

# Empirical Research on New Household Intelligent Vacuum Cleaner Design

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**Abstract.** Start from the basic concept of vacuum cleaner and learn various functions, features and advantages of new multi-functional intelligent vacuum cleaner. Then conduct theoretical verification through conceptual analysis, market research and algorithm, analyze the structure and classification of vacuum cleaner step by step and use these facts as theoretical guidance for multi-functional intelligent vacuum cleaner. This paper analyzes structure, color design, psychology and other aspects of intelligent vacuum cleaner and makes this products attract domestic consumers.

## 1. Analysis and objective

### 1.1 Domestic and foreign development status of vacuum cleaner

When the consumers understand functions, features and convenient usage of intelligent vacuum cleaner, Chinese market opens. Each family overseas has more than one vacuum cleaner, and even some of them have four or five. While there is a significant differences between domestic usage amount of vacuum cleaner and population ratio. It is not because that domestic consumption level is not high, furthermore, the price of vacuum cleaner is more consistent with our consumption level. There are two reasons, first: the public has no comprehensive enough understanding on vacuum cleaner and they are not familiar with its various functions. Second: in the era that floors and tiles rise, great majority of families choose to clean with mop. But some dust can only be cleaned with vacuum cleaner.

Chinese vacuum cleaner market is increasingly becoming saturated. Without development there can be no progress, and without innovation there can be no market. If we insist to attract and occupy the market with traditional vacuum cleaner, it is really precarious, and we have to open up a new road -- multi-functional intelligent vacuum cleaner at this time. In addition, such vacuum cleaner is increasingly accepted by the public, both appearance and technology have been greatly improved, and the cost is getting lower and lower, it has become one of the indispensable home appliances in life.

### 1.2 Design objective

In order to overcome the single function of existing vacuum cleaners, improve the performance and stability, reduce noise as well as improve inadequate cleaning range, I design a multi-functional intelligent vacuum cleaner. This vacuum cleaner has innovative design and gorgeous colors, and can meet individual demands in our hearts. Meanwhile, this vacuum cleaner also has simple structure which is easy to operate. It can not only be used in daily cleaning, but also clean some invisible “dust” and takes entertainment, practical and security into account at the same time. Adults as well as the elderly and children can use.

### 1.3 Design contents

- 1) Overall design scheme and specific structure of vacuum cleaner
- 2) Component design, materials and computing of vacuum cleaner
- 3) Color analysis of vacuum cleaner
- 4) Psychology and human-computer analysis of vacuum cleaner

## 2. Overall design scheme

### 2.1 Intelligent return charging design of multi-functional intelligent vacuum cleaner

There are many technologies within a intelligent vacuum cleaner such as: vacuum technology, power technology and path planning technology, etc. Wherein, path planning technology is undoubtedly one of the most difficult one. Most products in current market do not have this technology because the vacuum cleaner will inevitably encounter the situation of power shortage working for a certain period of time. As a result, under the premise that there is no increasing of sensors, we may use Edsger Wybe Dijkstra algorithm to achieve the shortest path to return to the charging seat. This method achieves the return charging of micro power through software and has a remarkable effect.

### 2.2 Automatic steering design of multi-functional intelligent vacuum cleaner

It consists of prime mover system, transmission system, work system and control system, and makes full use of the mechanical automatic steering principle. Put vacuum cleaner on the floor, press the start button, and it will automatically rotate to avoid when encountering obstacles. In addition, it will automatically cut off the power and alert if there is malfunctions and caton phenomenon. The cost of technology is far lower than other vacuum cleaners in the market.

### 2.3 Operation principle of multi-functional intelligent vacuum cleaner

The principle of traditional vacuum cleaner is relatively simple, and it is a combination of front shell and back shell, dust collecting barrel and motor are respectively are installed in these two shells and there is a blower in the front axle of motor. Such structure will lead to motor paralysis if the vacuum cleaner inhales water and other liquids. While designing a baffle inside can effectively cut off the contact between water and power generator. In addition, this machine is equipped with ultraviolet light (kill the mites), vibration beating end (beat out the hidden mites) and double filter blocking system which can eliminate mites and kill bacteria effectively.

Multi-functional intelligent vacuum cleaner collects moisture absorption, mites removal and strong cleaning in one which is economy and saving. It may complete all the cleaning which requires many machines before and makes the housework become more relax and convenient, improves the quality of life and saves the labor.

## 3. Structure of multi-functional intelligent vacuum cleaner

### 3.1 Product material selection

Different materials have different textures and similarly, different materials give us different feelings about cold and worm as well as hard and soft. As a result, I choose ASS plastic for this product and this material has a high wear resistance and equips with texture and beauty at the same time. ASS resin is the co-polymer of acrylonitrile, acrylate and styrene, and its molecular structural formula is shown in figure 1.

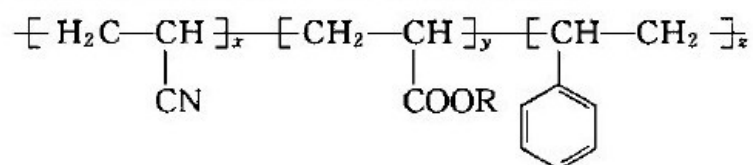


Figure 1 Molecular structural formula

### 3.2 Product color selection

The world we live is colorful, different items have different colors and presents different visual effects. If we say material is an important part to the product, color is an integral part. Many information about the product are all conveyed through colors which have a special impact on our feeling. Reasonable use of color may play a “finishing touch” role.

Apart from showing part functions of the product, color can also give us a strong psychological hint. Take some small designs for example: we may use the colors which are completely opposite the main colors to match. In other words, colors may give us a psychological suggestion. Different colors

have different scopes of application, and the feelings they bring to us are also different. Therefore, I choose several colors to match in this product, first I choose golden yellow, black and gray to highlight solemn and generous and represent male characteristics in color expression. Second, I choose pink, white to carry on collocation and give us a bright and warm feeling, and the color character is more feminine which is shown as figure 2.

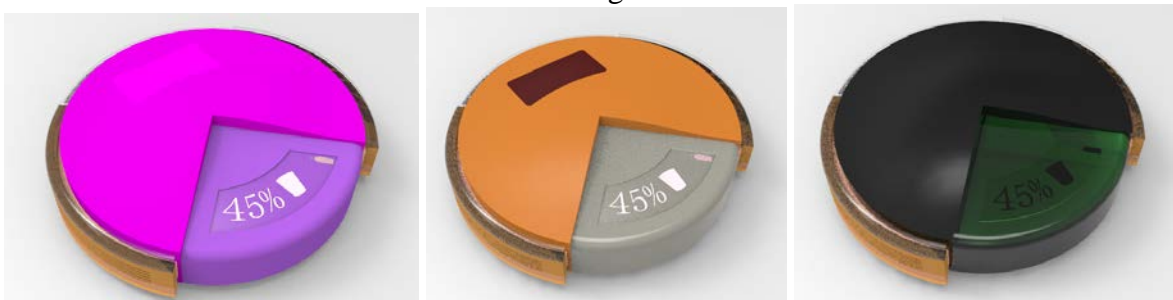


Figure 2 vacuum cleaner with multiple colors

### 3.3 Modeling style of multi-functional intelligent vacuum cleaner

Traditional vacuum cleaner has the several following styles: first, structure style that uses curve lines as main lines; second, structure style that uses straight lines as main lines; third, structure style that combines curve lines and straight lines together; fourth, structure style with multi-body morphology. While because of the special nature of its work, the structure style of intelligent vacuum cleaner tends to be more compact. In order to save space, I adopt disk-shaped structure style, and the traditional vacuum cleaner is shown in figure 3.



Figure 3 Two kinds of modeling of traditional vacuum cleaner

### 3.4 Morphological features of multi-functional intelligent vacuum cleaner

To ensure the integrity, a product must have its own structure. Product structure refers to an important factor that constitutes a product, and it relates to the self structure in the design process.

Form beauty of the product is inextricably linked with its self structure, appearance of a novel structured and special product will give the public a strong visual impact and stimulate their desire to purchase. Apart from bringing a strong visual impact, good structure may also will make the product arrange work more reasonably as well as improve working efficiency.

Product form can be good as well as bad which will affect the expectation of consumers. As a result, a good product form determines its market which is shown in figure 4.

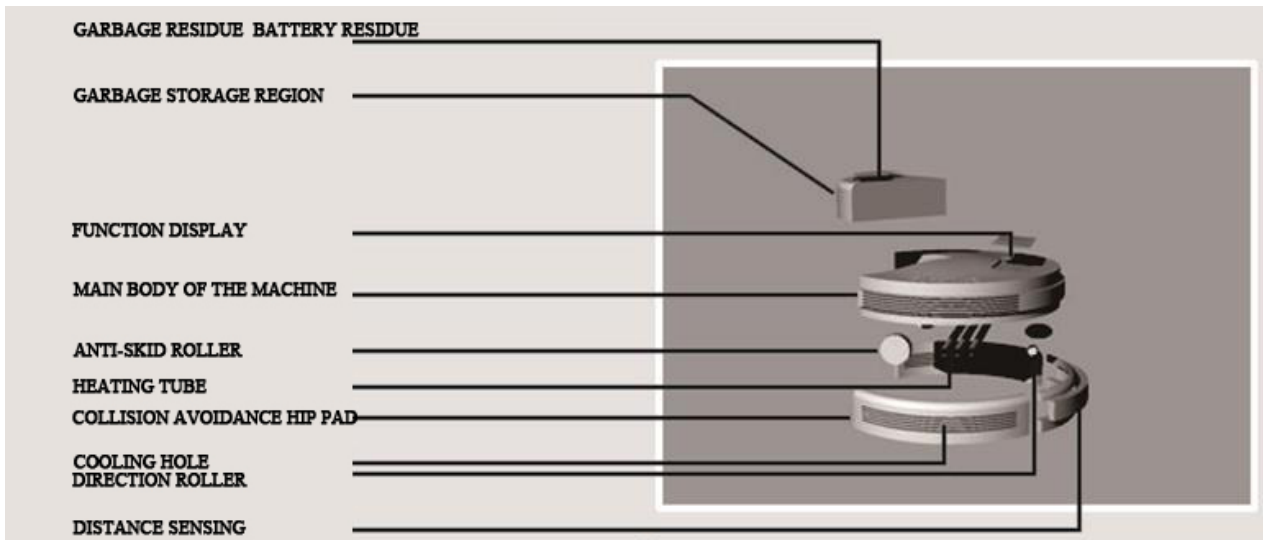


Figure 4 Form analysis

#### 4. Summary

Vacuum cleaner has become an indispensable electrical appliance in our daily life now and the vacuum cleaner market is also facing a fierce competition which is filled with a variety of personalized products and each one has its own good points, it reflects the diversity of vacuum cleaner from the side. While multi-functional intelligent vacuum cleaner has not been popularized in life, it also has some drawbacks and we need to study and discover constantly. Research and development of multi-functional intelligent vacuum cleaner conforms to the development trend of market as well as our demands, meanwhile, it is also the issue that all the manufacturers concern about. Vacuum cleaner plays more than one role in our daily life, in addition to an excellent cleaning assistant, it also decorates the family; in addition to clear the rubbish in our living environment, it also brings us a clean and green living environment. It decorate our lives like other household appliances and makes we live more intelligent and humanized.

I inject the “human oriented” concept into my design when researching its function and treats their inner demands as the first consideration factor, in addition, I also combine with domestic and foreign vacuum cleaner markets to study the scientific validity of “human oriented”, verify and study the feasibility of this method through standing on the perspective of domestic and international market demands.

Vacuum cleaner development is becoming more and more complete and research trend of multi-functional intelligent vacuum cleaner shows the importance. All the designers are committed to change our lives, improve the quality of life as well as working efficiency. I always believe that as long as we have positive thoughts, spirit of exploration and innovation enthusiasm as well as research spirit, people-oriented belief and research thinking, we will infinitely make the multi-functional intelligent vacuum cleaner develop better, allow it go into millions of households to improve their quality of life, so that each family could have a healthy, clean and fresh living environment, and we can change our lives and improve the quality in real sense.

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