Research on new Energy Vehicle Modeling Design based on the Converge of Art and Technology

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Abstract—In the digital age, the vehicle has gone beyond the basic property of the vehicle has gradually become a mobile data port. From the perspective of users, the comfortable, safe and high-speed driving experience of vehicles no longer meets the needs of users. In the future, vehicle will become an important tool for mobile life service. Therefore, the vehicle artistic modelling design is bound to the direction of digital, intelligent development. In this paper, the key factors affecting the vehicle art design are analyzed comprehensively and systematically, and the law of the new energy vehicle art design is explored from two aspects of technology and art. Then the method of new energy vehicle art design is discussed.

1. INTRODUCTION
At present, new energy vehicles are booming in the world, and the automobile industry is entering the new energy era. Because the overall shape of new energy vehicles is evolved from the traditional fuel vehicles. As a result, the appearance and interior of new energy vehicles are not very different from the traditional vehicles due to the restrictions of materials and manufacturing technology. If the system of human - car - road is regarded as a unitary, the system operation is dependent on the network. After mobile phones become people’s mobile data ports, the vehicle has become an important tool for mobile service life. The art design of new energy vehicles has become a complicated system engineering. In addition to functional, materials and manufacturing process, vehicle modelling is closely related to the aesthetic brand, as well as the development of digital technology. As we all known, the internet and driverless technology have changed the way of vehicles art design. Therefore, it is necessary to explore the law of development of vehicle artistic modeling from the aspects of art and technology, and combine the investigation and research of user experience in order to develop innovative ideas of vehicle artistic modeling.

2. EXPLORE THE MAIN FACTORS OF ARTISTIC MODELING DESIGN OF NEW ENERGY VEHICLES
Contemporary outstanding painter Zuoren Wu said: “Art and science are the two pillars of human civilization, people used to forward with two legs, it is impossible to lose one”. By all means modelling design of new energy vehicles is a systems engineering, and also have to rely on both legs of art and technology to move forward. As mention above, the summary from the vision of innovation design are mainly five factors: as shown in figure 1. The elements of human body engineering, mechanical engineering, fluid mechanics as well as input and output information belong to the technical elements, while aesthetic mentality belongs to the art elements. These five elements supplement each other mutual influence of the vehicle model change (see figure 1)
In vehicle modeling design, we should not only consider the user's perspective, but also consider the three levels of cognitive emotional behavior in user experience. It is an effective method for vehicle artistic modeling design to combine the above factors with technical factors after the refinement of artistic design. At the present stage, intelligentization has completely changed the human-vehicle-road interaction of the vehicle, which will inevitably lead to a series of design changes such as the appearance and interior of the vehicle car. In the digital age, the new intelligent information input and output equipment such as camera and sensor should also be taken into account in the vehicle modeling design. With the development of unmanned driving technology, fully automatic driving will be the future development direction. The upgrading of these technologies means the iteration of modeling design, which will ultimately affect the artistic modeling design of the vehicle.

3. BASIC LAW OF NEW ENERGY VEHICLE ARTISTIC MODELLING DESIGN

In the fiercely competitive automobile sales market, users' aesthetic needs cannot be ignored. Due to the diversification of users, aesthetic tastes also show a trend of diversification, thereby the vehicle modeling design becomes more and more complex. Throughout the development history of 100 years vehicles art design, vehicle shape evolution is followed by the footsteps of art and technology progress. The original appearance of vehicle is developed by the carriage. It has experienced the box type, beetle (streamline) type, ship type, fish type, wedge type. [1] In addition to the aerodynamic factors, users' aesthetic demand for vehicle design and the inheritance of brand characteristics are important factors. The artistic trend of each period has a very obvious influence on vehicle modeling and design. The simplicity and rationality of modern design gives rise to streamlined, organic sculpture and bionic design, leading to the birth of fish-shaped car, ship-shaped car and wedge shaped car. Therefore, designers have to look at art trend, at the same time grasp the balance between globalization and national aesthetic, the balance of the traditional culture and modern science. Designers should apply digital technology into the art design of vehicles modelling. Vehicle modelling design includes not only the body shape, lines, color, but also the appearance of the texture, three-dimension space, information input and output interface, etc. It is an effective method to draw the essence from traditional culture, [2] extract the of national art elements, and the apply of traditional arts and handicrafts to modelling of the vehicle.

The artistic modeling law of new energy vehicles is the organic integration of cultural inheritance and scientific and technological innovation. Due to the constraints of price, culture, production technology and other aspects, the majority of Chinese consumers' current cognition of new energy vehicles is only limited to the sense of conservative, balance and moderation. [3] At present, China is investing heavily in the new energy vehicle industry, while foreign countries have the commanding heights of traditional vehicle technology. The development of new energy vehicles has become an important inflection point of opportunity and a new direction of future automobile development. With the vigorous development of domestic society and economy, and the strong impact of foreign cars, people's aesthetic taste of vehicle artistic modeling is constantly improved. And the public's acceptance of novel and avant-garde modeling elements is getting higher and higher, which makes designers' creation space get rid of many of the original constraints. The appearance design of new energy vehicle will be more perfect. The development of culture and art has brought a broader space for the shape design of new energy vehicles, which has a profound influence on the shape design of vehicles from both spiritual and material aspects. [4] The main artistic elements of the artistic modeling of new energy vehicles include the overall shape, color, texture and decoration. The above factors are supplement each
other, and each factor is influenced by culture and art. The correlation between art and vehicle modeling is shown in Fig 2.

![Figure 2. The correlation between art and vehicle modeling](image)

### 4. THE RELATIONSHIP BETWEEN ARTISTIC MODELLING AND TECHNOLOGY DEVELOPMENT OF NEW ENERGY VEHICLE

Through the exploration and analysis of artistic design factors and technical factors in new energy vehicles. The artistic modeling of new energy vehicles can be preliminarily divided into three parts from the structural formula: exterior decoration, interior decoration and chassis for general classification. Meanwhile, the derived details all have corresponding technical levels. As a whole, it forms a network of art and technology. Whether for artistic or technical reasons, the development and change of each factor will affect the whole and present in different ways. (See Fig.3) The two influence each other cannot exist independently. In the future the modelling art of new energy vehicle will be influenced by the development of technology is fundamental, while the changes of art trends will continue to have a significant impact on the development of new energy vehicles. It is an important strategy of the development of new energy vehicles to explore the relationship between art and technology and to develop their advantages. [5]

![Figure 3. The correlation between technology and vehicle modeling](image)

### 5. NEW ENERGY VEHICLE ART MODELING DESIGN PRACTICE

#### 5.1. Geely Holding Shares the design of the Luxury electric Evija

The styling design of Geely brand perfectly combines strong tension with dynamic fashion style, and integrates Chinese ethnic elements into it. Geely embodies the noble atmosphere and smooth elegance that are unforgettable once seen. And the British famous sports car brand Luster modeling design is known as strong power, balance and precision. The design of the top luxury sports car Evija embodies the strong alliance between Geely and Luster and represents the brand new image of Luters under the support of Geely Holding. [6] Her birth pushes the brand experience of Geely and Lutus to the extreme.
Combining the advantages of the two brands, its smooth lines and dynamic shape represent the modeling semantics of future electric cars, and the unique front grille highlights the identity characteristics of electric cars. In order to cater to the preferences of young groups, Evija presents the avant-garde, sports and cool appearance. Its appearance looks like a coupe. Evija's interior design and appearance style to maintain unity, simplify all unnecessary decoration. The release of pure electric Evija is the renewal and upgrade of the Lutes brand. Different from the traditional vehicle, the core of electric vehicle is the motor, battery, electric control and chassis, which determine the grade of electric vehicle. Evija redefines the Road's future 100km acceleration in just 3 seconds with a top speed of 320 km/h. Evija's target range is 400km; It can be fully filled in 18 minutes. At the same time, the sustainability of power output is also a highlight. As an epoch-making product that embraces the future, Evija offers drivers the full range of digitally connected Infotainment cars. The system can provide wireless software updates and users can check the status of the vehicle through their mobile phones in real time. Evija's overall styling design is also innovative. This model not only has the characteristics of a sports car, but also has superior handling performance. (See Figure 4-7)

From the front face of the Evija car, the grille is lowered and shrunk, the lights and grille are integrated, and the protrusion of the hood on the left and right sides and the downward sloping hood form a forward posture. The waist line on the side of the Evija car is unique. The hub line is hale and hearty, the wheel and the body are in harmony. The rear shape of the Evija car highlights the taillights. Externally, there are special bumpers and rear spoiler to improve aerodynamic performance, and air vents for cooling are added to the rear wheel arch. The front and rear bumpers, doors and rear fins are made of carbon fiber.

5.2. Based on the BMW Z4 platform and user experience of the concept car styling design
The BMW Z4 is a typical coupe, with a long hood that almost lands on the rear axles with very snug seats. The upward-sloping tail is attractive, and the sharp curves on both sides give it a very aggressive look. Combined with the three elements of user experience, the iterative modeling design of BMW car was created. The front face, the side face and the rear end were improved. The front face was redesigned with grille and headlights. The upper and lower grille is the whole. The grille's color material is consistent with the body. The headlights are changed into slim and slender laser lamps, as shown in Figure 9, the overall modeling of the front face of the car. In addition to the continuation of BMW's hard style, the edges of the body side are redesigned with the trend of fading edges. The modeling language is still the feeling of three-dimensional flame. The headlamps are arranged in the longitudinal cavity of the previous generation, as shown in Figure 10, the overall modeling of the body side. The grille is still BMW's signature two-kidney grille, and the tail wing is partially upturned to continue The Bango's hip. Tail light changed to hollow suspension tail light. See Figure 11. The three images respectively represent the organic profile language, the grille processing mode of electric vehicle, and the dynamic force of dragonfly applied to the relationship between grille and light group.
The sketch was deduced with the idea of first diffusing and then contracting, and the final renderings of the vehicle are as follows (Figure 8-11).

![Overall rendering](image)

**Figure 8.** Overall rendering

![The overall shape of the front face](image)

**Figure 9.** The overall shape of the front face

![The overall shape of the side](image)

**Figure 10.** The overall shape of the side

![Back shape of the body](image)

**Figure 11.** Back shape of the body

From the perspective of art design, this concept car based on BMW Z4 continues the brand characteristics of BMW coupe. Meanwhile, the aesthetic psychology of the public should also be considered. The design of this concept car is trying to reflect the fashion. Designers apply the dynamic three-dimensional flame and dragonfly wings to the profile of the vehicle. The shape of the vehicle and the rear wing of the vehicle constitute a full of vitality organic form.

From the technical level, panoramic video technology will be widely used, the central console will use touch control of the large display. Cars will also be able to make reliable judgments about the outside world through their own sensors. Camera, radar, lidar, ultrasonic radar or cellular vehicle networking communication technology (C-V2X), each with its own advantages, each is able to
complement another. [7] Let the car be able to "see six ways". The epidemic has prompted all people to use digital tools more frequently to communicate and collaborate online, and to exchange information faster and faster. The epidemic is pushing humanity into a more digital future. The digital process undoubtedly reduces the time and cost of the entire car design. In terms of functions, no matter the exterior decoration or interior decoration, automatic driving or auxiliary system, a unique new energy vehicle can be designed in a short time.

6. THE DEVELOPMENT TREND OF NEW ENERGY VEHICLE MODELING UNDER THE CONVERGE OF ART AND TECHNOLOGY

In the context of the integration of art and technology, the development trend of new-energy vehicle modeling will be more scientific, more humane and more reasonable. In the new energy vehicle modeling, exterior decoration, interior decoration, vehicle and machine system are all interrelated parts. [8] From the overall perspective of the new energy models at home and abroad in recent years, their styles are diversified, each brand is committed to creating unique genes, and the multi-culture is constantly integrated. Gradually form a new energy vehicle features of the design language. [9] The styling design of the vehicle has the following characteristics; The body shape tends to be integrated, and various color schemes are a design trend. Rich and varied shapes enhance the sense of fashion and innovation of design. Enhance the sense of future and technology by using dynamic and dynamic planes. Simple LED front and rear headlights are more full of design sense. There are also changes in the interior design corresponding to the exterior design. The interior design reflects a linear aesthetic, touch-screen controlled electronic displays will become common, and the operating system will become simple, applicable and sensitive. The use of natural environmental materials such as wood has become a trend. The seat USES modular design, can move and turn, at the same time create a more flexible sense of space. It is necessary to add the internal functions to the interior design of the vehicle to iterate office, travel, home, and to improve comfort of passenger. The organic combination of a variety of materials serves as the design highlight. The whole interior space appears comfortable and warm. [10] In-Vehicle Information System (IVIS) has been gradually applied in new energy vehicles. The human-computer interaction interface in the cab is gradually transformed from physical buttons and physical instrument panel to integrated digital display interface.

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