

Real-Time Feedback Data System with 4D Printing in Clothing Design and Manufacturing Collaboration

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Abstract: 4D printing is used to carry out the deployment control of the space mechanism, the on-orbit deformation control of the antenna width, the temperature self-feedback control in the space environment, and the on-orbit self-repair. With the rise of cultural and creative industries, the public is paying more and more attention to the cultural innovation design of bamboo products. Taking "bamboo" as the theme, combined with the application carrier, on the basis of inheriting the traditional bamboo weaving skills, the application development of the real-time database system forms the application development of the real-time database system to form the production monitoring and management content of the coal chemical branch company. Try to use modern cultural creative design. The method explores the charm of bamboo culture, and extends the basic pattern to the whole set of cultural and creative product design by means of visual translation. The preparation methods and properties of shape memory polymers and their composites suitable for 4D printing are summarized.

Keywords: Real-Time Feedback, 4D Printing Technology, Cultural and Creative Product

1. INTRODUCTION

The 4D printing concept was proposed in 2013 by MIT researcher Skylar Tibbits in collaboration with 3D printer manufacturer Stratasys [1] and 3D design software developer Autodesk. SMPs have the advantages of low density, large deformation, convenient processing, and cheap raw materials. The degree of response to external stimuli can be adjusted by chemical methods [2], thereby realizing the multi-functionalization of materials. Therefore, SMPs are called new smart materials. potential application value.

In today's society, production technology and production technology are constantly [3] developing and improving. In some respects, manipulators have gradually replaced human labor. It can not only be used in actual production, but also can meet the frequent repeated operations in assembly operations; it can also be used for teaching experiments [4]. and scientific research, in the fields of aerospace, deep-sea exploration, and hazardous material removal. During the operation of rotating machinery, there are physical [5] quantities such as vibration, noise, temperature, and pressure. Among them, the vibration signal contains a wealth of operating state information, and is the main signal reflecting the system [6] state and its changing laws. Therefore, the data acquisition of the vibration signal is an important part of the failure analysis and operation trend prediction of mechanical equipment [7].

Umberto Eco proposed explicit signification and connotative signification. Max Benzer and Elisabeth Walter systematically organized [8] the theories of Pierce and Morris and tried to apply them to the study of aesthetic problems. Therefore, the basic theory of semiotics still occupies every corner of life with the advantages of Saussure's signifier and signified [9], lightness and convenience, and the market demand for bamboo woven products is gradually declining. This paper takes the traditional bamboo [10] weaving skills of Wuyi Mountain's intangible cultural heritage as the research object, combines the advantages and characteristics of bamboo materials, organizes, refines and translates [11] the symbols of bamboo weaving utensils, weaving techniques and other elements, and applies them to the design of cultural and creative products to [12] spread Wuyi bamboo weaving.

culture. Compared with 3D printing technology, 4D printing technology has an extra "D" [13]. The extra "D" refers to the latitude of time. To be precise, it is a new type of material that can be deformed automatically [14], without any complicated help. The electromechanical equipment can be automatically folded into the corresponding shape according to the pre-designed product and meet the performance requirements [15].

The key to 4D printing is memory alloys. When it comes to databases, by default [16], it generally refers to relational databases, but in fact there are other types of databases that are widely used in production and life [17], such as the real-time databases mentioned, which are used in very demanding, in- In industrial control enterprises with a very large amount of data in industrial production [18]. The cultural and creative industry is to integrate "culture" into product design and "creativity" into products, which has become the key to enhancing product value [19]. The first place where the cultural, creative and creative industry was initiated was the UK. With the gradual disappearance of the labor industry and the technology industry [20], the cultural and creative industry began to emerge, which is different from the previous two industries. 4D refers to the self-assembly of 3D printed objects over time, and t in the broader [21] 4D printing technology is to characterize all the variable parameters implied in the four-dimensional printing material. 3D printing technology originated in the mid-1990s and is a new technology that uses light curing and paper lamination to realize rapid prototyping of objects [22]. The printing device is filled with printing materials such as liquid or powder, and the printing materials are superimposed layer by layer through computer control, and finally a 3D structure is obtained [23]. The control system can adjust the driving parameters according to the data obtained by the sensing system, so as to determine the action of the manipulator.

In the above-mentioned idea of intelligent robot. Data acquisition and feedback [24] control are very important technical links. However, most of these data acquisition systems are open-loop control systems, which lack feedback control of rotor speed. In order to meet the needs of remote network experiment, the computer control of rotor speed must

be realized. Aiming at the above situation, a data acquisition system with feedback control of rotor speed is developed.

2. THE PROPOSED METHODOLOGY

2.1 The 4D Printing Technology

Although the process of 4D printing the structure to realize the change of the letter "MIT" may seem simple, it contains the elements of 4D printing technology: 4D printing technology directly embeds the design into the material, which simplifies the creation process from design concept to physical object, including programmable Smart materials (structures), programming design. The research on 4D printing is still in its infancy, and the rapid rise and development of 4D printing relies on the collaboration of 3D printing equipment, smart materials, and model design.

As shown in Figure 2, 4D printing technology mainly involves four aspects: (1) 3D printing technology, mainly including Fused Deposition Modeling (Fused Deposition Modeling, FDM), Direct Ink Writing (DIW), digital light Processing technology. The traditional weapon equipment manufacturing process is: manufacturing → deployment → use → scrapping, while the 4D weapon equipment manufacturing process is: semi-finished product manufacturing → deployment → on-site shaping → use → recycling → redeployment. The weapons and equipment produced by 4D printing can optimize the attack performance of weapons according to the environment and attack target, thereby improving combat effectiveness. Thirdly, the 4D printing structure needs environmental stimulation to trigger, so that the structure changes according to the program settings. At present, the common trigger media are water, Electric, magnetic, thermal, chemical, etc., to study the triggering mechanism corresponding to different smart materials, can meet the needs of 4D printing for different smart materials and different triggering methods. Thermotropic SMPs Because the substrate SMPs themselves are thermally responsive, the addition of fillers is generally It will not change the response mode of SMPs, so there are many kinds of fillers that can be added. According to the morphology of functional fillers, SMPs can be divided into particle-filled and fiber-filled.

4D printing technology can make more weapons and equipment into a folded state, which is convenient for remote maneuvering. At the same time, the semi-finished products printed by 4D will have stronger moldability and environmental adaptability, and it is also expected to reduce the type and inventory of equipment, improve logistics efficiency, and exert stronger combat effectiveness. 4D printing technology is a multidisciplinary interdisciplinary science. , involving optics, electricity, magnetism, heat, chemistry, mathematics, materials and other majors. At present, 4D printing technology is still in the laboratory or conception stage. U.S. invests in research and development of 4D printed combat uniforms.

2.2 The Real-Time Feedback Data System

In the existing intelligent feedback control system. Many researchers use microcontroller programming as the core control part of the whole system: some researchers also use MARC technology. A feedback controller is introduced to achieve differential synchronous control of the system. However, these methods are relatively expensive, and the procedures are more complicated, and they are not universal to most instruments. Because the rotor vibration signal collected by the sensor may be very weak, or contain a lot of

noise, or be nonlinear. Therefore, the signal needs to be preprocessed at the front end before entering the acquisition card to minimize the influence of the interference signal, improve the signal-to-noise ratio, and amplify the weak signal output by the sensor.

PIProcessBook is the graphic display interface of OSIssoft's PI real-time database system. It is simple and easy to operate, and can effectively display real-time data and historical data, and store it in other sources of the PI system. In the production process, we can easily use PIProcessBook to create an interactive graphical interface, the display interface can be saved in real time, and can also be shared with others. Some ideas have also been put forward in terms of infrastructure applications, such as the use of 4D printing technology to manufacture self-changing pipes, which have the function of expanding or shrinking pipes, avoiding the shortcomings of traditional pipes with fixed flow velocity, driving motors and valves, and difficulty in changing; through 4D printing The technology manufactures pipes with environmental awareness and self-healing function after damage. The two fingers of the manipulator are controlled by two stepping motors respectively to realize the opening and closing of the fingers. The minimum step is 1 degree. In the control circuit, the single-chip ATMEGA8L is used to program and control the actions of the two stepping motors. It is only necessary to send different instructions to the control circuit through the serial port to control the direction and angle of the rotation of the two fingers respectively.

Due to various electronic interferences in the test environment where the system is located and the influence of the test system itself.

2.3 The Application in Cultural and Creative Product Design Training Environment

Using the signifier and the signified to interpret cultural symbols is helpful to explore the relationship between the product expression layer and the inner layer. Wang Wei interprets the shape and composition of Tujia patterns from the perspective of the signifier: the four plums and the double plums are mostly square and diamond, and follow the symmetrical form. Interpret the color from the point of view: because the Tujia people have the custom of "chasing the white tiger", they "avoid using white" in color. unique characteristics.

Therefore, when designing cultural and creative products based on Zhuang dry fence buildings, certain principles must be met in order to meet the requirements of local cultural and creative design. The elements of life are extracted from the ancients' lifestyle of "drawing water from bamboo troughs"; bamboo slips are the main writing tools before the invention of papermaking, so the image of bamboo slips is used for literary elements to represent the use of bamboo in literature; utensils are mainly extracted from bamboo strips All kinds of production and living utensils made, such as bamboo sieves. Craft elements mainly refer to various handicrafts woven from bamboo. However, the idea of "controller is still like" has not been explained in depth. Signifier and signified can comprehensively interpret symbols, including external representation and internal meaning. However, there are currently "shapes" that use signifiers to interpret forms, and "meanings" that use signifieds to interpret colors, as well as in-depth interpretation of the relationship between signifiers and signifieds. 4.3 Bamboo bag and bamboo fan design Bamboo bag and bamboo fan design apply the growth process

and color gradient of bamboo to series products. Drawing on the surface of the product not only retains the aesthetics of the object, but also spreads the bamboo culture. Take the bamboo bag making process as an example to illustrate. The configuration parameters contained in industrial control data mainly include real-time data and control data.

The real-time data reflects the operation status of the industrial field equipment and can be divided into three switches: simulation, quantity, and volume. Simulations are used to describe data types as integer, floating point data such as temperature, water level, current field, etc.

3. CONCLUSIONS

The development of 4D printing in the future still depends on interdisciplinary research and technological progress in various fields, such as 3D printing technology and smart material science. The inheritance and development of Wuyi bamboo weaving skills have been greatly tested. This topic takes Wuyi traditional bamboo weaving skills as the object, through the research and development of cultural and creative products, cross-border cooperation between intangible cultural heritage culture and creative products, so that the bamboo weaving culture has a richer level of interpretation, and also builds an effective cultural memory and emotional connection for the audience. Only in this way can the Wuyi bamboo weaving skills be truly activated and passed on.

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