Artificial Intelligence Technology in the Design of Smart Products

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Abstract. Artificial intelligence technology promotes technological progress. This research mainly discusses the application of artificial intelligence technology in home robots in the design of smart products. In order to let users know more quickly and more clearly where security problems or hidden dangers have occurred, the emojis are designed together with related icons. While generating the voice, the system also calls the method in animation to switch the specified screen. Before that, the specified time value will be set for the refresh frequency, so that the screen is clear and visible, and conforms to the normal facial movement habits. In addition, during speech synthesis and broadcasting, Android's Toast method is called to show the progress of synthesis information and the progress of broadcasting, which fully reflects the intelligence and interactivity of the system. During the functional test, the normal average continuous use time of the face recognition alarm system was 45 minutes, and the correct rate of face recognition on the computer screen reached about 81.2%. This research contributes to the further development of smart homes.

Keywords: Artificial Intelligence Technology, Smart Products, Home Robots, Face Recognition Alarm System

1. Introduction

Smart devices are actually an extension of the Internet. Compared with the terminals of the Internet, which are personal computers and servers, the terminals of the Internet of Things extend to more hardware and sensors. When computer terminals present more diverse forms, such as smart hardware, smart wearable devices, environmental monitoring devices, virtual reality devices, etc. The Internet has also become a network of interconnection of all things, or as long as there are hardware or products in the network and data exchange occurs, this network can be called the Internet of Things.

The control robot said that the digital expressions presented can not only complete the intimate anthropomorphic interaction with the user, but more importantly, the state of the home scene is deliberately conveyed to the user through the expression and supplemented by auditory feedback [1-2]. First of all, in the speech recognition function, the experiment sets two button controls for the speech recognition and monitoring function, "open monitoring" and "close monitoring" [3-4]. When the user clicks on the "Enable Monitoring" function, the system automatically loads the local voice template and displays "Yes" in the main interface, that is, the voice monitoring service has been
activated [5-6]. Only when the user selects "open monitoring", the system will start the internal monitoring mechanism, call the local voice sensor, and monitor the voice environment of the system [7-8]. If the user selects 'close monitoring', the system will release the occupation of the local voice sensor and release the local resources. In this way, while improving the user experience, it also enables the system to maintain a better running state. On the basis of accompanying music, users can also directly pick up the remote control and complete song search and playback commands on the interface. This design gives users more choices [9-10].

In this research, some typical and representative uncertain reasoning algorithms are selected. According to the different types of knowledge required for different problems, the corresponding uncertain reasoning algorithms are used to obtain corresponding solutions. Integrate the corresponding modules and develop a smart home service robot memory system.

2. Home Robot

2.1. Robot
As a smart device with a sense of intimacy and flexibility, the smart home control robot is also very important for the collection of user context information. It can be mainly through the following methods: When the control robot meets the user for the first time, the user asks and collects the basic information, life style and behavior preference information in the user's situation information, and collects this information in the future interaction with the user. In certainty theory, we define credibility as:

\[ CF(H,F) = MB(H,E) - MD(H,E) \]  \hspace{1cm} (1)

Among them, \( MB \) is the degree of trust growth. Makes the conclusion H is true trust growth. They are defined as follows:

\[ MB(H,E) = \max\{P(H/\ E), P(H)\} - P(H) \] \hspace{1cm} (2)

Among them, \( P(H) \neq 1 \). It can be concluded that \( CF(H,F) \) is:

\[ CF(H,E) = MB(H,E) - 0 = \frac{P(H/E) - P(H)}{1 - P(H)} \] \hspace{1cm} (3)

Among them, \( P(H/E) > P(H) \).

2.2. Human-Computer Interaction
For this deformable remote control, its main function is to control music playback, video playback and hardware control in smart homes in home scenes. It also allows users to complete the addition of newly purchased smart hardware and equipment through operations on the remote control. When the user expresses the desire to listen to music, the voice interaction is more convenient, only need to say the name of the song to the voice assistant to complete the song. But portability brings about the lack of accuracy, because: First, the accuracy of voice assistant voice recognition is not perfect. Second, the songs have the same name, and there are many versions, and sometimes it is impossible to rent specific songs that users want to listen to in the first time.

After the user gives the voice command of "query pasta", the system will search for the local voice template according to the user's voice command. When the equals method is used to match successfully, the interface will automatically jump to the "query pasta" interface. When the "query pasta" is displayed on the screen, Activity calls the on create function to initialize, and queries the "noodle" keyword in the local database. When the relevant data of "noodle" is queried, the information
is synthesized into text, and upload the text to the server, synthesize the speech corresponding to the text, and call the loudspeaker of the system to generate the speech.

3. Home Robot Application Experiment

3.1. Expression Interaction Design

For the digital expression design of the control robot, the principle still followed is a friendly and playful graphic expression style and good recognizability and readability. In order to let users know more quickly and more clearly where security problems or hidden dangers have occurred, the emojis are designed together with related icons. Such as musical notes and flames, make the information conveyed by digital expressions more accurate.

3.2. Voice Broadcast Module and Broadcast Animation

While generating the voice, the system also calls the method in animation to switch the specified screen. Before that, the specified time value will be set for the refresh frequency, so that the screen is clear and visible, and conforms to the normal facial movement habits. In addition, during speech synthesis and broadcasting, Android's Toast method is called to show the progress of synthesis information and the progress of broadcasting, which fully reflects the intelligence and interactivity of the system. The SQ Lite database is shown in Table 1.

| Column name | Type of data | Length | Can it be empty |
|-------------|--------------|--------|-----------------|
| Number (id) | Var char     | 20     | NOT NULL        |
| Kind        | Var char     | 20     | NOT NULL        |
| Name        | Var char     | 20     | NOT NULL        |
| Flag        | Int          | 2      | NOT NULL        |
| Quality     | Var char     | 20     | NOT NULL        |

4. Application Analysis of Home Robot

4.1. Forecast Model Analysis

The prediction model is shown in Table 2. This article uses Smart project data on the U Mass Trace Repository data platform. The goal of this project is to optimize household energy consumption. Here provides various data collected from three real households, including electrical (use and power generation), environment (temperature and humidity, etc.) and operation (device switch). This article uses Homa A data as the test data. The data is sorted in chronological order. The prediction mainly includes the state prediction of the air conditioner, lights, and curtains. The two states of the air conditioner are turned on and off using 0 and 1 respectively. Real-time environmental information is used for neural network prediction, so we can get the air conditioner. State data graph. The status data of one day of the test is shown in Table 2. Based on the same day's data in the data set, we obtained the state prediction data of the air conditioner by running the machine learning system. We can see that after testing one day's data, we get the day's air-conditioning state prediction map and the original data in the data set are mostly the same. Through continuous operation of the system output, we can see that the correct operating state accounts for more than 90%, the accuracy of the prediction is high, and compared with the current smart home system, the degree of intelligence of the system is improved. In addition, the control display of the system's prediction results on the equipment status greatly reduces the invalid startup time of the system in a short period of time, thereby reducing the energy consumption of household equipment.
Table 2. Predictive models

| Temperature | Humidity | Summary | Pressure | Wind Speed |
|-------------|----------|---------|----------|------------|
| 16.67       | 0.53     | Clear   | 1022.69  | 11.23      |
| 16.19       | 0.52     | Clear   | 1022.58  | 9.92       |
| 15.69       | 0.55     | Clear   | 1023.61  | 8.72       |
| 15.29       | 0.58     | Clear   | 1024.31  | 8.25       |
| 15.37       | 0.6      | Clear   | 1024.51  | 7.38       |
| 14.81       | 0.65     | Clear   | 1024.83  | 7.47       |

4.2. Factors Affecting Young People's Purchase of Smart Home Service Robots

The factors affecting young people's purchase of smart home service robots are shown in Figure 1. Questionnaire statistics show that young people attach the most importance to whether the functions and services provided by smart home service robots meet their life needs, and whether they can truly provide convenience for their home life. Beautiful shapes and convenient interaction methods are ranked second and third respectively influencing young people's purchase factors, and there is little difference between the two. It can be seen that on the basis of practicality, young people have certain requirements for the aesthetics of products and the good interaction between robots and humans. 66.67% of young people will choose smart home service robots because they like a certain function. When positioning products, they can consider designing from a certain type of function based on home life scenarios. Questionnaire statistics show that home security and home appliance control are the functions that young people consider the highest priority, followed by housework functions. And 33.33% of young people would consider buying a sweeping robot with housework functions, ranking second among the four types of robots. Among the types of smart home service robots that young people would consider buying, social companion robots like housekeepers accounted for the highest proportion, accounting for 37.78%. It can be seen from this that home security and home appliance control are the basic functions of smart home service robots that are more accepted by young people, while functions such as daily affairs processing and social companionship are not yet fully recognized by young people because they are not technically mature enough. Features that people are looking forward to. Statistics from the questionnaire show that nearly half of young people prefer cute and cute styles, and those with a sense of technology rank second, accounting for 28.89%. Because boys and girls have different aesthetic preferences, the appearance preferences of boys and girls for smart home service robots are separately counted. Among boys, the appearance with a sense of science and technology and the cute and cute appearance are ranked first and second respectively. And among girls, 66.67% like the cute and cute appearance. It can be seen that in the overall target population, the cute and cute appearance is the most popular.

![Figure 1](image_url)  
**Figure 1.** Factors affecting young people's purchase of smart home service robots
4.3. Performance Test
The performance test results are shown in Figure 2. WAN mobile phone remote monitoring requires about 7MB of mobile data flow at a time; the average frame rate of the video stream monitored by the computer is 2.5fps, and the video image resolution is 640*480. The reaction time of WAN remote control is within 500ms, which means that the reaction time of the robot under remote control is within 500ms. The average frame rate of the local area network surveillance video stream is 8fps, and the response time of the robots in the local area network is within 50ms. The average rate of face recognition in the local area network is 0.52ms, the normal average continuous use time of the face recognition alarm system is 45 minutes, and the correct rate of face recognition on the computer screen reaches about 81.2%. On the basis of music accompanying, when the user orders a song, the robot can display several popular song versions on the display screen, and the user can hear the version that he most wants to hear as long as he listens to the first one: the user can also directly pick up the remote control. It completes the search and play commands of songs on the interface. This design gives users more choices.

![Figure 2. Performance test results](image)

5. Conclusion
The smart home system as a whole is divided into a data management module, a network communication module, and a prediction module, and detailed technical analysis and specific implementation of each part are carried out. The system has been tested in three aspects, mainly environmental information collection test, wireless network communication test, and predictive model test.

The overall trend is to shift from the narrow concept of robot to the broader concept of robot technology, and from the industrial robot industry to the solution business of the robot technology industry. The connotation of robotics technology has become "a smart system that flexibly applies robotics technology and has real-world action functions". Although this article has initially verified the design of the entire smart home, it is affected by the size of the data and the The impact of working hours is still not up to the level of products applied to the market. It is expected that the system will be further improved after a certain amount of data.

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