

Product Design of Intelligent Blind Guide Stick Based on Humanistic Care

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ABSTRACT

At present, it is well known that there are a large number of visually impaired people, assistive devices is not provided adequately and barrier-free facilities is not also advanced. Thereby, this paper conducts user experience and analysis produce in the market, and seek clear position to design practice. Eventually, the purpose devotes to developing a functional, humanistic and driven intelligent guide rod and constructing a effective research path in order to help related people easily travel daily life. This blind guide stick through research and design not only solve product functional aspect, but consider humanistic care and emotional fields, using intelligent technology to meet blind group needs and increasing product more sustainable values and market prospect.

Keywords: *Visually Impaired, Humanistic Concern, Intelligent Blind Guide Stick*

1. INTRODUCTION

Globally, an estimated 1.3 billion people suffer from some form of visual impairment, according to data released by the World Health Organization on 11 October 2018. There are a large and increasing number of people with visual impairment, and impaired visual function has a huge negative impact on their living ability and life experience. With the gradual development of urban transportation, the travel experience of visually impaired people is getting worse and worse[1].

Generally, guide dogs are one of the most common ways for visually impaired people to travel. At present, there are many practical problems that are difficult to solve. During the use of guide dogs, visually impaired people are adversely affected in psychological, emotional and social life[2].

This paper analyses the present situation of the visually impaired and auxiliary appliance, and combines with the scientific and systematic design process, which contributes to designing an intelligent seeing-eye products, and lifting user satisfaction and social care.

2. DEVELOPMENT STATUS of ASSISTIVE DEVICES for the VISUALLY IMPAIRED

The common way for visually impaired people to travel is the use of guide dogs, guide canes, guide glasses,

guide vests and other visually impaired people's appliances. Traditional AIDS for visually impaired people focus on the basic functions of the products, but user experience is less concerned. In the market, a bunch of products are great instability and singleness, the safety factor of visually impaired people's actual travel cannot be guaranteed, so the design and research of intelligent guide rod is urgent.

3. DESIGN and PREPARATION of INTELLIGENT GUIDE ROD

3.1. Research on the current situation of visually impaired people

3.1.1. Research process

The user demands of visually impaired people are studied from multiple dimensions, and research methods such as literature method, competition-driven method and field investigation method are used to combine theory with practice to construct a scientific and feasible whole research process. The main process is as follows:

3.1.1.1. Literature

Research direction in the identified under the premise of the same products market research analysis, through the networks, papers, industries, magazines, exhibition,

games and so on, these channels to collect related information and dates, which includes product kernel thought, key technology, the advantages and disadvantages etc..

For example, The Glasses for the Blind designed by Lumen Romania uses the latest autonomous driving and robotics technology to mimic the key functions of guide dogs and apply it to wearable devices using internally developed tactile and auditory feedback mechanisms to complete user commands. The design won the Red Dot Best Design Award of 2021 and the Red Dot Star of 2021. Its advantage lies in avoiding the limitations of using guide dogs, meeting the user needs of visually impaired people, providing relatively safe and intelligent way of travel, and overcoming the shortcomings of other solutions that are not scalable.



Figure 1 Glasses for the Blind

3.1.1.2. Competition drive

Use of the design plan to participate in related events, including Internet + 2021 college students' innovative entrepreneurship competition, college students' innovative entrepreneurial training plan, jiangmen "mayor cup" industrial design contest 2021, 2021, "a guest in guangdong jiangmen" small and medium-sized enterprise innovation entrepreneurship competition, etc., through expert review product design and market feasibility of defects, Identify problems, and constantly upgrade and improve product solutions.

3.1.1.3. Field investigation

Field research mainly survey on local organizes, communities and people group. For example, it was conducted in Enping Disabled Persons' Federation of Jiangmen city, New Hope Social Work Organization, etc. Under the guidance of social workers and volunteers, the service areas of the organization were visited to explore the welfare policies, the lifestyle of blind people, the development degree of visually impaired products and media publicity channels. Among them, we know that there are about 2,000 people with different degrees of visual impairment in Enping City, Jiangmen. Ordinary blind sticks with prices ranging from 100 yuan to 500 yuan are commonly used in daily life. In addition,

intelligent products are relatively lacking. The following is an analysis of similar products of assistive devices for visually impaired people:

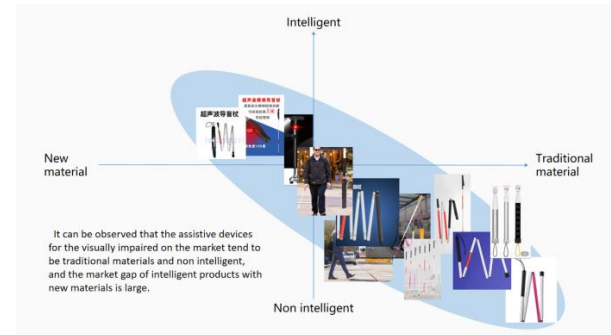


Figure 2 Polar coordinates

According to the field investigation, the user portrait of the crowd including the youth stage and the middle age stage was carried out:

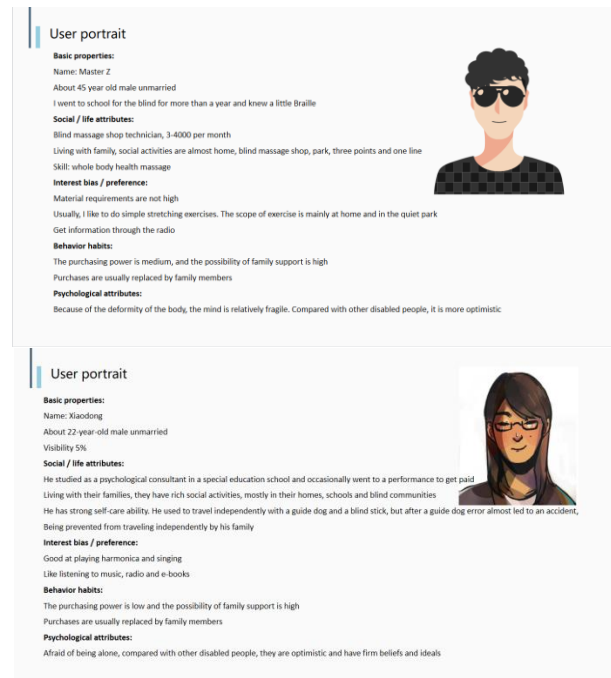


Figure 3 User portrait

3.1.2. Survey summary

The problems were found as follows via research methods mentioned above:

- ① At present, the number of people using intelligent visual impaired assistive devices is small, mainly limited by price, product popularity and other restrictions;
- ② There is a wide range of research on intelligent assistive devices for visually impaired people in the academic world. However, few related products have entered the market for quantitative production, and the research and application of products are separated from each other;

③ The use of guide dogs has great limitations, reflected in the cost of guide dogs, breeding difficulties, and the use of guide dogs to a certain extent against the nature of animals;

④ The visually impaired people have different degrees of psychological problems due to lack of vision and mobility.

Therefore, product design should pay attention to functional and psychological factors.

3.2. Market forecast and development trend

3.2.1. PEST analysis

① Political analysis

China has been paying attention to the disabled group, and has formulated relevant policies for the disabled group, including economic assistance, daily life assistance and subsidies for seeking medical care. In recent years, China has issued a number of policies to encourage and support the development of rehabilitation and medical care for persons with disabilities, involving The State Council, the Ministry of Finance, the China Disabled Persons' Federation and many other departments and organizations.

Among them, the "14th Five-year Plan for the Protection and Development of Persons with Disabilities" issued by The State Council in 2021 points out the direction for further protecting the livelihood of persons with disabilities and promoting their development. "Improve the system of care and services for persons with disabilities, and improve the quality of public services such as rehabilitation, education, culture and sports for persons with disabilities." Accelerate the development of rehabilitation assistive device services.

② Economic analysis

According to the data released by the Ministry of Civil Affairs, the scale of the national rehabilitation assistive devices industry in 2020 will be about 700 billion yuan. With the increase of residents' income and the introduction of relevant policies, as well as the huge demand, the market size of China's rehabilitation assistive devices industry will maintain an average annual growth rate of 15%. It is estimated that the market size of rehabilitation AIDS in China will exceed 1 trillion yuan by 2025.

China's rehabilitation assistive devices industry is still in its infancy. The huge number of disabled people determines the market demand for rehabilitation assistive devices in China. Driven by multiple factors such as relevant policy support, it will have broad development prospects in the next decade [3].

③ Social analysis

At present, the sales channels of products for the disabled in China are mainly in the form of welfare institutions and government procurement and donation. According to the data of Main Business Progress of China's Cause of the Disabled (2014-2018) released by the China Disabled Persons' Federation in 2019, as of 2018, the supply of assistive devices for the disabled in China only reached 3.191 million people. The market system is not yet sound. With the improvement of China's economic strength and civilization, the proportion of social investment and family expenditure for the disabled will continue to rise.

④ Technology

The AIDS for the visually impaired in China are low in technology and single in performance, which cannot truly meet the living needs of the visually impaired. The basic principle of the existing electronic devices to assist the visually impaired is to convert some of the above information that the visually impaired cannot obtain into other sensory information. Of these, touch and sound, or a combination of both, are relatively ideal and often used.[4]Therefore, related technology research may become the future development trend and focus of the industry.

3.2.2. SWOT analysis

The research on assistive devices for the visually impaired started late in China, and the existing technology level is low, which is relatively backward compared with the products in the international market. In addition, there are few assistive devices for the visually impaired available through common purchase channels in China, and the supply on the market is far from meeting all market demands [2]. The following is the SWOT analysis:

Table 1. Competitive SWOT analysis

S	W	O	T
① The trend of domestic economic development is improving, and the state has strengthened its support for scientific research in colleges and universities.	① Limited technical difficulty and landing cost.	① The domestic market is relatively immature and has a large space for development. ② Policy support.	① There are few product cases for reference on the market, and experimental resources are limited.

4. PRODUCT DESIGN SCHEME

4.1. Design position

Visual acuity status was a significant determinant of quality of life. Visual impairment significantly affects people's overall health status, including daily life (self-care degree, social interaction and various activities), mental health and social burden. Visually impaired people are a special group.[5] Due to lack of vision and lack of sense of security, they are prone to inferiority complex. For visually impaired people, complex design concepts add to the burden of use. Therefore, it is necessary to do subtraction properly in product design. The product is designed to satisfy the needs of visually impaired people by focusing on senses other than vision. Through the analysis of visually impaired users, the design direction of "safety, guidance and lighting" is obtained.

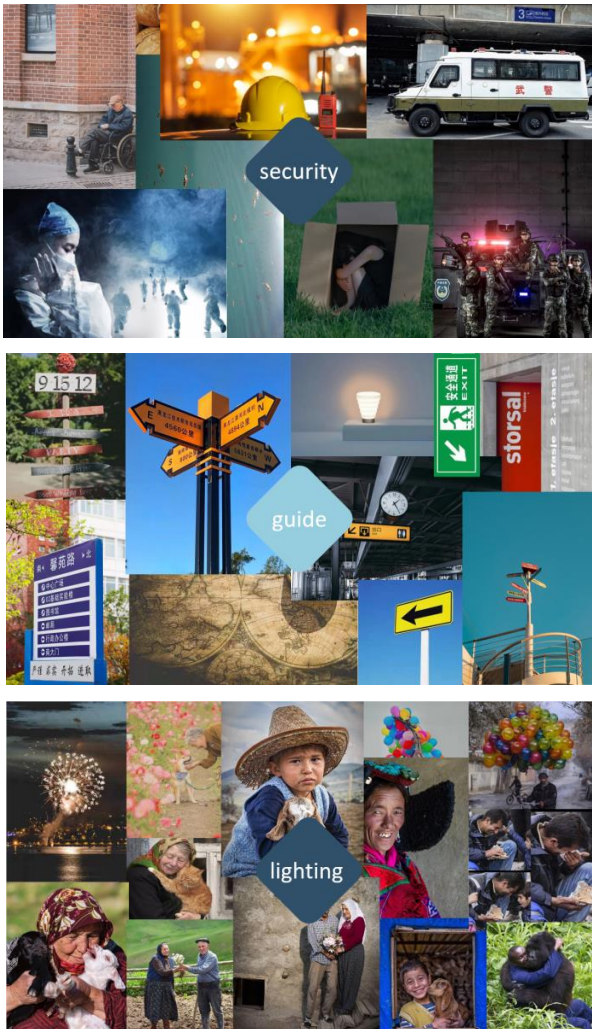


Figure 4 Keywords emotional template

Emotional design is applied in product modeling design to give users more pleasure [6]. The design source from a similar and emotion product—flashlight, which is pointed out in this emotional boards and is best

represent three position words. Then blind stick is thought with the flashlight as the prototype. The appearance of blind stick with telescopic function, which solves the problem of inconvenient carrying of traditional AIDS for visually impaired people. In addition, the world of the visually impaired is dark, and a flashlight means light. Thus, our products aim to improve the quality of life of the visually impaired while helping them maximize their social value.

The function of the product deeply considers the user experience, with the five senses as the focal point, and makes up for the lack of vision by improving other sensory experience besides vision. Braille buttons, voice vibration warning, night warning lights, wireless charging and other functions are used in the design to maximize the travel experience and safety of the visually impaired.



Figure 5 Product function analysis

4.2. Product Solutions

Combined with the design positioning, the product CMF is set as follows, and the design scheme is presented in the form of 3D through modeling.

4.2.1. COLOR

Three sets of color schemes are designed. Under the original international standard colors, bright colors in small areas are used to provide warning and meet the requirements of different groups.

4.2.2. MATERIAL

Intelligent guide rod will be used as daily necessities for the visually impaired. The material is mainly characterized by strong material, good ground information conductivity and light weight.

①The rod body is made of carbon fiber material, and the rod body is attached with reflective film, which can effectively reduce the use burden and play a role of safety warning.

②The handle and tip are made of nylon and fiber, wear-resisting and insulating;

③ The tip of the rod is made of ABS plastic, aluminum alloy tube and carbon fiber tube, which is durable and has good comprehensive performance.

4.2.3. FINISHING

Grinding process is used for processing to increase the texture of objects and friction between hands to ensure gripping force, anti-slip and anti-fall.



Figure 6 3D rendering

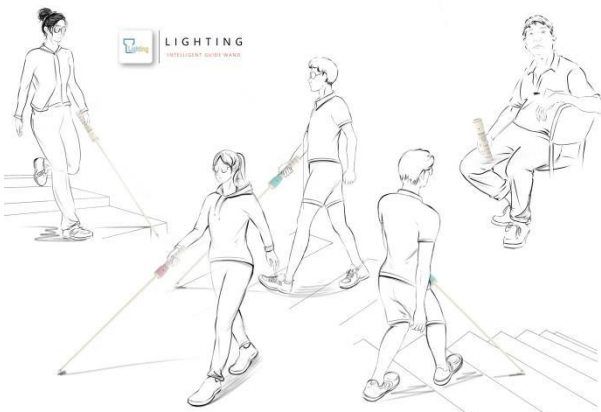


Figure 7 Usage scenario diagram

4.3. Design description

The main audience of the product is the visually impaired. With the application of emotional design concept, the product is committed to creating an intelligent guide rod that fits the user experience. With the concept of "Lighting up the lives of the visually impaired, we are always taking action". To grasp the pain points of poor performance, low safety factor, poor sense of experience and insufficient social care of traditional AIDS for visually impaired people, we are committed to developing a functional and humanistic care driven intelligent guide rod: it can greatly reduce the walking inconvenience and safety risks of visually impaired people, and avoid accidents caused by unrecognized

obstacles; at the same time, focus on user experience in functions and sense of use, improve the sense of security of visually impaired people in the dark environment, and truly become a product that visually impaired people can rely on.

4.3.1. Emotional design concept

Emotional design is a design concept that focuses on people's inner emotional needs and spiritual needs. The goal is to establish a connection with users on the personality level, so that users can generate positive emotions in the process of interacting with products. The design of the traditional guide stick focuses on the realization of the basic functions of the product. This product pays more attention to emotional appeal and psychological appeal, conducts in-depth research on user experience, and improves users' satisfaction with the product.

4.3.2. Guide dog protection under ecological health vision

In the past decade, scholars in the field of ecological theater have reflected and criticized the relationship between humans and other species in the ecological crisis from the two-way research path of "animal participation in performance" and "human performance of animals". The product developed in this project has the function of a guide dog, is more reliable in terms of safety, and brings richer user experience to visually impaired people in terms of functionality. The popularization of the products (class) in this study can replace the guide dog or even the guide dog training industry chain, which is of great significance to ecological health [7].

4.3.3. Deep interactive functional experience of five senses

Based on the five senses, the product is designed to be an immersive experience, including braille buttons, voice vibration warning, night warning lights, wireless charging and other functions. Due to the lack of vision, users lack sensory pathways to the outside world. In product design, they make up for the lack of vision by magnifying other senses other than vision, and at the same time improve users' recognition of the product.

5. CONCLUSION

The main research purpose of this paper is to draw a scientific and effective design method based on the background of humanistic care, and design a reliable intelligent guide stick for the visually impaired, which meets the actual needs of the visually impaired.

The conclusions are draw as follow: The intelligent guide staff provides convenience for the visually impaired to travel, helps the visually impaired to better

integrate into the society and realize social value; At the same time, compared with guide dogs, intelligent guide sticks have better user experience and build a good ecological chain of harmonious coexistence between human and animals; Finally, the research of this kind of products provides a design reference for the design field of assistive devices for the disabled, including assistive devices for the visually impaired, and improves the attention to the disabled in the design field to a certain extent.

In the design process, some technical problems could not be further studied due to the limitations of disciplines. In the future development, it is hoped to establish a multidisciplinary research system for continuous research.

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