



Research on the intelligent design of a new home physical therapy instrument based on voice interaction

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Abstract. Traditionally, the use of home physiotherapy equipment can relax the body and relieve fatigue, and to some extent, relieve the fatigue accumulated during the long-term work. In view of the current situation of home intelligent physiotherapy instrument does not support voice interaction, this paper discusses the system application of voice interaction in home intelligent physiotherapy instrument. Combined with the current user's demand for the use of the ideal home physiotherapy instrument, and in order to serve the users more conveniently, the intelligent method of voice interaction application is adopted, and the voice interaction system in which the users can communicate and communicate with the new home physiotherapy instrument is designed. By combining the home physical therapy instrument system and voice interaction technology, can improve the human-machine interaction performance, increase the interaction between physical therapy instrument information, make the relevant physical therapy personnel and physical therapy instrument interaction more convenient, realize the simple control of physical therapy instrument, improve the working efficiency of physical therapy instrument, implementation with physical therapy instrument management system, improve the coordination ability of home physical therapy instrument, make intelligent interaction process, to improve the shortcomings of the traditional way of physical therapy provides a reference scheme.[1]

Keywords: Voice interaction; Home physiotherapy; Intelligent design

1 Introduction

In recent years, with the innovation of the Internet of Things, artificial intelligence and other technologies and the increase of consumers' demand for intelligent home appliances, intelligent home appliances have been effectively developed, among which new

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home physiotherapy devices play an important role in intelligent home services and other aspects.[2] However, the research of the new home physiotherapy instrument is not very mature, and there are still some places that do not meet the current consumer demand. Therefore, this paper aims at the home physiotherapy instrument and related research in the market, combined with the needs of intelligent design, and puts forward the intelligent design scheme of intelligent home physiotherapy instrument. Under the concept of intelligent design, the reasonable and practical intelligent home physiotherapy system can improve the shortcomings of intelligent home physiotherapy instrument on the market.

In addition, in terms of voice interaction, the cloud holds a variety of models made of massive data trained through deep learning, and provides terminals with large computing services such as speech recognition, semantic understanding, and speech synthesis through its strong processing capability.[3]

Therefore, this paper proposes an intelligent voice interaction design based on home physiotherapy instrument, using home physiotherapy instrument to realize intelligent human-machine interaction, and to transform the voice and text through corpus recognition, audio synthesis and other technologies, which can effectively improve the user experience. The system is mainly designed for home physiotherapy personnel to solve the problems such as limited computer operation ability and difficult system interaction. Through voice interaction, it not only conducts necessary operation and runs [4] for home physiotherapy personnel, but also improves the speed, convenience and interaction of information processing of the new home physiotherapy instrument.

2 Hardware design of the voice information interaction system

2.1 Concept of voice information interaction

The function of language is information transmission, and the purpose is accuracy and efficiency. Voice is the fast and accurate information transmission through software, which is the fundamental way for people to interact. People realize real-time communication within the region through language transmission, and information technology transmits the information conveyed by people to others in the form of voice, realizing more flexible and diverse forms of human-computer interaction. The characteristic of voice interaction is that the language people conveys emotional information at the same time, which is the display of context. The application of auditory information expression in the product interface depends on the user's information ability. Voice information capability can be used to enhance and promote the process of user function realization: as the first step of user implementation behavior, as a function [5] for expression, and as a form of information feedback after functional application or end. According to the survey, people respond more quickly to the information feedback than to the visual information stimuli, so the interactive information communication between products is more effective in the auditory communication of the choice of special information than in the visual communication.

2.2 Demand Analysis of voice interaction module

After the needs of analysis and monitoring, the design should integrate and apply natural language processing technology into the database to realize the main function of collection and feedback, and finally operate in the form of text + voice. The use of emerging technologies for information collection is equivalent to equipment questions, people to answer, can achieve high efficiency, automation and intelligent. In the feedback mechanism, the device collects voice signals, detects voice information, and transmits it to the local knowledge base and cloud server to find relevant matching information. After confirmation, it outputs feedback in the form of voice and text, effectively reducing human resources.

2.3 Speech recognition and interactive system of home physiotherapy instrument

The voice interaction module of the home physical therapy instrument mainly collects voice data through the function of the acquisition equipment, and the data is transformed and processed. The processing process is mainly divided into three parts: feature extraction, data calculation and voice decoding. The flow chart is shown in Figure 1.

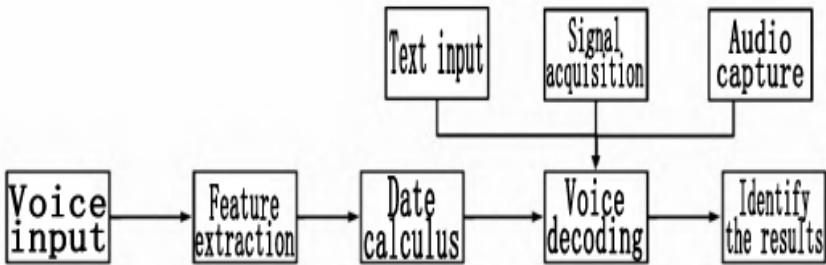


Fig. 1. Speech recognition system flowchart

2.4 System structure

2.4.1. Part of the system.

The system is mainly composed of speech acquisition, recognition system, central control system and driver and interaction system.[6] The specific structure is shown in Figure 2.

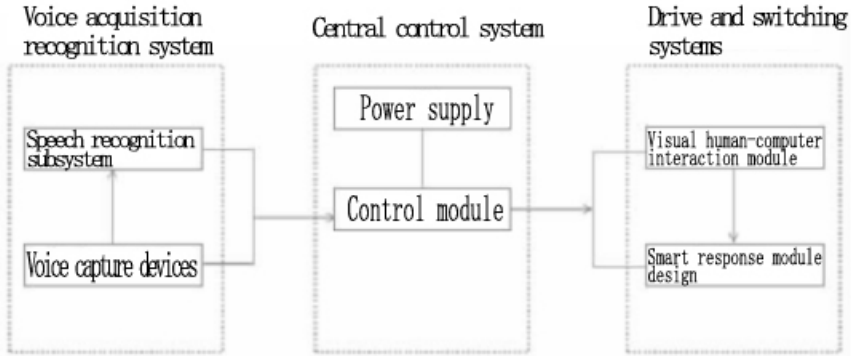


Fig. 2. Structure diagram of human-computer voice interaction system

2.4.2. Working principle of the system.

When the human-computer voice interaction system works, when the user sends a voice command, the voice acquisition equipment receives the voice and transmits it to the next voice recognition system, the speech recognition system recognizes the received voice and sends the voice signal into an electrical signal to the control system to calculate the received voice signal and the command signal set by the system.

2.4.3. System hardware design.

2.4.3.1 Introduction to Arduino UNO.

Arduino UNO Is a convenient and convenient design hardware product, with AT-mega328 as the core processor, and has a USB port, multi-channel digital input, output port, has the advantages of low power consumption, low cost.

2.4.3.2 LD3320 speech module.

LD3320 Chip is a voice control chip module for non-specific recognition, specific speech recognition. LD3320 The speech module is integrated with high-precision D / A and A / D interface, and the keyword recognition language list can be dynamically edited. For LD3320 chip, it can realize recognition, voice control and man-machine dialogue functions.[7]

3 Hardware design of the voice information interaction system

3.1 The main flow chart of the system software design

Figure 3. First, the master chip is initialized, and then the relevant speech signals and matches the remaining modules.[8] Through the material identification module to identify the mandatory signals issued by the user, and then choose whether to realize the

physical therapy function or other activity functions. Some of the code for speech recognition is as follows:

```

void LD3320 (void) {
    unsigned char Res = 0;
    While (1) {
        switch (nAsStatus) {
            case LD__ASR__RUNING;
            case LD__ASR__ERROR;
            case LD__ASR__NONE;
                nAsrStatus = LD__ASR__RUNING;
                If (RunASR () == 0) { nAsrStatus = LD
D__
ASR__ERROR;
                Break;
            }
            case LD__ASR__FOUNDOK: nAsrStatus = LD
__ge-
tResult ();
            printf ("\r\nidentification code: d%", nAsrR
es);
        }
    }

```

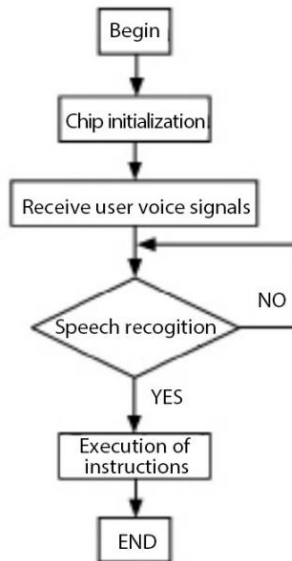


Fig. 3. Main flow chart of system software design

3.2 System principle

For the application of voice interaction, the intelligent home physical therapy instrument system is composed of relevant operation modules. The flow diagram of human-computer interaction implementation is shown in Figure 4. The intelligent home physiotherapy instrument work module includes speech recognition module, speech broadcast module, voice processing, and the work module mainly includes display processing, film and television processing, audio processing and other intelligent home physiotherapy instrument processing modules.[9]

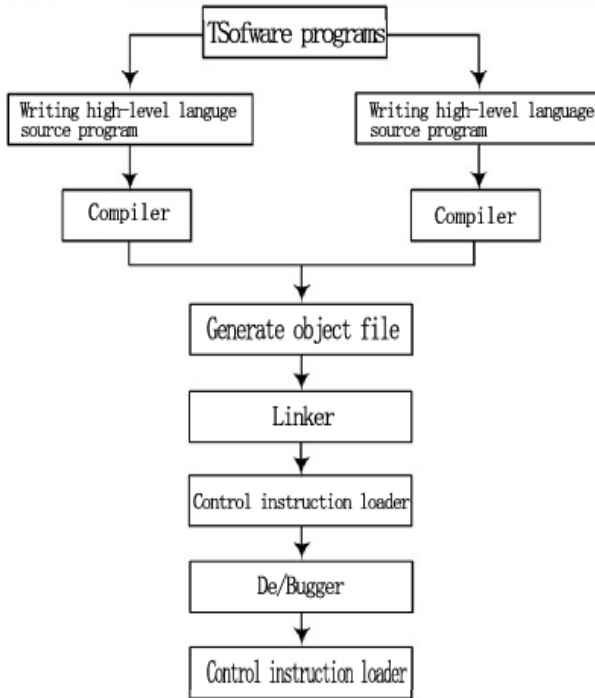


Fig. 4. Human-computer interaction module implementation process

4 Test

Under certain conditions, the voice interaction of the new home physical therapy instrument function test, through the speech recognition function of voice acquisition, the content of the feedback through the voice player broadcast, test is divided into five groups, each group test 30 times, respectively for operational feedback, environmental data and information, the average recognition rate can reach over 93%, can meet the user for the use of the new physical therapy instrument, recognition results as shown in table 1.

Table 1. Voice interaction recognition results

Identifying statemen	Number of correct recognition times	Recognition rate
1	30	100
2	26	87
3	30	100
4	28	93
5	26	87
Statistics	140	93

During the test, it is necessary to select the functional module for testing according to its own needs, and to judge whether the current identification is accurate according to the identification information and instructions output during the test. The speech recognition module can make the new home physiotherapy instrument have a particularly intelligent "ear", can make the new home physiotherapy instrument hear what the user is conveying, can improve the service ability and service quality, is also an important link and bridge for the interaction between people and intelligent products.

5 Conclusion

(1) through voice interaction to achieve rapid access to intelligent product information, control the function of intelligent products, improve, the function of human-computer interaction at the same time, also can to intelligent products quickly run some basic operation, is advantageous to the user control for intelligent products, further enhance the operation mode of intelligent products, is advantageous to the management of intelligent products, improve the intelligent development of the new household physical therapy instrument.

(2) As an important organic part of the future smart home appliances, the product design and research can not only provide convenience for people's life, but also have a strong market promotion and application. In the application process, the design product still has related identification and easy to be disturbed by the environment and other phenomena, which need to be further improved in the future. In the subsequent practical application, it can establish a more intelligent home physiotherapy instrument data analysis system with intelligent functions, and combine with the development platform of the Internet of Things, realize the control function and remote communication of home physiotherapy instrument and equipment by mobile terminal and database, and conduct humanized, accurate and intelligent analysis of data statistics.[10] Intelligent design of voice interaction can make the current consumers better integrate into the era of intelligence and live more calmly.

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