Intelligent Home Item-searching System Based on iBeacon Technologies

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Abstract

Driven by the improving efficiency of life, people's need of an intelligent item searching system becomes increasingly urgent. This project is the innovation and experimentation of the indoor locating function of iBeacon technology, which serves to save the time spent on searching, prevent theft of valuables as well as provide smart alert, etc. Based on the user's accessible data, the system locates the item by employing iBeacon tags and Bluetooth Module, which switches to the WIFI Module through gorge line, presenting feedbacks to the user after exchanging information with the smart terminal display. In addition, this humanized system enhances its user agglutinant by applying the Internet of Things technology. This project now has reached the stage where its physical prototype and smart-phone application have passed multiple tests and can precisely function as designed. Compared to traditional ways of searching, the system clearly economizes time and costs, and has strong competitiveness and a promising future.

Keywords

Intelligent item-searching, iBeacon Technologies, Bluetooth Module, Smart Terminal APP.

1. Introduction

With the improvement of life efficiency, people use more and more small items in daily life, and people's need of an intelligent item searching system becomes increasingly urgent. Therefore, it is urgent for us to design an Intelligent Home Item-searching System.

From the data available, we know the total sales of finders in various countries in the world have been on the rise in 2015. From 0 sales in April to 7.5 billion sales in October and then by 2017, exceeded 20 billion. We can see that the finder equipment has an amazing market potential and value range in the future. So our research is very meaningful.

The current search device has limitations, such as complex system, function imperfect, high prices and so on. Therefore, our project is the innovation and experimentation of the indoor locating function of iBeacon technology. Our objective is to design a system which can solve these limitations. Through this project, we can effectively solve the problem of reduced efficiency due to the waste of time caused by searching for things; In the face of emergency, we can quickly find the urgently needed items; Remind us when items are forgotten; You can count and monitor the range of daily activities of the elderly and children and can give dogs and cars more than a guarantee.

This product has designed a Home Item-searching System using iBeacon technologies, Bluetooth module and Android smart display. Our system really solves the users' problems and can find something needed. When the user is looking for items, just need to tell the system what the desired item name is, then the system will tell the user where the item is located. The system locates the item by employing iBeacon tags and Bluetooth Module, which switches to the WIFI Module through gorge line and exchange information with the smart terminal display. The terminal receives the message and processes the data to determine the location of the item. Finally, present feedbacks to the user.

This project now has reached the stage where its physical prototype and smart-phone application have passed multiple tests and can precisely function as designed. Compared to traditional ways of searching, the system clearly economizes time and costs, and has strong competitiveness and a promising future.

2. Product and Technology

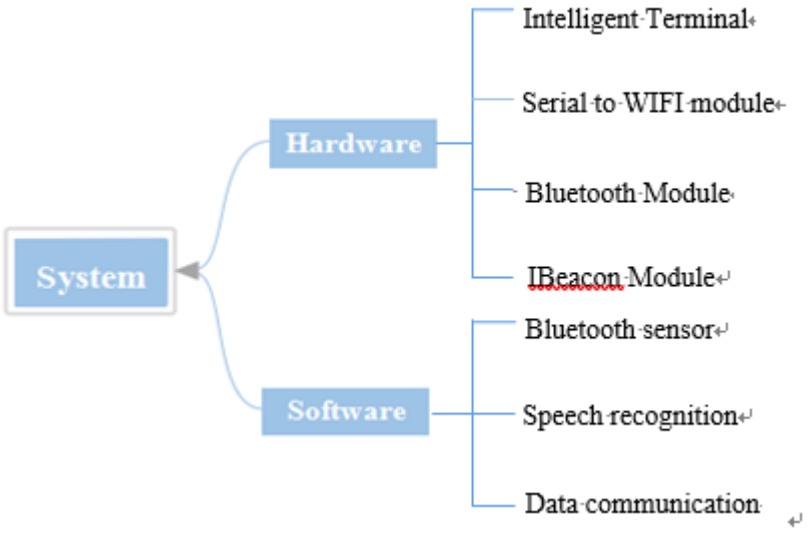

Fig. 1 System structure diagram

2.1 Hardware section

It is mainly divided into four parts: Server, Voice App, Bluetooth Module, iBeacon Module. The specific group is as follows:

Position sensing module

We use Bluetooth Module and iBeacon Module and as a position sensing module.

The iBeacon Module is divided into two kinds: Items' module and module at the door. The former does not send the broadcast packet to the smart terminal when the user does not find the item. It is in standby mode to extend the use of time. Once the user starts looking for an item, it is activated and sends out broadcast packets regularly. However, the iBeacon module at the door has been always activated to send broadcast packets regularly. At the same time, the Bluetooth module can receive broadcast packets sent by iBeacon Module.

Speech recognition module

We use mobile APP as a speech recognition module for voice input and broadcast. When the user to find things, the user said to the phone to find the items to be found, the voice module will broadcast items somewhere in the room. When the user goes out, the APP in the user's mobile phone detects the signal of iBeacon Module at the door and automatically broadcasts the location of the forgotten item by the user and its location.

Serial to WIFI module

Serial to WIFI module uses ATK-ESP8622 module. This module complies IEEE 802.11b, IEEE 802.11g, IEEE802.11n protocols. It contains an internal TCP/IP protocol stack, to achieve the conversion between the serial port and WIFI. Through the ATK-ESP8622 module, the Bluetooth module can transmit data via WIFI and smart terminals without any configuration changes.

Smart display

The receiver estimates the distance between the transmitting module and the receiver based on the signal strength received by reference. Then displayed on the screen.

2.2 Software section

The software part mainly consists of mobile APP. The function is as follows:

The Bluetooth receives iBeacon packets sent through the serial port to WIFI forwarded; The phone App receives voice commands, converted into text messages, and voice broadcast location information; Data communication between the various modules; Recommend the best item placement according to historical data; Detection of the distance between the item and the phone.

The phone and patches can be linked by scanning the QR code. Then we connected numbers and items with the smart display. This will make it easier for us to find things. Users can clearly see the location of each item through our Android smart terminal. In addition, the user can set out the necessary items through the smart terminal. When the user goes out, click on the "Go Out", our system will check the items carried by the user and prompt the user.

2.3 Technical realization

(1) Set the ID number for each iBeacon module and Bluetooth module. Common items hung up iBeacon module, set the Bluetooth module in place where always put things.

(2) The activated iBeacon periodically sends a packet to the Bluetooth module, which contains its own ID number and distance information.

(3) Serial to WIFI module connected to the Bluetooth, responsible for the Bluetooth module and intelligent terminal data transmission. The Bluetooth module periodically forwards iBeacon packets to the intelligent terminal and its own ID number. The intelligent terminal determines the position of the article through the data package.

(4) Install smart voice recognition app on your phone. When searching for objects, the user utters a voice command, then the APP sends a request, the smart terminal finds the object location, and finally broadcasts the voice to the user.

2.4 Information processing

Android smart terminal database is mainly responsible for information processing and matching, the specific process as shown below:

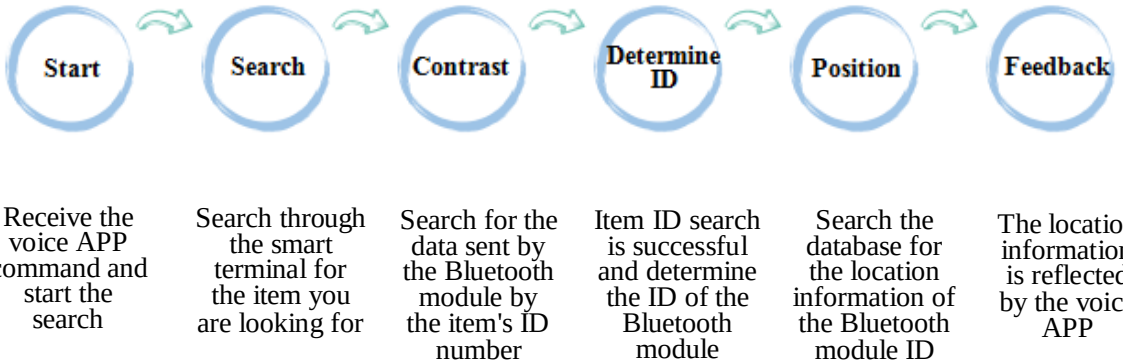

Fig. 2. Information processing flow

3. Competition and Opportunity

3.1 Competitive Power

3.1.1 Market Advantage

- Vacancy

According to the market research report, we can get a general understanding of the market vacancy and the mismatch between demand and supply. At present, we have few competitors and big market vacancy. A brand-new brand is easily recognized by the public. Under the same mass base, it is easier to make a breakthrough.

- Contemporaneity

Combined with the characteristics of the times, it helps people solve every day trifles. In an era of rapid information growth, people have a lot of information to contact each day and need to remember a lot. Therefore, the demand for this product is increasing. The practicality of our product can be reflected clearly.

3.1.2 Innovation

In order to be able to quickly open the market, we have more extensive development of software features: Voice search objects, Public search, Lost and found platform, Accounting manager, Car mode, Anti-lost pets and other functions. Different functions to meet the needs of different users, to attract more users. In the hardware part, we have done a lot of style, low price and low energy consumption. Finally, we use a differentiation strategy. The product is divided into four levels according to the completeness of price and function. As shown in the following table:

Table 1. Product level

Category	Target customers	Features
Public	Ordinary people	Low energy consumption, Reminder, Public search, Lost and found platform
Child	Children	Child assistant
Elderly	Old people	Voice search objects, Simple interface, Large font
Advanced	White collars	Anti-lost pets, Accounting manager, Car mode

3.1.3 SWOT Analysis

For product features, we carefully analyzed and summarized its strengths, weaknesses, opportunities and threats. The result is shown below:

Table 2. SWOT Analysis

Strengths	Weaknesses
Advanced technology and low energy consumption Full functioning and cost-effective Variety of styles and privately-made High sensitivity, accurate search Wide range of applications	Brand initial access to the market, low visibility Competitors have social experience Requires phone compatibility Market dynamics difficult to grasp
Opportunities	Threats
Severe population aging, high market demand Creative novel and less competitors Low prices and price-friendly	Market public relations is weak The lack of entrepreneurial market experience Venture capital is limited

4. Conclusion

Intelligent Home Item-searching System make a family and individual as a unit, Simultaneously, achieve decentralized control and centralized management. It builds a low-cost, low-power and self-organizing home sensor network. Users can find items through the smart terminal. In addition, it can still achieve many functions, such as Reminder, Public search, Lost and found platform, Children and pets assistant and so on.

Our system mainly consists of iBeacon technologies, Bluetooth module and Android smart display. The system locates the item by employing iBeacon tags and Bluetooth Module, which switches to the WIFI Module through gorge line and exchange information with the smart terminal display. The terminal receives the message and processes the data to determine the location of the item. Finally, present feedbacks to the user.

Intelligent Home Item-searching System using Internet of Things technology has low cost, reliable design and practical features. It is not only for home use, but also for people of all ages. Because of its existence, it has brought great convenience to people so that the wisdom family is no longer a dream.

References

[1] Hu Yi, Yao Yanli. Effects of APP Intervention on User-interactive Product Design for the Elderly - A Case Study of Anti-lost Device for Intelligent Surveying [J]. Art Education Research, 2016 (20): 58.

[2] Ma Guanhua. Wisdom home co-processing system [J]. Modern Manufacturing Technology and Equipment, 2015 (02): 84-85.

[3] Wang Weiqiao, Lu Miao, Deng Shuyu, Tan Guoping. Research and Development of Wireless Intelligent Positioning System Based on Android [J]. Electronic Design Engineering, 2014,22 (03): 18-20.

[4] Yuan Xiaofeng, Li Yan, Zhao Yue, Lei Yi. An intelligent spirit [J]. Technology of Internet of Things, 2014,4 (02): 11-12.

[5] Chen Qin, Li Xin, Zhang Lübing. An intelligent material-finding grab [J]. Computer Technology, 2003 (03): 56-60.