

## *Retraction*

# **Retracted: Design and Application of Public Welfare Posters Based on 5G Wireless Network**

### **Mathematical Problems in Engineering**

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

- (1) Discrepancies in scope
- (2) Discrepancies in the description of the research reported
- (3) Discrepancies between the availability of data and the research described
- (4) Inappropriate citations
- (5) Incoherent, meaningless and/or irrelevant content included in the article
- (6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets 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 own 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] W. Xiao and X. Li, "Design and Application of Public Welfare Posters Based on 5G Wireless Network," *Mathematical Problems in Engineering*, vol. 2022, Article ID 2239228, 11 pages, 2022.

## Research Article

# Design and Application of Public Welfare Posters Based on 5G Wireless Network

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As a traditional communication medium, public welfare posters take the public welfare issues of social concern as the theme, through visual images and creative connotation to dialogue with the audience, advocate social values, and convey positive energy. Nowadays, the audience's aesthetic requirements and level of design awareness are gradually increasing; whether emerging public welfare posters can be truly accepted and achieve good communication effect depends not only on the excavation of new thematic content but also on designers' willingness to try new things in the communication environment. As the medium of public service information dissemination, public service posters also reflect the characteristics of the communication tools used in the era and have a profound impact on human production, life, cognition, and communication. In the 5G era, the rapid development of mobile communication and digital technology has injected fresh power into the change and innovation of public service posters, and the evolution of public service poster media technology has changed the communication relationship between public service information and audiences.

## 1. Introduction

In this age of information overload, in the face of rapidly changing science and technology, public welfare poster design needs to use the mainstream communication media to deliver public welfare propaganda content, so that the content is intuitively delivered to the audience, to achieve the effect of public welfare poster design. How to design public welfare posters in virtual reality, human-computer interaction, information visualization, and other cutting-edge technology, combined with the visual perception of the viewer, so that it presents multiangle, multidimensional, multispace visual effects, so that the public welfare poster design both internal communication effect, but also external visual experience is particularly important [1–4]. With the popularization of fast fashion culture, various and complicated visual information comes into view, which gradually affects the visual experience of viewers. Due to the infiltration of these mainstream media, public service poster

design needs to seek new visual innovation and design mode to make the communication language presented by public service posters more direct, more effective, and more interesting. The change of people's vision has brought about the change of public service poster design, bringing about the integration of design with media and technology, and the gradual dissolution of the boundary between the three. This also changes the evaluation standard of public service poster design that is, from the past focus on the content and information conveyed to emphasize the participation and interactivity of the poster communication object. This visual change has prompted the development and transformation of public service poster design, requiring a broader scope of consideration in public service poster design, multiple perspectives of design innovation, combined with a variety of media to seek innovative strategies and design models. At the same time, it also makes public service posters seek breakthroughs and development in design thinking, presentation, technology use, and visual effect. Along with the

transformation of the public's way of accepting information, the way of understanding and perceiving society also changes, which makes the public service posters more attractive and influential to reach the function of communication and edification nowadays. This paper is based on how to combine 5G with public service poster design and apply it to innovative research, to promote the innovative development of public service poster visual strategy and increase the communication effect, and influence of public service posters is of great significance. Looking into the general direction of future public service poster innovation and development, the design should fully consider visual elements, visual experience and technology, and other media, so as to achieve more effective, fast, and dynamic dissemination of public service information, and continuously promote the work to personalization and long-term development [3–6].

Posters, as a way of propaganda, are often posted in the form of notices in some special locations to play the role of information release for the group. Although posters do not have sound effects, they are a very common form of media in modern society, whether it is for corporate publicity or for association planning, as they can disseminate information through vivid graphics and colors. Nowadays, with the continuous development of modern technology, the dissemination of information has become more diversified, the Internet, cell phones, television has become the mainstream of information dissemination, and the traditional advertising methods such as posters have brought a dramatic impact. However, although posters are no longer the mainstream medium of advertising, with their excellent creativity, powerful visual impact, and content expression, it can achieve information transfer while giving the viewer a better artistic experience, visual enjoyment, and even spiritual shock. In the process of poster design, color as an indispensable and important element, not only can effectively enhance the visual effect of the poster and can also be efficient with the text and graphics to better express the content. This paper is an in-depth study of the psychology of color in poster design and its effective role. In the scope of culture, color has a very important significance, has been, people's history, culture, experience, experience, memory, and wisdom have an impact on people's perception of color, because the color and many specific things have a specific connection with certain special things in nature, and this connection has been deeply imprinted on people's psyche with the refinement of time [7–9]. At the same time, people in various cultural environments have completely different feelings about color. For example, in China, red is the basic color of Chinese culture, representing vitality, joy, and enthusiasm, but in Western culture, red is a derogatory symbolic representation, associated with "blood" and "fire", signifying bloodshed and violence.

If all forms of poster design work can master the entry point of color, it will be more efficient to show its creativity, so as to obtain a better quality of poster art design. Combined with experience, when designing posters, the main color expression methods are the following: color gradient. The color in the hue, purity, lightness, and other aspects of

the regular gradient, can make the poster more layered, and the picture language to enrich. Brightness contrast [10–12]: Poster design, the more commonly used is the contrast between lightness and darkness of a color. When the brightness contrast is greater, the overall picture will be more layered and livelier; the smaller the difference in brightness contrast, the picture will become more smooth. Cold and warm contrast: In fact, the contrast between warm and cold is a subjective contrast in human perception. Warm colors are sunlight, strong, near, and deep, while cold colors are shadows, faint, light, far, and thin. The reasonable application of warm and cold contrast can improve the sense of concordance of poster design. Hue contrast: Hue is the appearance of color; the main role is used to distinguish the color system. When designing a poster, the knowledge of hue can be used to find the color you need more precisely, thus saving design time. Color matching: Scientific color mixing can build a high quality, unique image texture, can make the poster work with more expressive visual effects. Color is to the poster, as color is to the picture, the title is to the article in general, the full use of color expression can make the poster has a good, higher quality publicity effect [13].

As a new generation of wireless communication technology, 5G can operate at gigabit speeds, meaning that gigabit-level traffic data can be easily handled by 5G. 5G has improved performance in terms of latency, mobility, peak data rates, connection density, data rates for user experience, spectral efficiency, network energy efficiency, and regional traffic capacity. In the future, 5G will be the foundation of all smart connectivity, which will not only enable upgraded scenarios such as VR, cloud services, and smart homes but will also enable the Internet of Things, autonomous driving, telemedicine, and other unexpected scenarios. With the development of 5G, social information dissemination and structure have been transformed, in which, under the domination of technology, public welfare poster dissemination has been iteratively updated. According to the time deployment of China's Ministry of Industry and Information Technology, China will enter the precommercial phase of 5G in 2019 and will officially enter the commercial phase of 5G in 2020. 5G refers to the fifth-generation mobile communication technology, which has four main features compared with 4G: wide coverage, dense traffic, low power consumption, and low latency, and can support multiple applications including virtual reality, augmented reality, Internet of Things, Internet of Vehicles, smart cities, etc. It will have a more profound impact on the public service poster communication practice and industry development. Throughout the development from 2G to 5G, the change of communication technology brings continuous upgrading of media; gigabit mobile network environment will bring richer forms of media and public welfare posters, such as short and long videos, virtual reality, augmented reality, and outdoor public welfare posters [13–15]. The 5G era will likely usher in the windfall of a long video, which will carry a richer public welfare poster content and information.

5G enables mobile access to virtual reality and augmented reality, meeting the technical requirements of this

business immersive experience, this market will also enter a new round of windfall period, bringing more opportunities for public welfare posters. In addition, outdoor public welfare posters can be used in more diverse forms, such as holographic projection and 3D visual technology. Since 2015, outdoor public welfare posters combined with programmatic purchases can achieve real-time interaction with consumers, such as Look at me programmatic outdoor public welfare posters launched by the British public welfare organizations, similar applications will be more common in the 5G era. In addition to diversified forms of public welfare posters, public welfare poster experience will become an important indicator of the effect of public welfare poster placement. On the one hand, the user experience rate is the most important indicator of 5G network transmission, in the 5G environment, whether in local hotspots or in a relatively harsh environment, users can experience millisecond end-to-end delay. The public welfare poster loading saves users' waiting time and reduces the probability of users closing the public welfare poster during the loading process, which will likely improve the public welfare poster arrival rate. Not only that, in the environment of limited network speed, whenever a user opens a web page, a large number of trackers in the background will delay the loading speed of the website, which is also a reason for the increase of public welfare poster shielding rate. Therefore, the latency-free network in 5G era will likely reduce the public welfare poster blocking rate, which is beneficial to the development of public welfare posters and Internet enterprises. On the other hand, immersive public service poster experience will become mainstream. In the era of everything is media, users keep switching between different media and receiving a huge amount of information, and immersive public welfare posters will create a pleasant environment for users to contact public welfare posters, reduce the user's avoidance of public welfare posters so that they are happy to accept and willing to buy in the state of mind flow. In other words, the 5G era of public welfare posters for users to bring immersive experience, which requires both ultrahigh-resolution, three-dimensional, smooth imaging technology support, so that users can be fully engaged in it. The 4G network has popularized and expanded people's information needs, and the advertising industry has entered the era of mass—from keyword public welfare posters flooding the network to displaying public welfare posters all over e-commerce websites, users are overwhelmed, and these public welfare posters are homogeneous. The posters are highly homogenized. In the 5G era, to create an immersive public welfare poster experience for users, the public welfare poster creativity matched with different media forms needs to dig deeper into the characteristics of each media form, as well as the creative needs of users in each scenario, in order to achieve the thousands of creative people.

The structure of this article is organized as follows. The literary works related to this study are presented in Section 2. The proposed methods are explained in Section 3. The experimentation and evaluation of the suggested method is presented in Section 4. Finally, Section 5 summarizes the main points of the paper.

## 2. Related Work

*2.1. Public Welfare Poster Design.* Public welfare posters are posters to call the public's attention to a public welfare topic, carrying a more important social responsibility, promoting mainstream values, and promoting the healthy and positive development of society [16]. Compared with commercial posters, public service posters do not aim at a profit but hope to better protect the interests of most groups or disadvantaged groups through publicity, to guide the support of certain social good morals. It speaks for the interests of the majority of people and the neediest groups. In short, it is to arouse public awareness of public welfare and create a positive, equal, and beautiful social atmosphere.

Public service posters are used as a propaganda mode to promote good values and morals and spread good social winds [17]. To achieve the expected effect, it is necessary to effectively combine many elements such as words, images, and colors. Among them, color has the strongest instant infectious power, and the use of appropriate color with the theme can bring a different psychological experience to the audience group, subconsciously influencing the emotions of the masses, and then causing the effect of psychological interference. For example, red, the color itself is bright and strong, representing enthusiasm, authority, and self-confidence. This color is stimulating in and of itself, eliciting vibrant and enthusiastic feelings, increasing adrenaline secretion, and enhancing blood circulation. There was a Wenchuan earthquake, and the usage of red in public welfare posters had a morale-boosting effect, allowing residents in the disaster area to rebuild their homes with more confidence and the power of love. Orange and yellow, these two colors have high brightness, with a warm and bright feeling, can bring people a vibrant psychological implication, so that people become physically and mentally happy.

The positioning of the public welfare poster design of the publicity concept: Positive concept public welfare posters are valuable because of their positive guiding meaning and instructional significance to all or specialized social groups. Most of the current public welfare issues are mainly: people and people, people and nature, people and social issues. For example, environmental pollution, water shortage, against war, freedom of speech, protection of animals, and other topics. The famous German philosopher, aesthetician, and sociologist Theodor Adorno put forward the proposition that "art is the negative perception of society", which means that the negativity of art is the negation of the objective reality of the world and the rebellion against the beauty of order. On the one hand, art maintains its self-discipline and is at odds with society to criticize and deny the falsity of reality, i.e., art's criticism of society. On the other hand, art breaks the tradition of using imperfect and discordant appearance to realize the negation of reality, that is, art turns itself into "anti-art".

Vision is the most important human sense, and at least 80% of our external information is obtained through vision, and we use it to recognize things. People's pursuit of vision is getting higher and higher, and this trend has a huge impact on our lives. In public service poster design, graphics is an important element to convey the visual language, which can

enhance the attractiveness and infectiousness of the work [18]. However, graphics are only a visual language, which needs to be combined with text, color, and communication media to present the effect of the work. Visual communication is not only two-dimensional, but multidimensional, not more and more specialized, but to break the boundaries and cross the field to a larger dimension. Designers should be brave to break the plane space, to multidimensional cross-border development, the future development of space will be greater, and there are more opportunities to create better works. In order to avoid homogenization and repetitive creation, innovative visual language is especially important in the development of public service posters. Through the innovation of visual language to optimize people's visual experience, and constantly attract the public's attention with new visual feelings, to better improve the quality of public service poster works. In visual innovation, text, graphics, color, and so on are the basic visual language of public service posters. It breaks through the intrinsic visual mode and increases the visual expression of public service posters by modifying its visual presentation form. Text elements are unique; Text is an irreplaceable visual language that, as people's aesthetic demands evolve, encourages the creation and invention of text features. The qualities of modern text, the use of diversified, multidimensional, artistic ways to represent it, should be added to the characteristics of public service poster design along with the evolution of times, in the use of text elements. Many words have new connotations in today's world of the Internet and new media. In the process of creating public service posters, we make full use of modern multimedia technology and other technological means to make the designed works always present new and unique text elements. The use of these unique text elements can keep the work contemporary and innovative, cater to people's changing aesthetic needs and visual perceptions, and make the work move towards a multielement and multidimensional trend. For example, the 2016 KAN Tai-Keung Design Award student category entry "Deep Sea, Ocean" uses the wave shape of the ocean and combines Chinese ink elements to express "sea" and "ocean", adding the English words "thesea" and "ocean" to the backing of the poster. In the background of the poster, the English words "thesea" and "ocean" are added to cater to the Chinese way of expressing the font in the shape of waves, reflecting the innovation of text elements, as shown in Figure 1(a). The innovation of graphic elements traditional graphic elements in the development of contemporary society is no longer suitable and cannot meet the needs of the development of public welfare posters. People have become accustomed to traditional graphics, and the traditional graphic design can no longer meet the visual needs of the public. Integrating innovative ideas and novel design methods such as extraction, division, and reconstruction into graphic elements not only changes the graphic elements themselves but also makes the whole design method innovative. For example, the graphic elements can be arranged in a certain way or presented with a three-dimensional effect by using technology, which breaks through the original traditional graphics and forms a visual innovation of the graphic elements. In addition, graphic elements should have a sense of

hierarchy, and through the grasp of graphics to distinguish the relationship between primary and secondary, so that when people view the work through the visual line of traction to convey the main idea and connotation of the work. For example, the Chinese character designed and the public welfare poster "Ninety-Nine to One", which expresses the theme of the return of Macau, both use ink and wash techniques to express the graphic elements, the former expresses the shape of the mountain echoing the Chinese character "mountain", and the latter expresses the spreading shape of the lotus flower echoing the Chinese character "one". The former expresses the shape of a mountain echoing the Chinese character, while the latter expresses the spreading shape of a lotus flower echoing the Chinese character [19]. Graphics have a strong recognition function and can also convey abstract visual information. The innovation of graphic elements also gives new life to the visual, as shown in Figure 1(b). In the design of public service, posters need to understand the connotation of different colors, according to different themes design hues. Or extract the colors on traditional patterns and traditional decorative patterns to use in modern elements or graphics. For example, the series of public welfare posters for animal protection created by Kazumasa Nagai in 1991 well combine the elements expressed with the traditional colors of the nation, the expression of abstract images plus traditional colors, so that the visual elements are subtly integrated, making the work full of traditional effects and oriental charm, as shown in Figure 1(c).

*2.2. Communication Changes in the 5G Era.* The American communication scientist puts forward the view of "media context theory". He believed that the change of media must lead to the change of social environment, and the change of social environment must lead to the change of human behavior. The 1G era is voice communication, the 2G era is "voice + text communication", the 3G era is "voice + image communication", and the 4G era is "image + video" communication [20]. The development of media has brought about a radical change in human life, and the emergence of 5G will certainly create a new way of life for us. The concept of "scene" is particularly important in the 5G era, which will make our lifestyles more convenient and provide advertisers with a new way of thinking and approach to advertising. The term "scene" is originally used in film and television to refer to the action that takes place in a specific time and space, or the specific picture formed by the relationship between the characters, which is a specific process to express the plot through the actions of the characters. However, in the new technological environment, the meaning of "scene" has gradually changed. In their book "The Coming Scene Era", Robert Scoble and Sheryl Israel argue that the arrival of scene communication is supported by technology, namely the "five forces of scene", namely mobile devices, social media, big data, sensors, and location systems. The emergence of 5G technology has provided new opportunities for the development of the advertising industry. In this paper, we discuss how the future advertising industry can develop intelligently in advertising delivery by combining the concept of "scenario".

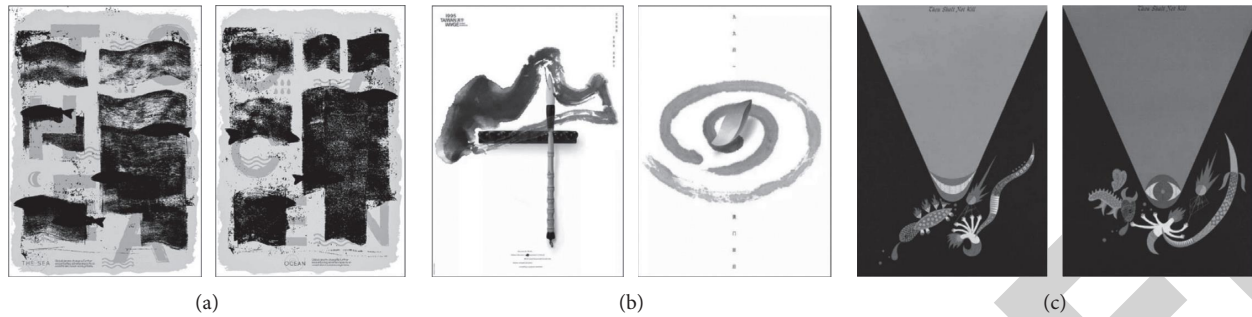


FIGURE 1: Public service posters and visual innovation.

To ensure efficient and stable transmission speed, large-capacity 5G requires more base stations to be built to achieve stable signal transmission. These base stations are small, low in energy consumption, and can be installed on top of any object. Each base station can receive signals from other base stations and transmit them to users scattered all over the place. Each base station can carry large-capacity storage, and 5G's mega data network will make it possible for everything to be connected. In the context of big data, data is the key to victory, and whoever has more data has a broader space to play. 5G's large-capacity advantage can be used in the advertising industry to establish a dedicated information base station for each user, which will make advertising more accurate and gain more advantages. The primary benefit of a high-speed 5G network is that it can transmit data 100 times faster than a 4G network, up to 10G bit/s. The primary reasons why people dislike commercials nowadays are because the visuals are not appealing enough and the loading time is too long [21]. With 5G technology, fast loading saves time for users to wait for ads, and a good experience makes users less likely to turn off ads, while high-definition videos delivered by 5G will make users more willing to watch them, thus significantly improving the reach and contact rate of ads. The creation of low latency 5G is expected to reduce end-to-end latency by a factor of 10, greatly enhancing the user experience. For consumers, it will bring faster bandwidth speeds with little to no latency, providing a more immersive experience. For example, we can chat with friends in HD video more smoothly and play games with less lag, all of which will further upgrade our experience and make us love using 5G networks with a good user experience. The efficacy of low latency applied to advertising will enable advertisers to interact with consumers in real time over the network and gain a more immersive experience when using VR and AR technologies. The low latency reduces the vertigo of VR and AR, and consumers are immersed in fun and interesting interactive experiences without perception, truly allowing users to get the products and services they need. How to use "scenarios" in the 5G era is particularly important. Have you ever dreamed that if I had a super robot around me, it would know when you want to eat a meal and bring it to you, and know when you want to watch TV and automatically tune in your favorite TV programs All these

things, which seemed like a pipe dream, will become possible with the advent of 5G [21–23]. The more we use our cell phones, the richer our big data system will be, and the more accurate advertisers will be in guessing what we think. For example, Taobao's "Guess what you like" is a way to predict what products we might buy based on the information we usually buy and browse, and the products pushed in "Guess what you like" is more likely to be purchased than random products because these are the things we may need. Accurate user management means knowing where your users are, what they want, and what content they need at what time and in what scenario. With 5G technology, advertisers can push different ads for us based on different scenarios. For example, the location system can locate us to push information about local food, tourist attractions, accommodation, playgrounds, etc. If you send a message in your circle of friends saying, "I want to go to Hawaii", advertisers can use that message to push ads for airfare and accommodations to Hawaii. Advertisers can use the huge information capacity of 5G technology to collect more information from users and make more accurate predictions about consumers.

### 3. Method

*3.1. Model Architecture.* Considering the differences in public welfare poster application requirements, project cost, and network capacity, according to the different locations of arithmetic power deployment, the public welfare poster design system deployment architecture of 5G wireless network proposed in this paper is edge cloud inference and closed-loop control, and the architecture is shown in Figure 2. This approach is to deploy the arithmetic power in the MEC platform, edge cloud hardware and software capacity is easy to expand, resources can be reused, more conducive to the widespread promotion of visual applications; field deployment of hardware is simple, flexible, and standardized; but subject to network connection stability, cost, network, and MEC construction. Processing latency requirements are not high for public welfare poster applications, and the total data volume transmitted is not significant in scenarios such as outdoor multiscene status monitoring of public welfare poster real-time design applications.

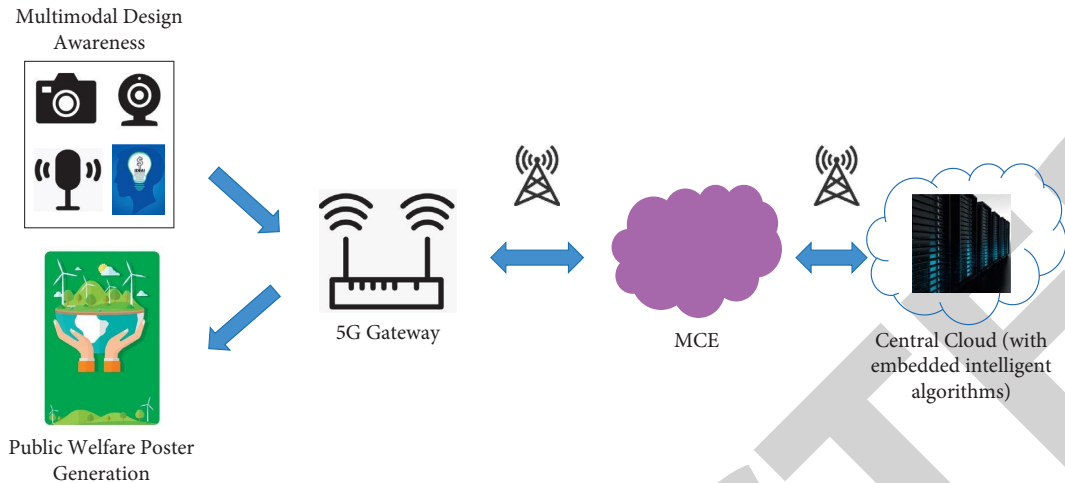


FIGURE 2: Model structure.

**3.2. 5G System Key Technologies.** In wireless communication, four types of antenna systems are often used: single input single output, single input multiple outputs, multiple input single output, and multiple input multiple outputs. The large-scale antenna technology used in 5G system is based on the MIMO system of multiple antennas and multiple user terminals (UE) at the base station, and the number of antennas at the base station is comparable to the number of user terminals. Compared with 4G system, the maximum number of transmitting and receiving antennas supported by downlink is 8, and the 5G NR system has a great improvement in the number of antennas. We can think of massive MIMO as “spatial multiplexing,” where multiple users exist in the space around a single base station, and each UE has access to all of the base station’s resources. By simultaneously sending distinct data streams in numerous antennas improves transmission throughput and cell site coverage. The antennas send signals in the 6 GHz (FR1) band, which is an expansion of 4G MIMO technology that adds more antennas while increasing the spectrum where the transmit signals are situated. To successfully direct the beam, 5G systems not only increase the number of antennas but also phase control the signals of each antenna unit. The current beam control and beam assignment methods can be used to control the antenna code pattern, which will drive further optimization of 5G large-scale MIMO technology and better exploit the advantages of multiantenna systems. Figure 3 shows the schematic diagram of beam control and beam assignment techniques.

The matrix-based technique can provide a variety of phase relationships, and for the specific orientation of the actual user, a beam containing eight positions can be selected for signal transmission, and the above figure shows a conceptual example of beam control. The orthogonal frequency division multiplexing (OFDM) technique, which is gradually developed from the multicarrier modulation (MCM) technique, uses the principle of fast Fourier transform to generate mutually orthogonal subcarriers to achieve multicarrier communication, which belongs to both modulation and multiplexing techniques. Currently, the

3GPP protocol has given: orthogonal frequency division multiplexing (CP-OFDM) with cyclic prefixes to support uplink and downlink transmission of 5G NR, and orthogonal frequency division multiplexing (DFT-s-OFDM) waveforms with discrete Fourier transform extensions to complement CP-OFDM waveforms; where CP-OFDM waveforms can be used for single-stream or multistream (MIMO) transmission, while DFT—the CP-OFDM waveform is used in the 5G NR standard protocol and can be adapted to a flexible and variable set of parameters. The variable parameter set allows multiplexing of services with different levels and delays and allows for larger subcarrier spacing in the millimeter-wave band. Since the signal no longer maintains orthogonality, this introduces the problem of large peak-to-average ratios and subcarrier interference. The DFT-s-OFDM waveform is used to reduce the peak-to-average power ratio of the signal in the uplink channel, where the UE is limited in transmit power and requires high power efficiency. The RF signal is transmitted in the wireless channel and becomes a baseband signal at the receiver side through RF demodulation, and then processed using Fast Fourier Transform (FFT) to finally output the demodulated signal. Since the subcarriers used in the baseband demodulation are orthogonal to the rest of the subcarriers, the integration result in one code element cycle is zero, so the information extraction is not affected. Figure 4 shows the OFDM waveform schematic. From the figure, OFDM saves a large amount of protection bandwidth compared with the traditional frequency division multiplexing technique, which results in a higher spectrum utilization. Secondly, the center frequency of any overlapping subcarriers in the spectrum lies exactly on the zero point of the adjacent subcarriers, and the effect of inter-symbol interference is significantly reduced.

**3.3. Intelligent Public Service Poster Design Algorithm.** This paper proposes a generative adversarial network model based on a public interest poster generation model. Graphic design staff can use the model to input specific Chinese text to generate specific design graphics. In the poster design work,

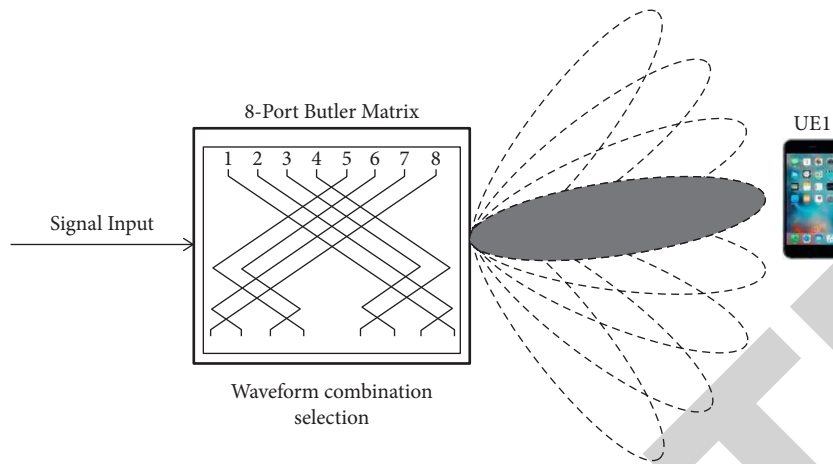


FIGURE 3: Matrix beamformer.

the content of the poster design requirements can be organized into text form and input into the model, and the model can generate specific content of the poster image after the training is completed. The text-to-image model can greatly reduce the work time of designers and improve their design efficiency, the model can create unlimited samples, and sometimes even to design a bright poster works. In the film industry, we hope that soon it will be possible to generate movies from textual content, since movies themselves are made from many images assembled in sequence, so that we can use fictional writings, etc., as input to generate movies with corresponding content, reducing the cost of filmmaking and allowing as many people as possible to participate in the creation of movies. Therefore, the proposed method is of great practical value.

The model consists of a generative network  $G$  and a discriminative network  $D$ . The network structure of both generators and discriminators is generally five layers, which is more stable than the traditional GAN model, and the generated images are more diverse and better meet the needs of creators. As with most generative adversarial networks, the generative network inputs a noise that generates a target image in the generator. The discriminative network accepts an image, which is judged by the discriminative network and the corresponding probability value is calculated. The proposed model is unique in network design in that the pooling layer is removed from the first network structure and replaced by a convolutional layer so that the convolutional network learns the same effect as the pooling layer in the operation process. This allows the convolutional network to learn the same effect as the pooling layer during the operation, in order to achieve the purpose of up-sampling and down-sampling and optimal image feature extraction, while also reducing the computational effort and increasing the computational rate. The architecture of a stable deep convolutional adversarial generative network uses stepwise convolution for the discriminator network and transposed convolution for the generator network replacing all pooling layers. Secondly, batch normalization (BN) is used in both generators and discriminators. As the neural

network deepens, its training process becomes more complex, and the distribution of the inputs to each layer during training changes depending on the parameters of each layer. The gradient descent technique that goes with it necessitates the more careful human selection of parameters, initialization settings, and so on, as well as commencing training with a lower learning rate, all of which slows down training speed. To address this issue, a normalization layer needs to be input, drawing its advantages by making normalization part of the model architecture and performing it for small batches of data collected in each batch. The use of batch normalization allows deep neural networks to use higher initial learning rates with less concern for initialization parameters. The third removes the fully connected hidden layer to obtain a deeper architecture. The fully connected layer is generally set at the last layer of the network model, the output layer, and its purpose is to connect the extracted image features and, more deeply, to map the distributed features learned from the network to the sample labeling space. However, the fully connected layer has a great disadvantage in that it has too many parameters. For a general neural network, the fully connected layer can take up more than half of the parameters of the whole network, which makes the computational speed of the whole network slow down, and the parameter redundancy can produce problems such as overfitting. As the range of perceptual field required for feature extraction such as animal face expression and hair texture in this thesis is small, there is no need to extract the full map features, and in order to avoid the above problems, the fully connected layer is removed directly from the network model in this experiment. Fourthly, the ReLU activation function is used on all layers in the generator except the output layer, and the Tanh activation function is used for the final output layer. The choice of the discriminator activation function is relatively simple, and the Leaky ReLU activation function is used for all layers. The generator of the proposed model is divided into five layers, and each layer can be regarded as a transposed convolution, according to the formula for the edge length of the feature map after convolution.



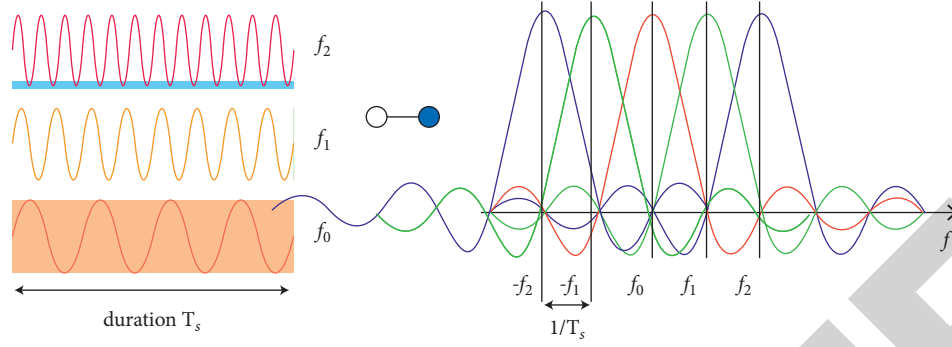


FIGURE 4: OFDM waveform schematic.

$$W_2 = \frac{W_1 - F + 2P}{S} + 1, \quad (1)$$

$$H_2 = \frac{H_1 - F + 2P}{S} + 1,$$

where  $W_1$  and  $H_1$  are the length and width of the feature map before convolution, respectively,  $W_2$  and  $H_2$  are the length and width of the feature map after convolution, respectively,  $F$  is the width of the convolution kernel,  $P$  is the complementary zero number, and  $S$  is the convolution step. The network structure of generator  $G$  is shown in Table 1.

The input of the discriminant network is a  $96 \times 96 \times 3$  image, which needs to undergo five layers of convolution and corresponding batch normalization, and finally the final probability is output using the sigmoid function to determine whether the image is a real sample image or a generated image. The discriminative network is basically symmetrical to the generative network except for the activation function selection, which is completely different from the generative network, and the rest of the network structure is symmetrical to the generative network, and a similar symmetrical parameter and activation function settings can be obtained. The proposed model belongs to generative adversarial network, and according to the characteristics of generative adversarial network, the network loss function is divided into generator loss function and discriminator loss, where the generator loss function is in the form of equations (2) and (3)

$$L_G = \sum_i (L_{G_i} + \lambda_1 L_{\text{per}}(I'_i, I_i)) + \lambda_2 L_{CA} + \lambda_3 L_{\text{DAMSM}}, \quad (2)$$

$$L_{D_i} = \frac{\frac{1}{2} E_{x \sim p_{\text{data}_i}} \log_a D_i(x_i) - \frac{1}{2} E_{x \sim p_{G_i}} \log_a (1 - D_i(x_i))}{\text{unconditional loss}} + \frac{\frac{1}{2} E_{x \sim p_{\text{data}_i}} \log_a D_i(x_i, s) - \frac{1}{2} E_{x \sim p_{G_i}} \log_a (1 - D_i(x_i, s))}{\text{conditional loss}}. \quad (3)$$

## 4. Experimentation and Evaluation

**4.1. 5G Streaming Media Distribution Test.** The number of requesters is set to  $M = 200$  and the CPU frequency of each requester device is  $f_m = 1$  GHz/sec. The number of collaborators is  $N = 20$  and the CPU frequency of their devices is

$f_z = 5$  GHz/sec. The distance threshold is set to mid-th = 500 m and the requesters are randomly distributed in the range of 50 m to 1000 m in the coverage area of collaborators. The number of performers is  $z_e(0, 20]$  and the CPU frequency of the base station is  $f_o = 100$  GHz/sec. The number of tasks offloaded by each requester is assumed to be (1, 2001.) The main parameter information in this section is shown in Table 2.

Compare this paper using MCOCA with MobMig401, Full BS, and Full local for analysis, where FullBS is the full base station computation algorithm, i.e., the requester offloads all tasks directly to the base station for computation. full local is the full local computation algorithm, i.e., all tasks perform local computation and are not assigned to any collaborators.

As shown in Figure 5, MCOCA obtains the shortest queue compared to the other three algorithms. The queue length of MobMig fluctuates around 550 and is slightly higher than that of MCOCA. On the contrary, the queue length value of Full BS is the largest, i.e., FullBS has the worst system stability.

Similarly, it can be seen from Figure 6 that MCOCA obtains the smallest value of virtual queue length, followed by MobMig. Combining Figures 5 and 6, it is known that MCOCA has the best system stability compared to the other three algorithms.

### 4.2. Public Service Poster Generation Algorithm Validation.

The experimental environment is as follows: Ubuntu 16.04, CPU is i7-4790k, and GPU is GeForce GTX 1080Ti. The experimental code uses the Pytorch deep learning framework running on the GPU. The dataset used in this paper is the publicly available dataset CUB-200-2011, the CUB dataset contains 200 different bird images with a total of 11788 images, which contains 8855 images in the training set and 2933 images in the test set. In this section, quantitative and qualitative comparisons with other methods will be made to evaluate the experimental results in terms of both evaluation metrics and visual effects. First, a quantitative comparative analysis of evaluation metrics is performed to compare this method with the classical text generation image network on the CUB dataset using three evaluation metrics: R-value, Inception Score, and FID. Then a subjective visual comparison is performed between this paper's method and previous methods to verify the effectiveness of this paper's method. The comparison results with the mainstream methods are shown in Table 3. The comparison shows that the experimental results of the proposed method on the CUB dataset have been

TABLE 1: Generator network structure settings.

Convolutional layer	Convolution kernel size	Step length	Makeup zero	Activation function	Batch normalization
First layer	$4 \times 4$	1	0	ReLU	Yes
Second layer	$4 \times 4$	2	1	ReLU	Yes
Third layer	$4 \times 4$	2	1	ReLU	Yes
Fourth layer	$4 \times 4$	2	1	ReLU	Yes
Fifth layer	$5 \times 5$	3	1	Tanh	No

TABLE 2: Main parameter information.

Parameters	Definition	Value
$M$	Set of requestors	200
$N$	Set of collaborators	10
$Z$	Executor set	(0,20]
$\lambda$	Arguments of the effect function	[5,20]
$V$	Parameters of the drift penalty function	(0,50]
$f_m$	CPU frequency of the requester's device	1 GHz/sec
$f_z$	CPU frequency of the executor device	5 GHz/sec
$f_0$	CPU frequency of the base station	100 GHz/sec

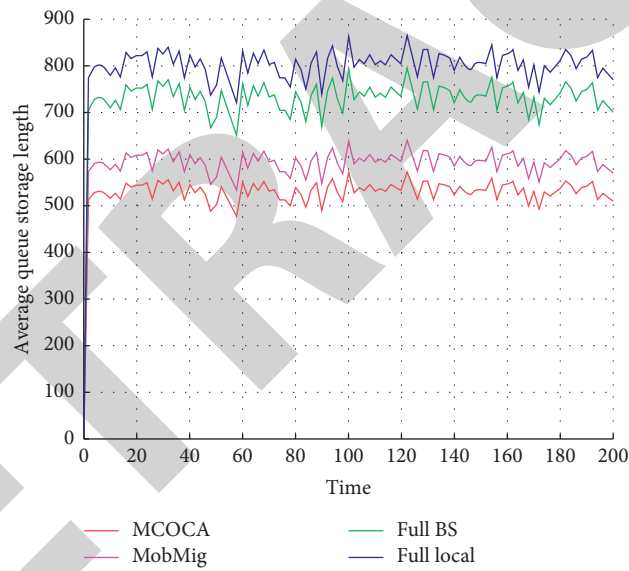


FIGURE 5: Storage queue at different moments.

improved compared with the current mainstream networks. Compared with AttnGAN and DMGAN, the R-value is improved by 11.5% and 4.6%, respectively; the Inception

Score is improved by 10.7% and 1.6%, respectively; and the FID is also reduced. The experimental results show that the proposed model generates better quality images.

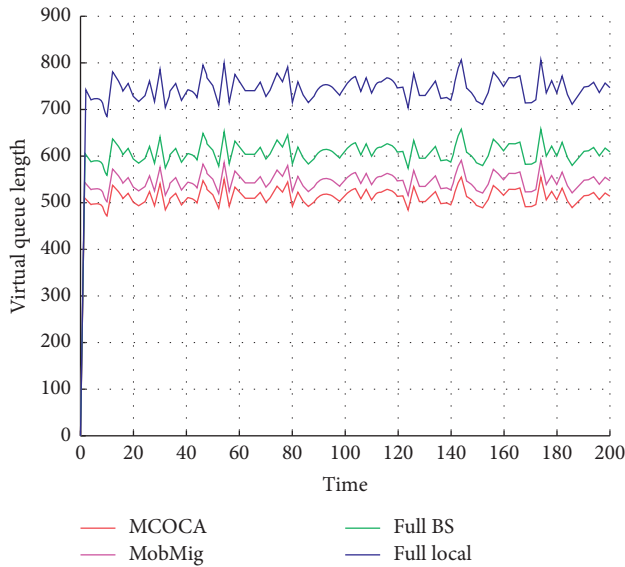


FIGURE 6: Virtual queues at different moments.

TABLE 3: Comparison of different methods on the CUB data set.

Method	R	IS	FID
GAN-INT-CLS		$2.8 \pm 0.04$	
Stack GAN		$3.7 \pm 0.04$	51.89
Stack++		$4.04 \pm 0.05$	
Attn GAN	$67.82 \pm 4.43$	$4.36 \pm 0.03$	23.98
DM GAN	$72.31 \pm 0.91$	$4.75 \pm 0.07$	16.09
ML GAN		$4.22 \pm 0.04$	
MPR GAN		$4.70 \pm 0.04$	18.97
Proposed method	$75.62 \pm 0.73$	$4.83 \pm 0.03$	15.28

## 5. Conclusion

In today's society, public welfare posters play an irreplaceable role in the construction of spiritual civilization with their rich and diversified spiritual connotations and unique visual communication methods, as poster designers should keep pace with the times, and try to explore the use of different advanced technologies to design public welfare posters while digging deeper into the theme of public welfare posters, so as to better serve the theme content and better play the social function of public welfare posters. 5G can make the world easier to connect everything while changing the way of life, the public service posters received by society are also upgrading the content and dissemination methods, the rapid development of new technology redefines the public service posters, and digital technology makes the placement of public service posters become more convenient and traceable. The public service poster has been transformed by the rapid development of new technologies; digital technology makes public service poster placement more convenient and traceable. The public service poster can not only be programmed for placement, but it can also precisely analyze the effect of public service poster placement, resulting in the creation of new media forms and methods.

## Data Availability

The datasets used during the current study are available from the author on reasonable request.

## Conflicts of Interest

The author declares that he has no conflicts of interest.

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