Application of Internet of Things Technology in Garment Design

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Summary. The Internet of things is an information network with the ability to perceive objects comprehensively and to transmit information reliably and intelligently. The research and development of the Internet of things enable us to obtain real-time information on anything, and also make the economic development of our country slowly enter the track of healthy operation. It is of great strategic significance to speed up the transformation of industry to a higher level, to develop new industries and to take the high-end industrial road. With the development of economic globalization and information globalization, the Internet of things is developing very rapidly in various industries. In view of the problems of low inventory utilization, poor management information and low supply chain efficiency in clothing industry, the application of Internet of things in clothing industry is very important. At present, there are various problems in the sales system of clothing industry, so it is of great significance to apply the collaborative system to the brand clothing system under the Internet of things. Reduce 10% inventory, improve 60% supply chain quality, brand clothing development is of great significance.

Keywords: Internet of Things Technology; Clothing Design; Inventory Utilization; Supply Chain

1. Introduction

With the development of social economy, people's living standard is getting higher and higher. In the process of consumption, people need not only the goods themselves, but also the experience created when buying goods, and experience economy to meet the requirements of consumers. The consumption under experience economy is called perceptual consumption, which takes personal preference as the criterion of purchasing decision, and pays more attention to "emotional value" rather than "functional value ". Perceptual consumption also includes consumption form based on personal intuition and perceptual cognition. Perceptual consumption is dominated by information technology, which has become an important force in the development of perceptual consumption, the management mode of using information technology to manage and operate enterprises has become an important strategic way.

The application of Internet of things technology in clothing design has attracted the interest of many experts and has been studied by many teams. For example, some teams have found that the life cycle of clothing is shorter than that of most products. If it can improve its efficiency, it will
undoubtedly seize the first opportunity in the market competition to meet the needs of consumers for products and services, thus winning the market[1]. RFID technology has greatly improved the efficiency of the clothing industry in a series of processes, such as production, logistics, warehousing and retail. According to statistics, the application of Internet of things technology involves more than 30 industries. At present, the application of the Internet of things in the clothing industry is mostly limited to labeling clothing, but industry insiders generally believe that the future Internet of things should be more deeply involved in the clothing industry, through the establishment of a comprehensive and systematic database, in-depth mining of product information[2]. In 2012, Haining Leather City also officially opened a virtual fitting room to allow customers to change clothes in a second. With the emergence of the virtual fitting room in China, the development of virtual fitting room in China has accelerated, but due to the increasing demand of consumers and the advanced level of domestic technology, it is difficult for enterprises to adapt and develop an intelligent fitting system that can take into account the needs of consumers and the interests of enterprises[3]. Some teams found that Internet of things technology has penetrated into people's clothing, food, housing, industry. For example, Panasonic's home appliance network system allows owners to download recipes by mobile phone, view stored food through the internal lens of the refrigerator, and determine what dishes they need to buy, even through the network, rice cookers can cook automatically; The clothing industry is no exception, the RFID-based Internet of things in the clothing industry raw materials collection, design and processing, logistics distribution and marketing processes have been widely used[4]. Another team found that the clothing industry is one of the pillar industries, always in an important position in the development of the national economy, China has been occupying the world's first batch of textile and clothing production and export, clothing industry as a typical human-intensive industry, is a very popular industry, clothing products timeliness, supply chain and production chain are very long[5]. With the progress of society and the development of science and technology, people begin to demand more fashion and personalized clothing demand. With the popularization of various communication equipment and the continuous expansion of network coverage, fashion and fashion trends spread faster and faster. This also means that fashion clothing fashion cycle is getting shorter and shorter. At the same time, the demand personalized needs and experience requirements are becoming higher and higher, which requires the clothing industry to improve the response speed, constantly meet the various fashion requirements of consumers, so as to stand out in the complex and fierce industry competition[6]. An investigation by individual experts found that Japan was one of the early countries to launch Internet of things applications. Their achievements in the Internet of things include disaster response, security management, public services, smart grids, etc. It is particularly important to realize large commercial —— mobile operators in mobile payment (such as mobile payment as a key business application) and explore successful business models. Japan has published a Strategy aimed at developing major projects, such as intelligent transportation systems and environmental technologies represented by green information technology, through the implementation of the Strategy, in order to expand and support Japan's new industries, which are the pillars of its medium- and long-term economic development[7]. Although their research results are very rich, but there are still some shortcomings.

Based on the background of this study, real-time information, tracking acquisition, updating, real-time transportation, information management and other aspects are studied. It is of great significance to study real-time information by mastering real-time information and using various interactive devices in computer network to process massive real-time information.

2. Method

2.1. Evidence Theory Based on Genetic Algorithm Improvement
Genetic algorithms (as a new stochastic optimization search algorithm for simulating biological evolution processes) have unique advantages and good performance in solving many combinatorial optimization application problems. Genetic algorithm was first proposed by professor of near root
university in 1960s to study the adaptive behavior of natural system and artificial system. In 1975, a report detailing the theory of genetic algorithm was published. In the same year, a functional test platform was established to clarify the performance evaluation criteria and lay a solid foundation for wide application in the future. Function [8]:

$$p_l(A) = 1 - Bel(\overline{A}) = \sum_{B \subset A} m(B)$$  \hspace{1cm} (1)

The quasi-truth function, also known as the upper limit function or the non-negation function, represents the uncertainty measure of the degree of trust established by the propositional non-false .[ Bel (A) pl (A)] represents the right trust interval. Assuming that two independent evidence E1 and E2 correspond to m1,m2, the BPA of synthetic evidence is:

$$m(\phi) = 0$$  \hspace{1cm} (2)

$$m(c) = \sum_{A \cap B = C} \frac{m_1(A)m_2(B)}{K}, C \neq \phi$$  \hspace{1cm} (3)

$$K = 1 - \sum_{A \cap B = \phi} m_1(A)m_2(B) = \sum_{A \cap B = \phi} m_1(A)m_2(B)$$  \hspace{1cm} (4)

2.2. Weighted Evidence Conflict Coefficient

The m1, m2 weighted evidence conflict coefficient can be expressed as of information in the process of intelligent recommendation, we will have a certain probability of conflict. Let the m1,m2 be the m1,m2 weight of two basic PBA, and the weighted evidence conflict coefficient of the m1,m2 be expressed as[9]:

$$K = \sum_{A \cap B = \phi} x_i m_1(A_i) x_j m_2(B_j)$$  \hspace{1cm} (5)

2.3. Weighted Evidence Distance

The m1,m2 weighted evidence distance can be expressed as m1,m2 weight of two basic PBA, at the x1,x2[10]:

$$d_{BPA}(m_1, m_2) = \sqrt{\frac{1}{2}(x_1 m_1 - x_2 m_2)^T D(x_1 m_1 - x_2 m_2)}$$  \hspace{1cm} (6)

3. Experiment

3.1. Source of Experimental Data

This paper takes the brand clothing identification and tracking system under the Internet of things as the research object, through the framework of the new brand clothing collaborative system under the Internet of things, pays attention to the pursuit of customer personalization and satisfaction while establishing the brand clothing collaborative system.

3.2. Experimental Design

In order to make better use of Internet of things technology to improve the efficiency, accuracy and timeliness of information in various production links, the Internet of things information model in this paper includes corporate reputation, cargo transportation, daily operation and inventory, timely understanding of product information, tracking product market price changes and product market awareness; secondly, in the aspect of data transmission in the process model, combining the functions
of EPC tag chip data reading, RFID automatic acquisition, wireless sensor network and wireless remote positioning, the real-time consistency of product transportation, sales information and system information is realized. Overcome the problem of information lag in traditional cargo transportation and warehousing management.

4. Result

4.1. Intelligent Sales Management
A professional store sensor is often placed between the front and back of the store to track the movement of clothes. The sales system can automatically obtain where the clothes are on the shelves, where they have arrived, and automatically alert the sales situation when restocking. At the same time, the sales manager can make better sales plans by counting customer attention, trial and purchase, and different sales. Intelligent sales management is shown in Table 2 below. In addition, through the RFID system, manufacturers and designers can understand the user experience of clothing the actual sales of popular styles, statistics the probability of customers trying on and buying clothes, and analyze the reasons why clothes are tried on but not purchased.

Table 1. Intelligent Sales Management

| Classification     | Substance                                                                 |
|--------------------|---------------------------------------------------------------------------|
| Smart shelves      | It can be detected how many times the clothes are selected and purchased the broken clothes are more popular |
|                    | Through the smart fitting room, the store can tell which clothes are brought into the fitting room, and buy, which clothes to bring into the fitting room was refused |
| Smart trim         | Receiver's sensors can track whether clothes pass through shelves or through fitting rooms buy, calculate and analyze what kind of clothes a customer has bought compare the clothes and analyze the competitors of the clothes |

4.2. Comparative Analysis of System Function and Technology at Home and Abroad
The function of foreign system pairs is not only limited to the function of accessories, but also from the aspects of consumers using the system to watch clothing, choose clothing, accessories and so on. Each enterprise using the system will improve the function of the system for the consumer group. In order to improve brand awareness and sales. The main function of domestic intelligent fitting system is focused on fitting. Because the application of domestic system is not strong, it can not develop the system according to the needs of customers and enterprises, which makes the function of domestic system single, even if it can be rotated. It's just a combination of multiple plane photos. In China, it mainly uses the real life model in clothing to take pictures, then uses the method of picture processing to make all kinds of pictures, and then selects pictures for consumers. This kind of fitting room mainly uses the JAVA to write the Applet program piece, embed the browser to run directly, the following table 2 shows is the domestic and foreign intelligent fitting system function and the technology comparison.
Table 2. Functional and technical comparison of domestic intelligent fitting system

|                      | Intelligent fitting system abroad | Domestic intelligent testing system |
|----------------------|----------------------------------|------------------------------------|
| Use technology       | 3D virtual reality technology, visual suture | FLASH technology, JAVA |
| Function             | Based on market and consumer demand design the system | Mainly out of the R & D phase, not considered to actual demand |

4.3. Consumer Awareness and Attention to Smart Fitting

As shown in figure 1 below, 256 samples have contacted or understood the intelligent fitting system, accounting for 10.6% and 371 samples have not contacted the intelligent fitting system, accounting for 89.4% of the samples. It can be seen that the popularity of intelligent fitting system is low and the application rate is poor. However, 399 samples believe that if there is an intelligent fitting system in a clothing store or shopping center, it will attract the attention of consumers, accounting for 96.1% of the samples, while 16 samples think it will not attract attention, accounting for 3.9% of the samples. This problem shows that the intelligent fitting system is in a large market and consumers are interested in the system.

4.4. Enterprise Findings

Based on SPSS20.0 analysis, the results were screened by descriptive statistical analysis, figure 2
below shows the current application of intelligent fitting system and the importance of enterprises to fitting. The figure shows an average value of 1.97% for an enterprise's smart fitting system, and when this option is set, 1 means use, 2 means unused, as can be seen from the average, the application rate of intelligent fitting system in enterprises is very low, and the mean value of the fitting business is 4.09, it doesn't matter whether the choice is set to 1, not very important, 3 As important, 4 As more important, 5 is very important, as can be seen from the average, companies still focus more on fitting, this shows that the development of intelligent clothing system is very promising. As can be seen from Figure 2, to these experts, 81.2 percent said it would bring a speed advantage, 43.8 percent said it would bring a focus advantage, 31.2% thought it would add value, and think will bring mobile advantage and cost advantage to the enterprise relatively few people.

![Figure 2. Comparison of current applications of intelligent fitting systems and the importance of enterprises to fitting](image)

5. Conclusion
The application of Internet of things in various industries is rising quietly. Through the application research of Internet of things in foreign garment enterprises, this paper summarizes the advantages of Internet of things commercial application, and draws the conclusion that Internet of things can improve economic benefit. On the basis of previous research and application, this paper obtains the improved technical route and system operation sequence diagram under the Internet of things environment. It provides a new idea for the application of Internet of things in clothing industry.

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