5G-Based Full-Scenario Intelligent Digital Media Display Platform

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Abstract. The needs of the 5th Generation (5G) mobile communication key all-scenario intelligent digital media display platform have gradually become clear. The use of digital media technology in display design has greatly changed the language and design methods in display design. It has a great influence on display design methods and design concepts in the traditional sense. The purpose of this article is to conduct research based on the 5G full-scenario intelligent digital media display platform. This article adopts the literature data method to study the 5G-based full-scenario smart digital media display platform for emerging things, analyzes related theories, finds relevant information from various documents, and conducts research on some of the previous technical problems. Explore. Research shows that 23.94% of the respondents are relatively satisfied with the experience of the 5G full-scenario digital display platform; 19.01% of the respondents are dissatisfied with the experience of the 5G-based full-scenario digital display platform; and 8.45% The respondent did not know the relevant situation.

Keywords: 5G Mobile Communication, Full Scene, Smart Digital Media, Display Design

1. Introduction
On the basis of the development of the fourth generation (4th Generation, 4G) mobile communication technology, the relevant research work of the new generation of mobile communication has been gradually carried out, and the basic implementation plan of the fifth generation (5th Generation, 5G) mobile communication has put forward requirements [1-2]. Among them, the new waveform technology as a key technology to support data transmission has important research significance [3-4]. The new 5G waveform needs to be more flexible to adapt to the signal transmission requirements in rich business scenarios, while requiring weaker user intervention, which can effectively improve the spectrum performance and support asynchronous transmission between users [5-6]. Filter-based rectangular frequency multiplexing (FOFDM) technology has good growth potential and can meet the needs of new 5G waveforms. Therefore, the research on 5G-based smart digital media platforms has important practical significance [7-8].
When studying a 5G-based full-screen digital media platform, many researchers have conducted research on this and achieved good results. For example, Guan Min and others believe that a better and faster full-screen intelligent digital media expansion platform should be realized. It is necessary to link information technology with innovative industries and pay more attention to the introduction of more professionals to give vitality to life [9]. Matics S and others analyzed the basic construction conditions of the intelligent full-screen digital media display platform and showed that the intelligent full-screen digital media display platform should be based on digital infrastructure, knowledge creation system and residents' creativity [10].

This article adopts the literature data method to gradually refine the search scope in the foreign literature and the Chinese literature database, and I want to search for foreign literature related to this research. Because the research on news visualization is far ahead of China, consulting foreign literature will provide great help to this research. A questionnaire survey method was also used to investigate the experience of the city’s 5G-based full-scenario digital display platform. In addition, a statistical method is also used. As the name suggests, the data statistics method is to integrate and comb the data, and get the laws hidden behind the data and the problems it contains.

2. 5G-Based Full-Scenario Intelligent Digital Media Display Platform

2.1 Based on Full-Scenario Applications in 5G Mobile Communications

The business types of the mobile communication industry are constantly enriched. Mobile Internet services and Internet of Things (Internet of Things, IoT) services have drastically promoted the future development of mobile communications, creating a broad development space for the next generation of mobile communications. Intelligent digital technology has a promoting effect on display design. Its diversification has changed the form of display design to a certain extent, making it gradually change from the original traditional, single, and flat form to a spatio-temporal, dynamic and multidimensional form, enriching the display. The expression form of design makes the expression technology of visual and psychological space more perfect. The past experience is applied to the virtual world. The design is no longer restricted by visual language symbols, but can more fully express the design ideas, thus Promote the design experience from different angles.

At present, the scenarios and requirements of 5G mobile communication have been initially determined, and related concepts and technical solutions have gradually deepened. The enhanced mobile communication bandwidth is mainly used in 4K/8KUHD ultra-high-definition TV, virtual/augmented reality, and broadband access in high-density areas. Such as large connection hotspots, smart offices, etc., high-speed mobility service scenarios, such as mobile hotspots, high-speed rail, etc.

Intelligent digital technology has an auxiliary effect on screen design. It is no longer restricted by time and space, making the exhibition more lively and interesting, allowing visitors to obtain useful help during the visit, and deepening their understanding and understanding of the cultural value of the exhibition. I know that digital media technology applies more updated language to design, so that people have more sensory experience, enhance visual authenticity and vividness, and make people feel more intense visual and psychological experience. Strengthen the information to be conveyed, and the display design pays more attention to the relationship between virtual objects, the relationship between reality and the virtual world, and the research on the way of conveying information, instead of focusing on the relationship between real objects and people.

2.2 Based on FOFDM Technology In 5G Mobile Communication System

In the 5G mobile communication system, the FOFDM waveform was first proposed by Huawei as an improved waveform based on the OFDM waveform. In the FOFDM system, the allocated bandwidth will be divided into several sub-bands. In each sub-band, traditional OFDM (and other possible waveforms) can be improved, parameters can be flexibly configured, and different sub-carriers can be supported in different sub-bands (The subcarrier (SC) interval, the length of the cyclic prefix CP and
the transmission time interval TTI are to meet certain types of services and related channel characteristics.

In general, the sub-bands do not overlap each other, and there is a guard band between the sub-bands, which reduces the consumption of the guard band between sub-bands and improves the spectrum utilization rate. Moreover, the sub-band-based filtering process suppresses the interference between the sub-bands, thereby reducing the out-of-band scattering OOB. Although the time domain orthogonality of the symbols between each sub-band is sacrificed, the performance loss caused is small. Therefore, compared with traditional OFDM, it can support asynchronous transmission between sub-bands, no strict synchronization is required, and at the same time, it can obtain the advantage of signal peak-to-average ratio.

2.3 Frequency Domain Efficiency Based on FOFDM System in 5G Mobile Communication System

Frequency domain efficiency represents the ratio of the number of subcarriers actually carrying useful signals to the total number of subcarriers in the available bandwidth resources in the frequency domain, expressed as:

$$r_F = \frac{N_u}{N}$$  \hspace{1cm} (1)

In the traditional system, taking the 10MHz bandwidth resource configured in the LTE protocol as an example, assuming that the sub-carrier spacing is 15kHz, the number of sub-carriers in the available bandwidth $N'$ can be calculated as:

$$N' = \text{floor}\left(\frac{10\text{MHz}}{15\text{kHz}}\right) = 666$$  \hspace{1cm} (2)

According to the LTE protocol, the number of subcarriers $N_{u,OFDM}$ that actually carry useful data in the total subcarriers is 600, and the frequency domain efficiency $r_{F,OFDM}$ of the OFDM system is:

$$r_{F,OFDM} = \frac{N_{u,OFDM}}{N} = \frac{600}{666} = 90\%$$  \hspace{1cm} (3)

It can be seen that in LTE, when the available bandwidth resource is 10MHz, the frequency domain efficiency of the 10MHz system is only 90%, and 10% of the spectrum resources are still reserved as protection subcarriers. Therefore, to a large extent, Spectrum resources cause waste and reduce the efficiency of spectrum use.

In order to further ensure less mutual interference between sub-bands, the number of protection sub-carriers can be reasonably configured according to the modulation mode adopted by the sub-bands, the suppression of the out-of-band spectrum of the sub-band filters, and the power allocation between sub-bands. The number of protection sub-carriers is related to the modulation order, power allocation, the number of sub-bands divided, and the performance of the filter, which directly affects the efficiency of the frequency domain. Therefore, it is necessary to reasonably configure parameters for the FOFDM system according to actual application scenarios, service requirements, and channel characteristics, so as to use spectrum resources reasonably and effectively and improve spectrum utilization efficiency. It can be seen from the above analysis that the frequency domain efficiency of the FOFDM system should be calculated according to specific conditions.

From the above analysis of the time-frequency efficiency, it can be seen that the time-frequency efficiency of the FOFDM system can be expressed as:

$$r_{TF,OFDM} = r_{T,OFDM} \cdot r_{F,OFDM} = \frac{MN}{MN + ML_{GF,OFDM} + L_{CF,OFDM}} \cdot \frac{N_{u,OFDM}}{N}$$  \hspace{1cm} (4)

The above analysis also shows that the FOFDM system can reasonably and effectively improve the time-frequency efficiency of the system by properly configuring parameters for the FOFDM system according to actual application scenarios, service requirements and channel characteristics. This
feature can well support 5G mobile communications. Rich application scenarios to meet a variety of business needs.

2.4 Based on the Advantages and Disadvantages of the FOFDM System in 5G Mobile Communication System

(1) The advantages of FOFDM system mainly include:
   1) More flexible frequency division multiplexing technology, which can be reasonably configured to meet a variety of service requirements.
   2) Channel equalization is relatively simple.
   3) Better combination with multi-antenna technology.
   4) Effectively improve spectrum utilization.
   5) The out-of-band leakage of the spectrum is low.
   6) The computational complexity is reasonable.
   7) Convenient to coexist with other waveforms in the system, and good forward and backward.

(2) The main disadvantage is that if the filter design is unreasonable, the out-of-band leakage of the spectrum cannot be well suppressed, and the orthogonality of the waveform is also lost, which may lead to a decrease in the transmission performance of the system. If the complexity of the filter implementation is relatively high, the actual application cost and overhead will be relatively high.

3. Experimental Research on 5G-Based Full-Scenario Intelligent Digital Media Display Platform

3.1 Research Objects
This article sends out one-to-one questionnaires to citizens who come to the city’s full-scenario intelligent digital media display platform experience management, and asks them to fill in carefully to help improve the quality of government services, and set up a recycling questionnaire box at the exit of the hall. To maximize the authenticity of the questionnaire results.

3.2 Distribute and Return Questionnaires
The questionnaire was distributed face-to-face and collected. 400 questionnaires were distributed, and 386 questionnaires were effectively returned, with an effective rate of 96.5%.

4. Experimental Research and Analysis of 5G-Based Full-Scenario Intelligent Digital Media Display Platform

4.1 The City's Citizens' Familiarity with the 5G-Based Full-Scenario Digital Display Platform is Shown in Table 1.

| Familiarity         | Number of people | Proportion(%) |
|---------------------|------------------|---------------|
| Very familiar       | 26               | 6.8           |
| Relatively familiar | 98               | 25.4          |
| Not very familiar   | 160              | 41.4          |
| Unfamiliar          | 52               | 13.4          |
| Completely unfamiliar | 50              | 13            |
Figure 1. Familiarity with the 5G-based full-scenario digital display platform

It can be seen from Figure 1 that the citizens of this city are not very familiar with the 5G-based full-scenario digital display platform, and close to 67.4% of the people said they are unfamiliar or unfamiliar. Only 6.8% of people are very familiar with the 5G-based full-scenario digital display platform. It can be seen that most citizens in this city are not very accepting of new things, and the joint efforts of the government and the public are needed to let more citizens understand new things.

4.2 Satisfaction Survey

The survey of the city's citizens' satisfaction with the experience and feelings of the 5G-based full-scenario digital display platform is shown in Table 2.

| Satisfaction Level | Number of people | Proportion |
|--------------------|------------------|------------|
| Very satisfied     | 46               | 11.97%     |
| Satisfied          | 92               | 23.94%     |
| General            | 143              | 36.62%     |
| Dissatisfied       | 72               | 19.02%     |
| Don't know         | 33               | 8.45%      |
As shown in Figure 2: 6.62% of the respondents are generally satisfied with the experience and experience of the 5G-based full-scenario digital display platform; 11.97% of the respondents are very satisfied with the base; 23.94% of the respondents are very satisfied with the 5G The experience of the full-scenario digital display platform is relatively satisfactory; 19.01% of the respondents are dissatisfied with the experience of the 5G-based full-scenario digital display platform; and 8.45% of the respondents are not clear about the relevant situation. It can be seen that there is still room for further optimization in the construction of a 5G-based full-scenario digital display platform to better meet the needs of the public.

5. Conclusions
The use of a 5G-based full-scenario intelligent digital media display platform will not change the purpose of the display design. Instead, it provides a more intuitive and scientific display form for the display design. In the actual display design process, the 5G-based full-scenario wisdom is used The exhibition items of the digital media display platform should focus on quality and content, and all digital media technologies are used to maintain the display effect of the exhibition items. At the same time, designers should not only make new ways of thinking about traditional display design, but also put forward higher requirements for their own comprehensive quality training. The future society is bound to be science and technology, and display design will continue to move in this direction. The relationship between display design and people's daily life will become closer and closer, and any design should go ahead of the times. The integration of 5G-based full-scenario intelligent digital media and display platforms will become closer and closer, and digital media technology will also play a greater role in demonstrating platform effects.

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