

Research on the Application of Computer Big Data Technology in the Visual Communication Design of Urban Construction

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Abstract. This article uses computer big data modelling technology to control urban construction. Use geometric model construction, texture feature extraction and real model construction to realize 3D modelling of virtual city environment scenes. At the same time, we use three-dimensional sound modelling to analyse and summarize the information data of the architectural graphic design, complete the construction of the building information model, and conduct a series of mining and management of the building information data. This describes its basic situation and attributes to optimize the data structure. The experimental results show that the digital plane pigment types of urban construction under visual communication are about 30 kinds higher than the pigment types of traditional graphic design on average. This verifies the effectiveness of the digital graphic design of architectural modelling under visual communication.

Keywords. Computer; big data technology; urban con.

1. Introduction

With the continuous development of Chinese market economy and the continuous advancement of urbanization construction strategies, urban infrastructure construction, industrial construction, cultural construction, etc. have increasingly attracted widespread attention from all walks of life, making social resource tensions continue to increase, and the relationship between cities and cities The competition among them has become increasingly fierce. If a city wants to occupy a favourable position in the fierce competition at this stage and for a period of time in the future, it must give full play to its own characteristics and advantages, conform to the trend of social development and the life concept of the general public, carry out a scientific positioning of the city, and create a liveable and warm an attractive, high-quality city image. At the same time, the image of a city is also a prerequisite for the stable development of the main body and the harvest of ideal comprehensive benefits [1]. Only by creating a high-quality image can a city further attract more talents and capital and provide reliable driving force for urban development. Relying on visual communication to shape the image of a city, and to carry out brand planning for a city with the help of marketing and image planning can not only meet the diverse needs of the public, but also continuously improve the city's market competitive advantage. Therefore, exploring and researching the practical application of visual communication in urban image design has very important theoretical and practical significance.

2. The status quo of visual communication in architectural space

Today's society has changed from an accumulation-oriented society in the past to a consumer-oriented society, forming a social form dominated by economy. People's lifestyles have undergone tremendous changes, and consumer lifestyles have become one of the most fundamental life behaviours to maintain people's survival. Under this premise, the commercialization of design has been caused. A large number of commercial designs have appeared, and complicated visual symbols have surrounded people's lives. Visual communication design has to explore visual expressions and communication rules that are consistent with the principles of industrialization, so as to find the best way of information transmission through scientific research. Architecture has become one of the carriers of visual media. Outdoor advertisements such as large-area high-definition electronic colour display screens and large-scale photo printing can be said to be pervasive and affect people's lives. Especially in the architectural design, the visual communication design has a more prominent impact on the building. The large-character signs outside the building reminding the purpose, the unique logo

of the store, the multi-media advertising design with eye-catching colours and novel composition, etc., the visual communication design has penetrated into the building All aspects. But after the implementation of excellent architectural design, the same outstanding visual communication design enters it, and the problem arises accordingly.

2.1. Coordination of visual communication

In the urban architectural space, people get experience in the process of using and viewing the building. Especially in large public places, commercial advertisements, posters, and various packaging are all promotional tools for commercial products. While people get democratic materials, visual communication should also be dedicated to providing spiritual democracy for most people. Colourful and gorgeous visual communication is essential, but mutual coordination is particularly important. Architecture itself is a work of art, a product of the combination of various knowledge in architecture, and a vehicle for visual communication [2]. There is no problem with the building itself, but the appearance of the building is affected by commercial information in the process of being visualized, resulting in a complex and chaotic appearance of the building, which makes it difficult to distinguish the primary and secondary. From an aesthetic point of view, the artistic effects of both parties will be greatly reduced.

2.2. Indication in communication

Design must conform to aesthetics and be practical, conceive for others, and be people-oriented. The use of visual communication design in architectural space design is inevitable. Because the logo design is based on graphics, with the main purpose of conveying meaning, and emphasizing simplicity and refinement, it is concentrated to almost equal to the symbol itself. It is widely used in architectural spaces, especially commercial buildings. The logo uses the interior and exterior facades of the building as the carrier. This is an appropriate effect of the coordination between the building facade and the logo.

2.3. Graphics-oriented

As a symbol system, graphic signs can convey some information appropriately and accurately. The development of culture and economy has appeared in different fields with their own iconic graphic systems. Express concepts and content such as prohibitions, restrictions, instructions, etc. The graphics system has the following characteristics: creativity, clear and beautiful, easy to identify, simple to make, appropriate standard colours, and so on. Graphical guidance signs are mostly located in horizontal and vertical evacuation areas, emergency entrances and exits, and special use spaces [3]. Pay attention to its statutory and habitual nature when using it, and don't modify it at will.

2.4. Architectural sketch orientation

Architectural sketches with a certain sense of direction and unique shapes, such as sculptures, green scenes, water scenes, etc., will often give different characteristics to the space environment, leaving a deep impression, forming a feeling similar to the logo landmark, thus making this Space is different from other spaces and plays a guiding role. For example, in the Kyoto Cultural Centre of Japan, the deformed giant spiral staircase used by James Sterling, as one of the building elements, can be seen as an architectural sketch. The distinctive image characteristics of the spiral staircase give people a clear sense of orientation and play a role of space orientation.

3. Digital graphic design of architectural modelling

The main functions of the digital plane of architectural modelling design include the collection, classification, processing and output of architectural design-related information. The four-in-one digital plane design requires a scientific and reasonable building information model. Based on this, it can ensure the establishment of the architectural professional database, and further realize the design

of the architectural plane-related constraints [4]. The design process is shown in Figure 1 (picture quoted from Combinatorial Spatial Data Model for Building Fire Simulation and Analysis).

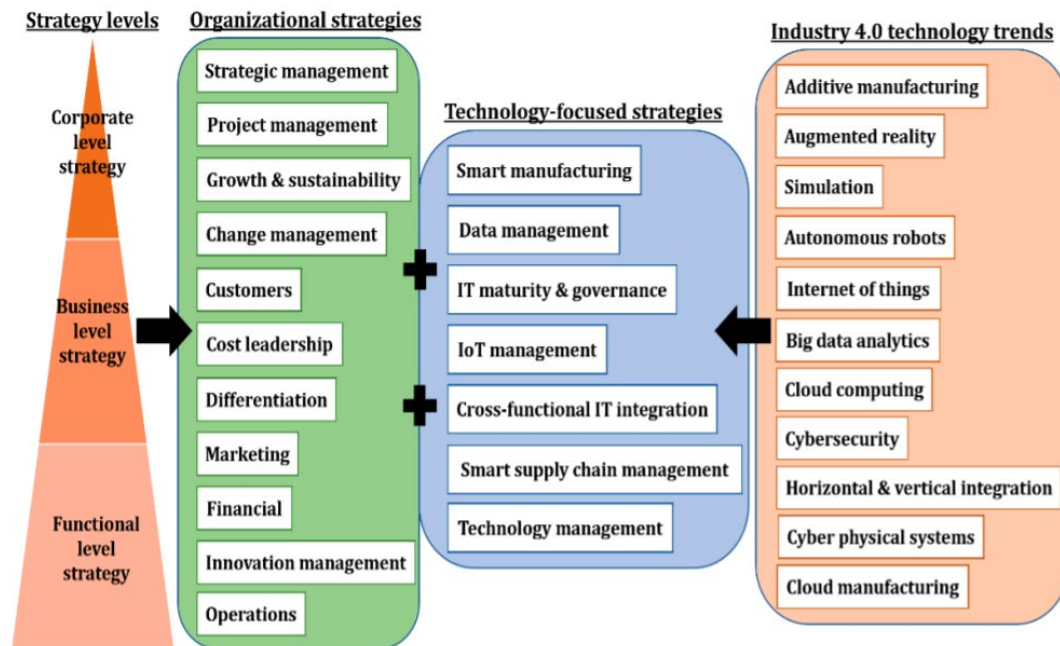


Figure 1. Digital graphic design flow chart of architectural modelling under visual communication

3.1 Building an information model of the building

The construction of building information model is the basis of digital graphic design. By analysing and summarizing the information data of architectural graphic design and designing an information model that can meet functional requirements according to the type of building, it serves as a prerequisite to customize various architectural graphic design functions [5]. The system analyses the plane-related information of the building, and the overall structure of the building information model is shown in Figure 2 (the picture is quoted from the Combinatorial Spatial Data Model for Building Fire Simulation and Analysis).

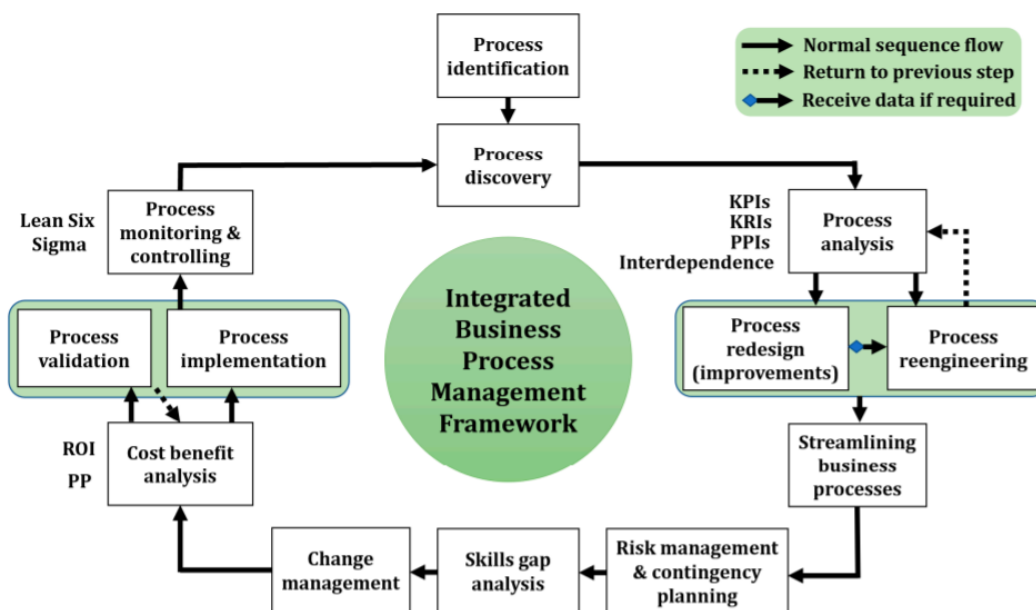


Figure 2. Overall architecture diagram of building information model

The constraints of the connection between the information include: the coordinates of the previous information and the next information are connected, the azimuth angles of the tangents are kept equal, and the curvature is relatively continuous [6]. These association constraints are related to the geometric boundary parameters at both ends of the information. A unified mathematical expression is used to simplify the calculation process. Set the column vector of the previous information as:

$$P_0 = [n, a, b, k, \varphi, m, x, y]^T \quad (1)$$

The latter information parameter is:

$$P_1 = [n_1, a_1, b_1, k_1, \varphi_1, m_1, x_1, y_1]^T \quad (2)$$

The first 4 parameters in P1 are specified by the user, which is equivalent to the calculation of the known first 4 parameters and the last 4 parameters.

Texture feature extraction

Through the object coordinates and image orientation elements, the collinear equation is used to project them to the image to obtain the image coordinates of the objects in the environment:

$$\begin{aligned} X &= X_0 - l \frac{\alpha_1(x - x_r) + \beta_1(y - y_r) + \gamma_1(z - z_r)}{\alpha_3(x - x_r) + \beta_3(y - y_r) + \gamma_3(z - z_r)} \\ Y &= Y_0 - l \frac{\alpha_2(x - x_r) + \beta_2(y - y_r) + \gamma_2(z - z_r)}{\alpha_3(x - x_r) + \beta_3(y - y_r) + \gamma_3(z - z_r)} \end{aligned} \quad (3)$$

Where: X,Y are the plane coordinates of the image point; X_0, Y_0, l is the internal orientation element of the image; x_r, y_r, z_r is the object space coordinates of the shooting site; analyses are the object space coordinates of the object point; $\alpha_j, \beta_j, \gamma_j$ is the external orientation of the image Cosines in 9 directions formed by corner elements, where $j=1,2,3$. According to the image coordinates to obtain the optimal judgment criterion, the best quality images are selected for all sides, so as to extract the object texture in the environment.

3.2 Interaction Design Tactile Design

Use various professional software to introduce environmental art design visual pictures, interactive functions and system integration schemes into actual work and implement them. The sensor is regarded as a human motion collection device, and gestures are designed according to system requirements, and tactile modelling is realized through gesture interaction, thereby controlling the sensory experience of environmental art design [7]. The gesture interaction process is described in Figure 3 (picture quoted from Gesture recognition for human- robot collaboration: A review).

Analyzing Figure 3, it can be seen that when tactile modelling is carried out, people's body language needs to be studied first, and gestures should be designed according to human movement habits; then different actions are defined through the designed gestures; finally, the sensor is used to collect human body movement signals. Mapping the human body movement and the tactile experience function, realizes the sensory experience through the sense of touch.

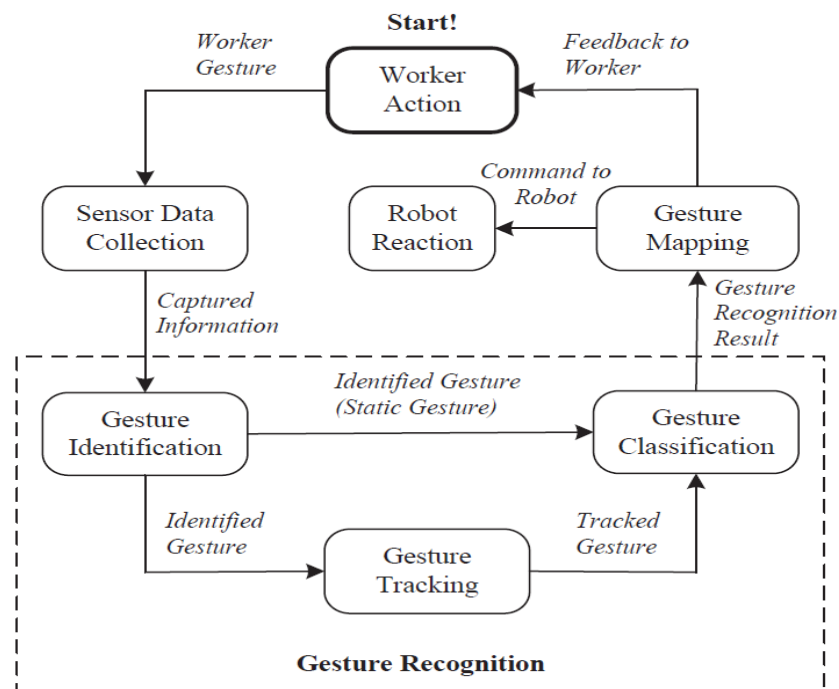


Figure 3. Gesture interaction design flow chart

4. Experimental Design

The digital graphic design of architectural modelling under visual communication proposed in this paper is to show the element colours in the building more intuitively. Therefore, in order to ensure the validity of the digital graphic design of architectural modelling under visual communication, the design is compared with the traditional graphic design, and the experimental results are analysed [8]. Five sets of architectural plans are selected, each of which includes a building, and the digital graphic design is carried out using the method of this article and the traditional method respectively, and the types of pigments included in the graphic design are counted. In the above-mentioned experimental environment, a comparison chart of the pigment type results of the traditional method graphic design and the graphic design method of this paper was obtained for 5 sets of schemes. For the convenience of comparison, a statistical diagram was drawn, as shown in Figure 4.

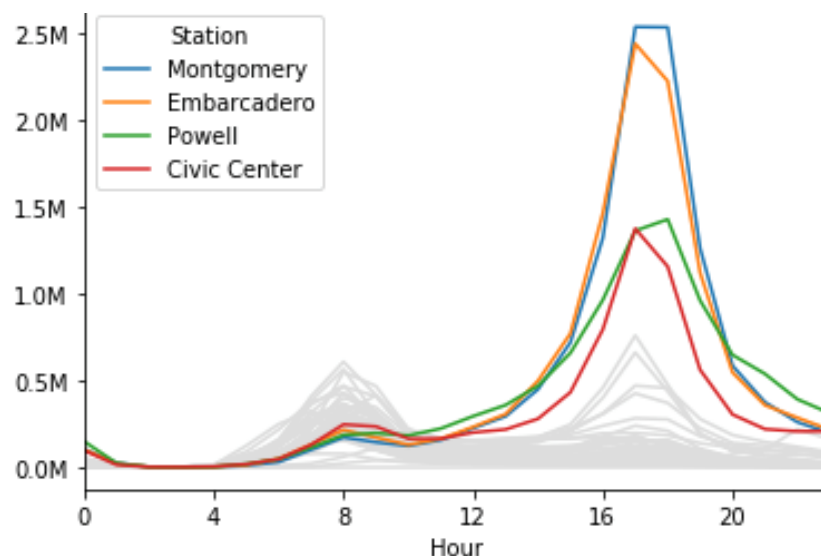


Figure 4. Graphic design colour type comparison chart

5. Conclusion

Urban architectural space design and visual communication design are closely linked. In the process of design implementation, designers must grasp the two sharp tools of architectural design and visual communication design and make them for their own use. This paper proposes the digital graphic design of architectural modelling under visual communication to enrich the visual effects of architectural modelling graphic design. The elements presented in the digital graphic design of architectural modelling under the mentioned visual communication are rich in colour, which can give people a sense of beauty visually, which verifies the effectiveness of digital graphic design of architectural modelling under visual communication.

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