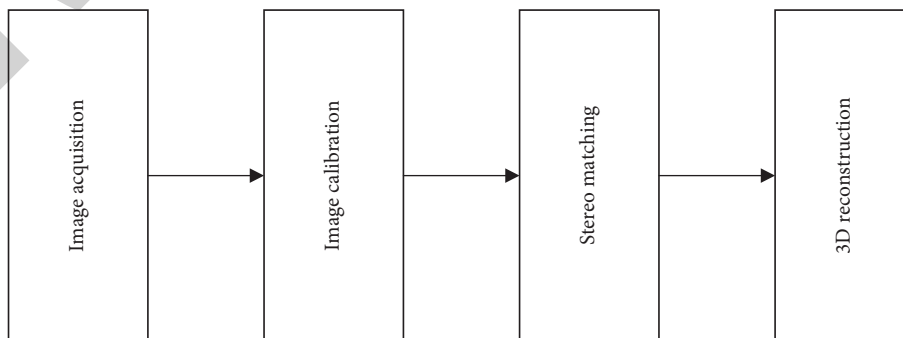
Figure 5: Four steps of image processing.

TABLE 2: Basic image processing operation table.

| Serial number	Operation	Steps and results							
1	The original image grayscale	0	1	2	3	4	5	6	7
2	The original histogram is each grayscale pixel	790	1023	850	656	329	245	122	81
3	Original histogram P (r)	0.19	0.25	0.21	0.16	0.08	0.06	0.03	0.02
4	Original cumulative histogram V1	0.19	0.44	0.65	0.81	0.89	0.95	0.98	1
5	Prescribe a histogram P (z)	0	0	0	0.15	0.2	0.3	0.2	0.15
6	Specifies the cumulative histogram V2	0	0	0	0.15	0.35	0.65	0.85	1
7	Minimal mapping |V2–V1|	3	4	5	6	6	7	7	7
8	Determine the mapping relationship	$0 \longrightarrow 3$	$1 \longrightarrow 4$	$2 \longrightarrow 5$	$3, 4 \longrightarrow 6$		$5, 6, 7 \longrightarrow 7$		
9	Postswap histogram	0	0	0	0.19	0.25	0.21	0.24	0.11
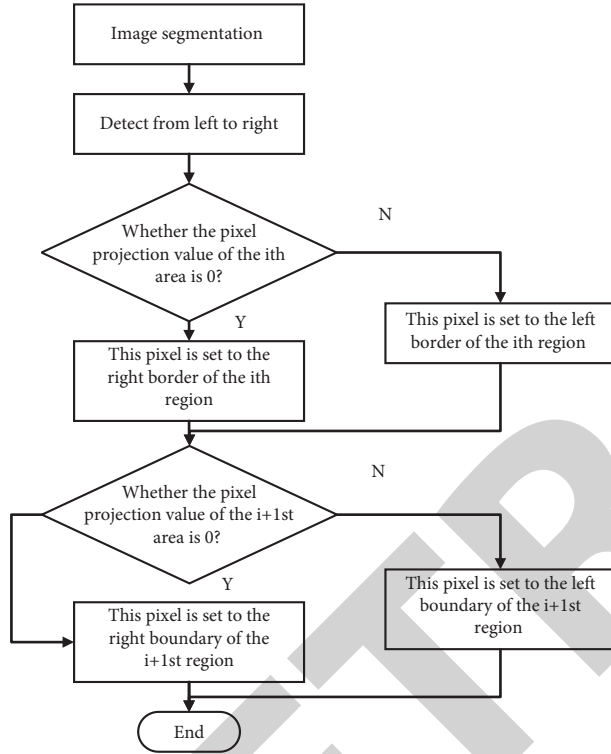
FIGURE 6: Image segmentation process.

process the original image and then present a more beautiful beauty effect for human beings.

3.1.2. Image Restoration. Also known as image link [11], this technology is easily understood by people. It is to improve image quality by means of image information processing and restore the original high-definition image. In the specific application process of image restoration, the corresponding algorithm should be adopted to reduce the interference of digital image in the acquisition process of relevant image capture equipment and reduce the impurities caused by the acquisition equipment itself.

3.1.3. Image Coding. A variety of technologies, also known as image compression [12], occur because the image itself has a large amount of data. In order to achieve the 3D rendering and analysis of the image, less data are necessary to achieve the detailed solution of the image, so some kind of compression method should be used to reduce the image data. When you compress an image, you first need to understand what data are redundant in the image. Below, use multiple bits to represent such data [13]. This can effectively compress the data in the image, and store and transmit the image, An image digital recognition is shown in Table 3.

3.1.4. Image Recognition. Image recognition: This is also the most common exposure to machine vision technology. It refers to the use of relevant optimization algorithms and recognition methods to screen and identify the image content, and uses machine intelligence to replace the human eyes to complete the image of real-time automatic monitoring [14]. The image classification and identification plan scheme can better identify and process the content in the image, which is the key content to promote the intelligent measurement, as shown in Figure 9.

3.2. Advertising Visual Communication Design. Advertising visual communication design is a modeling activity that spreads information and emotion to the public with visual media as the carrier. Visual communication design covers a wide range, including all kinds of graphic design, but also covers new communication media such as network and video. Through the processing, design, and innovation of layout, text, color, and other elements, it is conveyed to the audience [15]. The traditional advertising visual communication channels and characteristics are mainly shown in Table 4. Through the above key technologies in computer vision processing, such as image recognition, image coding, and image restoration, we can process the visual communication effect of traditional advertising.

The main characteristics of visual communication design are reflected in three aspects: visual competitiveness; interaction between communicator and audience; and globalization of visual communication forms [16]. The application of visual communication design in online advertising can not only enhance the display effect of advertising and improve the communication rate of advertising content, but also achieve better interaction between the communicator and the audience, as shown in Figure 10.

3.2.1. Theme Elements. The success of online advertising must be based on the realization of theme objectives, and the accurate expression of theme ideas to the audience is
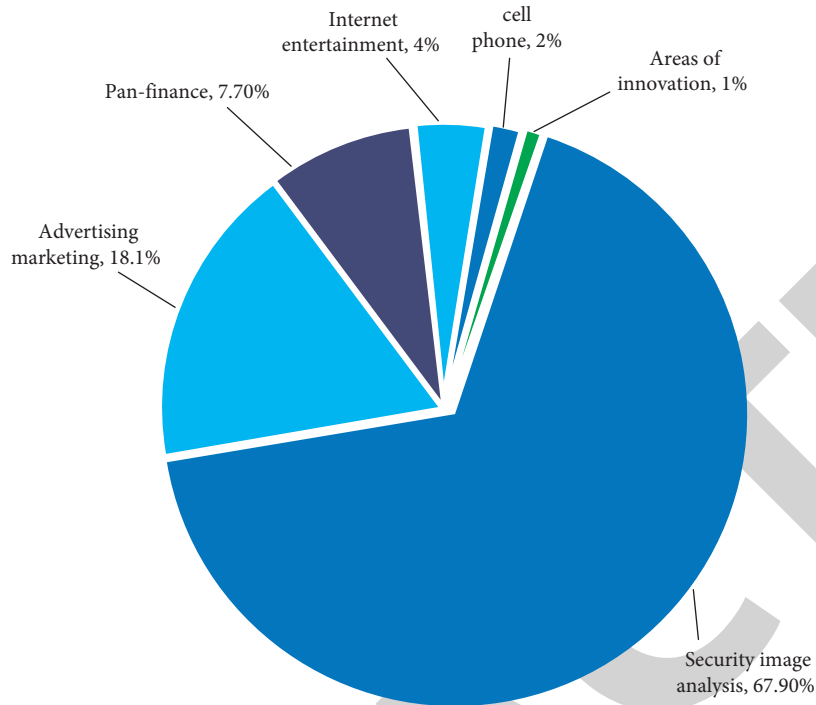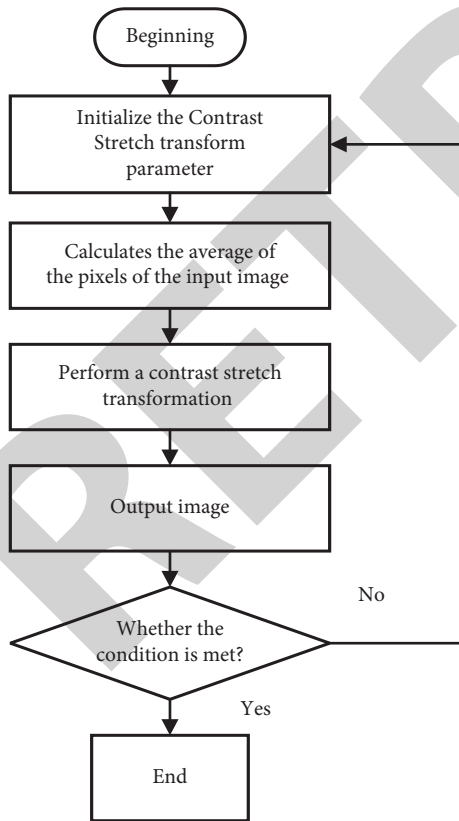
FIGURE 7: Computer vision application survey.

FIGURE 8: Image transformation process.

inseparable from the continuous pursuit of novelty and creativity. Displaying creative visual language through unconventional ways can attract people's special attention, so

as to accurately achieve the dissemination of advertising themes. In the visual communication design of online advertising, determining the theme content of the design is the first and last step. The subsequent application of text elements, layout elements, and color elements is always carried out around the theme content. Therefore, the theme element is the key to the visual communication design of online advertising.

3.2.2. Text Element. Because of its unique expressive force, text has irreplaceable importance in modern network advertising. The information of network advertisement often needs a certain text description to appear fuller, and its different visual expression forms, such as graphic text, bring different emotional communications to the audience. In online advertisements, the visual form of text generally has two forms, namely, graphic text and text text [17].

3.2.3. Layout Elements. Successful layout design can clearly convey the main idea, which is more convenient for people to read and participate in. On the one hand, it is necessary to arrange the visual elements that are easy to attract the attention of the audience according to the characteristics of the target of online advertising information. On the other hand, controlling the proportion of pictures and words in layout design, and displaying important words in striking fonts or colors can also ensure better results. At the same time, adjust the proportion of text and picture in network advertisement according to the main content to ensure the harmony of web page layout. Rich layout should pay special attention to the reasonable guidance of the visual process, so as to catch

TABLE 3: Digital recognition record of an image.

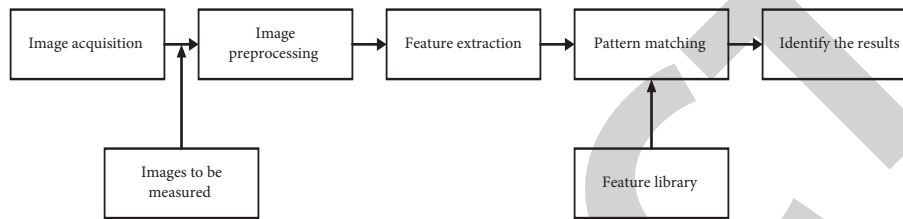| Digital	Number of intersections with Y	Number of intersections with X1	Number of intersections with X2	Classification
0	2	2	2	A
1	1	1	1	B
2	3	1	1	C
3	3	1	1	C
4	2	2	1	D
5	3	1	1	C
6	3	1	2	E
7	2	1	1	F
8	3	2	2	G
9	3	2	1	H

FIGURE 9: Image recognition process.

TABLE 4: Comparison of traditional advertising visual communication channel.

Project	Merit	Shortcoming
Newspaper	Short lead times for ad purchases Information can be passed over a certain area Ad sizes are flexible High acceptance and reading rates Free help is often available	Less impact on customers under the age of 18 Reading is rushed Too much advertising content Poorly targeted Poor ad quality
Magazine	Highly targeted Reader acceptance is high Low cost and good quality	Invalid ads Longer lead time for purchase Circulation is not large
TV	Sound and image combined Many viewers Low cost per viewer	Poorly targeted Viewers spend a short time watching ads High overall cost
Broadcast	Wide range Highly targeted Fast and flexible Good psychological effect	Unable to pass image Information is fleeting Not impressed Clutter and noise

people's sight from beginning to end, enhance people's attention to the advertising information while strengthening the understanding, and better convey the advertising information.

3.2.4. Color Elements. Whether the use of color is appropriate benefits will be directly related to the success or failure of online advertising. Color has a strong expressive force, and it can profoundly affect people's emotional state. At the same time, reasonable collocation of different colors can create perfect artistic effects in line with the content and theme of advertisements [18]. The effective use of color elements in online advertising will greatly improve the visual impact of the audience and arouse the emotional resonance of the audience. Therefore, designers must correctly understand the inner meaning, relationship, and law of

different colors, so as to flexibly use them in online advertising design.

4. Application Analysis and Results

4.1. Advertising Visual Communication Design Content. With the development of diversified media based on electronics, print-oriented advertisements gradually extend to the field of multimedia technology, and advertisements gradually change from static signboards to electronic flip boards, LED displays, and other new forms [19]. Modern advertising composed of shop signs, curtain wall advertising, light box advertising, dazzling lights advertising, wall advertising, banners, gas model advertising, etc. Due to the variety and complexity of its contents, it is necessary to design advertisements reasonably considering the environment and visual impact. In advertising design, the
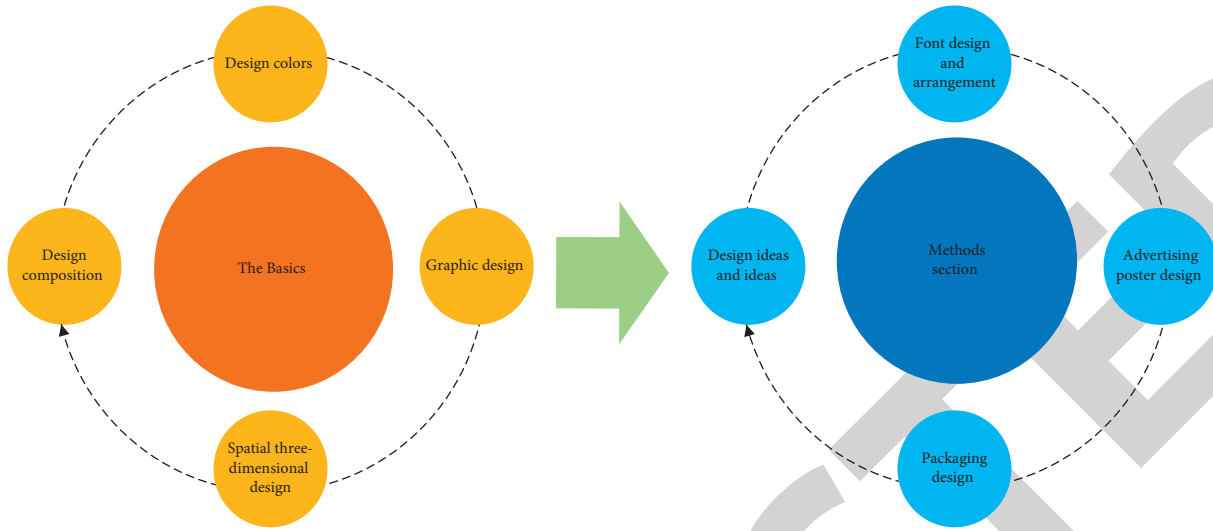
FIGURE 10: Composition of advertising visual communication design.

audience's visual instant perception, namely, the first impression, is particularly important, which is one of the conditions to determine the effectiveness of advertising. The basic operation content is shown in Figure 11.

The regionalization of spatial characteristics is influenced by factors such as spacing, size, appearance, dynamics, static data, and deep layers. Visual science research can avoid the problems caused by visual cognitive ability in advertising design. Visual science research can conduct [20] in both psychology and physiology. Visual rate, visual acuity, and visibility are suitable for functional measures of vision. The form and proportion of advertising are related to the first impression of the audience group. Sign color proportion, appearance, size, and relative height must conform to the scientific and reasonable proportion.

Advertising art creativity is a clever artistic creativity, highlighting the characteristics and essential characteristics of new products, with the support of multimedia technology, to deliver the creative content that must be expressed to consumers. Excellent advertising art creativity can arouse consumers' consumption awareness, promote consumers' purchase willingness, and correctly guide consumers to trade. Interior designers apply contemporary multimedia technology to turn the advertising interface from static data into dynamic, stimulate consumers' visual experience, promote consumer resonance points, promote consumer behavior, and at the same time, improve the artistic beauty and communication effect of advertising. The diversity of electronic information and media has driven the rapid development of the whole society. Visual delivery design scheme has also undergone a change from traditional methods to digital information.

4.2. Future Development of Advertising Visual Communication. Nowadays, the development of electronic information technology has brought new development opportunities for advertisers. More efficient and environmentally friendly advertising equipment can save advertising
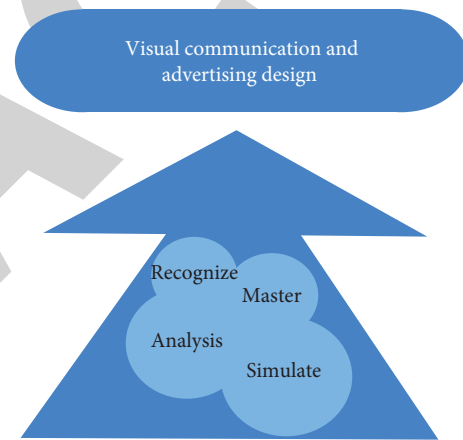

FIGURE 11: Visual communication advertising design content.

investment, improve the effect of advertising visual communication, and meet the needs of modern city development while realizing the maximization of interests. China advocates the concept of "energy saving" and "environmental protection" [21]. The new technologies, such as energy saving and environmental protection, ultraviolet shielding technology used in display and flip screen, and data integrated manipulation, have promoted the rapid development of advertising visual communication design, and the construction and rapid development of urban low-carbon environmental protection construction and beautification. Therefore, the visual communication design of contemporary urban advertising has made great contributions to the urban development and urban image construction. In the economic development of contemporary news media, the sharing economy mode is dominant. It will become the future development trend to complete the sharing of advertising resources and advertising planning activities among news media. It is a trend to integrate the data information of advertising websites, data networks, and social media. Advertisers can know how consumers respond to advertisements and publish them more
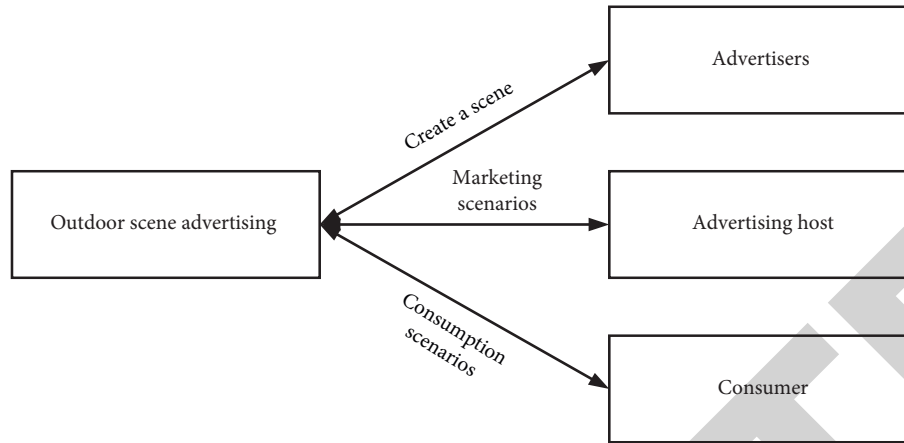
Figure 12: Composition of scene advertisement.

appropriately and scientifically. Advertising and marketing according to the scenario are also very important, as consumers have different understandings and experiences of the product in different scenarios as shown in Figure 12.

Therefore, the visual effect of modern advertising consists of frame and form of expression [22]. First, the advertising design renderings are composed of illustrations, article title, text, registered trademark, boxes, and so on. Because these factors can be placed in appropriate parts to spread the actual effect of advertising, the advertising composition interface must be improved. The expression of the store recruitment Cheng advertising is simple and clear, and the backlight and text picture billboard advertising will be the store design style to show incisively and vividly, and pedestrians at a glance. Similarly, the wall advertisements on the roof are simple color matching, a single font way. Targeted design according to color, illustration, text, etc. can achieve better advertising visual effect. The size of advertising illustrations, virtual reality technology, color, black and white, appearance, etc. will affect the communication effect. .

5. Conclusion

In a word, more and more people follow the harmony of the ecosystem and realize the importance of protecting the environment. The idea of green ecological design has penetrated into all walks of life of social development and has been recognized and highly valued by the public. Computer vision technology is an extremely important technology, and it is of great help to human work. In the development of future work, computer vision technology will develop in a more intelligent direction and help to various fields. With the development of a variety of media with Internet media as the main body, advertising creativity has gradually expanded to the multimedia system technology industry, stimulating the visual effect of customers, arousing customer resonance points, promoting consumer behavior, and improving the artistic beauty and communication effect of advertising. With the rapid development of social development and the continuous innovation of information network technology,

Internet advertising and visual communication professional will inevitably dispute. As a new form of advertising, online advertising has become a part of people's online life. It is of great significance to study the visual communication design of modern online advertising under the ecological design concept and use computer vision processing technology to better perfect the configuration of online advertising and create a more pleasant visual environment, which is of great significance to promote the rapid development of online advertising.

Data Availability

The labeled data set used to support the findings of this study is available from the corresponding author upon request.

Conflicts of Interest

The authors declare that there are no conflicts of interest.

Acknowledgments

References

[1] xiaomin Ren, "Value and application of Chinese elements in graphic advertising design," *Industry and technology forum*, vol. 19, no. 4, pp. 145-146, 2020.

[2] C. M. Yeum, S. J. Dyke, and J. Ramirez, "Visual data classification in post-event building reconnaissance," *Engineering Structures*, vol. 155, no. 15, pp. 16–24, 2018.

[3] W. Li, "Research on the application of graphic creativity in graphic advertising design," *Art Overview*, no. 5, pp. 25-26, 2020.

[4] B. Conde-Carnero, B. Riveiro, P. Arias, and JC. Caamano, "Exploitation of geometric data provided by laser scanning to create FEM structural models of bridges," *Journal of Performance of Constructed Facilities*, vol. 30, no. 3, 2016.

[5] J. Ma, Xi Liu, and Y. Yang, "Application of computer vision technology in Part Identification," *China Equipment Engineering*, no. 21, pp. 244–246, 2020.

 [6] L.-C. Chen, G. Papandreou, I. Kokkinos, K. Murphy, and AL. Yuille, "DeepLab: semantic image segmentation with deep convolutional nets, atrous convolution, and fully connected CRFs," *IEEE Transactions on Pattern Analysis and Machine Intelligence*, vol. 40, no. 4, pp. 834–848, 2018.

 [7] Y. Xue and Y. Li, "A fast detection method via region-based fully convolutional neural networks for shield tunnel lining defects," *Computer-Aided Civil and Infrastructure Engineering*, vol. 33, no. 8, pp. 638–654, 2018.

 [8] D. J. Atha and MR. Jahanshahi, "Evaluation of deep learning approaches based on convolutional neural networks for corrosion detection," *Structural Health Monitoring*, vol. 17, no. 5, pp. 1110–1128, 2018.

 [9] Y. Tao, P. Hu, and W. Yang, "Computer vision technology in smart home," *Artificial Intelligence*, no. 5, pp. 30–38, 2020.

[10] L. Qi, Z. Tu, and C. Chao, "Application of computer vision technology in food quality inspection," *Food Research and Development Hair*, vol. 9, no. 16, pp. 208–213, 2020.

[11] H. Huang and T. Sun, "Inspection equipment study for subway tunnel defects by grey-scale image processing," *Advanced Engineering Informatics*, pp. 32188–32201, 2017.

[12] M. Song, S. Yousefianmoghadam, M. E. Mohammadi, B. Moaveni, A. Stavridis, and RL. Wood, "An application of finite element model updating for damage assessment of a two-story reinforced concrete building and comparison with lidar," *Structural Health Monitoring*, vol. 17, no. 5, pp. 1129–1150, 2018.

[13] M. Alipour, D. K. Harris, and GR. Miller, "Robust pixel-level crack detection using deep fully convolutional neural networks," *Journal of Computing in Civil Engineering*, vol. 33, no. 6, 2019.

[14] J. Yu, "Brief Discussion on computer vision Technology and its emerging application," *Journal of Beijing Union University*, vol. 34, no. 01, pp. 63–69, 2020.

[15] J. He, Z. Huang, and X. Song, "Research progress of fish behavior recognition and quantification in aquaculture based on computer vision," *technologyFisheries modernization*, vol. 46, no. 03, pp. 7–14, 2019.

[16] A. Zhang, K. C. P. Wang, B. Li et al., "Automated pixel-level pavement crack detection on 3D asphalt surfaces using a deep-learning network," *Computer-Aided Civil and Infrastructure Engineering*, vol. 32, no. 10, pp. 805–819, 2017.

[17] ZiW. Jiang and F. Wang, "Study on environmental art design based on ecology concept," *Remote Sensing Technology, Regional Development, and Climate Change*, vol. 2022, Article ID 8034930, 8 pages, 2022.

[18] B. K. Soojin, *etc.Automated Vision-Based Detection of Cracks on Concrete*, Surfaces using a deep learning technique, vol. 18, no. 10, Sensors (Basel, Switzerland), 2018.

[19] H. Maeda, Y. Sekimoto, T. Seto, T. Kashiyama, and H. Omata, "Road damage detection and classification using deep neural networks with smartphone images," *Computer-Aided Civil and Infrastructure Engineering*, vol. 33, no. 12, pp. 1127–1141, 2018.

[20] Xu Han, "Technical and aesthetic thinking in visual communication design," *Decoration*, no. 7, pp. 38–41, 2018.

[21] L. Yang, "Discussion on innovative ideas of visual communication Design," *Packaging Engineering*, no. 12, pp. 285–288, 2020.

[22] S. Yin, "Innovative exploration of visual thinking mode in visual communication Design," *Packaging Engineering*, no. 4, pp. 291–311, 2020.