

# Application Problems and Solutions of Intelligent Airport Service Robots

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**Abstract:** With the development of new technologies such as artificial intelligence, big data, and cloud computing, the “intelligent airport” is considered to be an effective means to solve or alleviate the current industry problems such as large-scale airport business, the large number of operating entities, and the complicated operation conditions. This paper is about the collaboration between universities and enterprises based on the concept of service design. Relying on big data and cloud computing technology, this paper addresses the problems of airport service robots in inquiries, blind spots of security inspection, and full monomer smart navigation diffiulce, combined with the basic technology of service robot artificial intelligence and the third-party interface to design solutions to effectively solve the problems of process.

## 1 INTRODUCTION

The Internet age is an era where experience is paramount. The relationship between products and users will become closer after the transaction. The design in the industrial economy era is limited to completing one product while the design in the Internet era is about a complete process of experience. Based on a fine entrepreneurial environment and the improvement of artificial intelligence technology, the robot industry has developed vigorously and formed an industrial chain; the consumption upgrading and the experience economy have brought about huge service demands.

## 2 EASE OF USE

Considering that it can provide humanized and accurate services as well as save labor costs, robot service has been introduced in some airports of developed countries such as the USA, Japan, South Korea and some European countries. For example, Amsterdam Airport in the Netherlands uses robots as airport guides to provide guidance services for passengers; Incheon Airport in South Korea adopts robots to offer passengers with relevant guidance on airport facilities and roads, luggage check-in service and ground sweeping; Narita Airport in Japan has tried robot pick-up. Robots proficient in three languages can also inform passengers of exchange rates

and introduce facilities in the airport; San Jose International Airport in the United States uses Norma robots to help travelers find restaurants, shops and other important places in six different languages.

In China, robots at Huanghua Airport in Changsha provide services such as automatic guidance, entertainment and true feelings delivery, etc. Intelligent robots at Phoenix Airport in Sanya can play specific voice prompts in designated areas, and can even implement man-machine dialogue to help passengers find the areas they need to go to; the service robots at Changshui airport in Kunming can not only recognize the voice, face and body movements of the speaking objects, but also understand both Chinese and English languages. Furthermore, they can provide various services for different passengers, such as the guidance of boarding gate, flight information query, query of nearby hotels, restaurants and self-check-in guidance, security inspection guidance, interactive entertainments, etc.

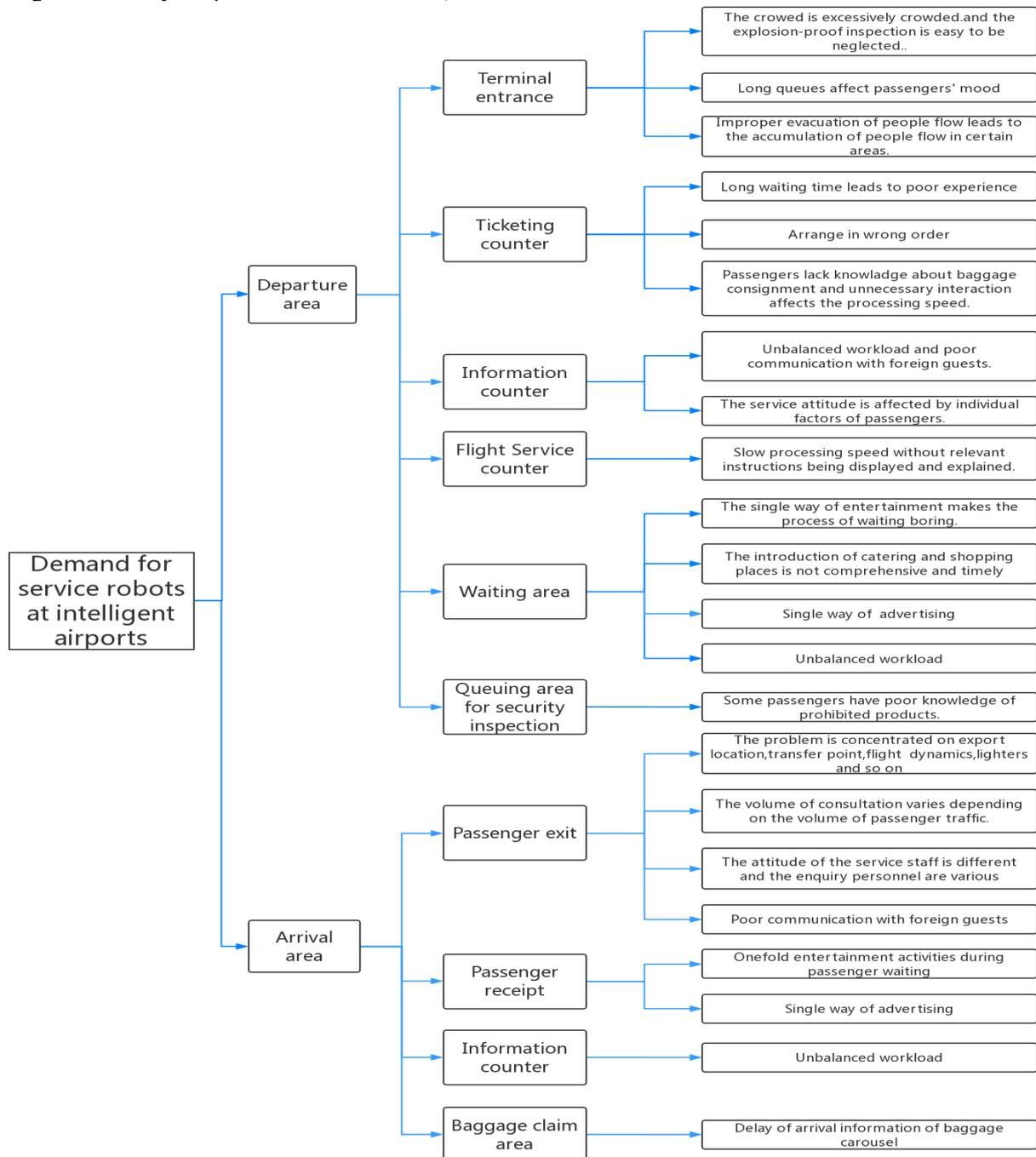
## 3 SERVICE ROBOTS DEMONDS ANALYZE

By using the concept of service design and analyzing the user value network relationship in the context of intelligent airport, it can be found that in the two parts of port entry and departure, the demand for intelligence services is mainly concentrated in the links of inquiry, navigation and security. Among them, inquiry is the most

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direct contact with users, so the problems are relatively concentrated and scattered, which mostly affects the service evaluation of users. There are blind spots in the coverage of security inspection to some extent, and

problems in the full monomer intelligence navigation diverting. Therefore, the demand analysis is mainly based on these three kinds of problems.



**Figure 1.** Demand analysis of airport robots

According to the above demand analysis, the following functions will be added to the solutions of the robots. Navigation: 1) The guidance of diverting the passenger flow 2) Diverting methods 3) Diverting efficiency; Safety and security: 1) Comprehensive coverage of security inspection; Consultation: 1) FQA

(procedure, location, single service) 2) Continuity of publicity 3) Service quality (efficiency, quantity, value-added services and personalization).It is specifically embodied in the decomposition of function implementation, as shown in the following table:

**Table 1.** List of airport application requirements

List of airport application requirements			
Modules	Functional subdivision	Service category	Function introduction
Enquiry	Service Enquiry	Existing business	1) Modularization, standardization and refinement for common problems to provide unified standard services such as location, exit, process, etc.; 2) FAQ large database is continuously updated by active deep learning and passive recording through AI technology; 3) Remote video customer service is specifically targeted at matters; 4) Flight information inquiry, terminal business information inquiry, service facilities inquiry, etc.; 5) Provide diversified services, such as multilingual services; 6) Reasonable deployment to avoid blind spots and provide services effectively.
	Explanation and publicity	Existing business	1) In the preset period of time, the relevant processes and precautions are continuously publicized to users within the coverage scope through simultaneous presentation of multiple machines or segment presentation of single machine; 2) Targeted advertising push and precision marketing based on big data can be realized regularly or irregularly for different coverage areas; 3) Preset or non-preset entertainment service functions; 4) The safety instructions in the security inspection waiting area are played in a loop.
	Personalized care	Existing business	1) Provide personalized value-added services to relevant customers, such as VIP or paying customers.
Navigation	Leading the way	Existing business	1) Free navigation of the robot in the designated area; (in a small area, such as VIP hall, etc.).
	Guiding the way	Existing business	1) The robot provides customers with directions to the destination by the arms, the screen displays the trajectory from the current position to the destination, and broadcasts the guidance prompts;
Conduction	Physical diverting	Potential business	1) Based on the data, people flow differentiation is carried out through active propaganda, communication, passive push, etc.; 2) Preparatory diversion via preset reminder service.
	Commercial diverting	Potential business	1) Commercial traffic distribution through active push and passive inquiry based on voice technology.
Safety and security	Mobile cruise, face recognition	Existing business	1) Proactive and targeted comprehensive cruise inspection; 2) Passive multi machine remote monitoring; 3) As an image acquisition device moving in the process of mobile cruise, the robot can work with the airport security system based on face recognition and face deployment control at the airport to supplement the monitoring blind spots; 4) Cooperate with the use of video analysis technologies such as face recognition, automatic tracking, behavior analysis, object detection, crowd flow judgment and the development and application of big data, to comprehensively improve the airport's capabilities for early warning, pre-judgment and emergency response, thereby supporting the intelligent security of the airport.
Big data	Data collection and processing	Existing business	1) Active collection and recording of video and voice; 2) Network-wide data analysis; 3) The collected data can be updated in the cloud for deep learning and intelligent processing.
Remote control	Remote control	Existing business	1) Managers can monitor the position of the robot in real time through the map; 2) Real-time monitoring of the camera and received sound of the robot; 3) The robot supports PC remote control and mobile phone remote control.
Other	Other	Potential business	1) Baggage drop-in service at the airport; 2) Diversified and precise push of terminal advertising; 3) Fast search for parking position; 4) Integrated services of internet to robot to business.

#### 4 FORMULATION OF INTELLIGENT CLOUD PLATFORM SOLUTIONS

After in-depth analysis of the problems and requirements, we believe that the concept of the solution in this scenario is to use the combination of intelligent data platform and intelligent robot terminal based on the unified technology platform and unified data service, establish the airport AI big data platform through the active learning of the machine, and build the intelligent service ecosystem of big data around the users. Specifically, the advanced architecture of “intelligent

robot + cloud platform” is adopted, with the unified cloud platform as the backstage supporter, and the front-end service robot utilizes the standard version for distributed deployment. During later use, all data maintenance, application updates, and other content are processed uniformly on the cloud platform, without the need to adjust the front-end robots one by one. At the same time, a smooth transition can be made when the front-end robots need to be expanded and maintained according to the business situation.

The specific system architecture diagram is shown as below.

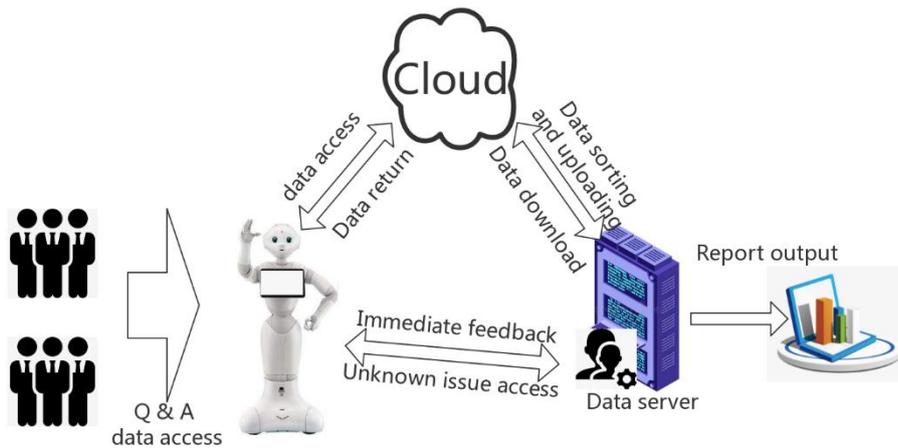


Figure 2. System architecture diagram

#### 5 DESCRIPTION OF SCENE FUNCTIONS

The setting of the service problem database can ensure the increase of the coverage of problems, the standardization and the continuity of the service, thereby solving the boundedness of service knowledge structure, emotional service and the constraints of working hours of the current service personnel. At the same time, the full freedom arms of the service and the humanoid design of minimalist and abstract aesthetics are more in line with the public aesthetics and will enhance the user experience. On the other hand, based on the existing services and business information, targeted services can be pertinently improved through big data mining and analysis.

A. The cloud connection not only solves the limitation of storage volume and timeliness of problem response, but also can be embedded in some value-added services in non-related fields. Cloud connection can give priority to the recommendation of targeted value-added services for some commercial and public interest inquiries, and increase the promotion of public welfare projects while achieving business value-added.

B. Service robots can effectively solve most of the customer service problems, but services that have not been involved or have to be manually resolved can be addressed by connecting to the artificial customer service

personnel through the U-meeting function of the service. The problems are diverted and screened by the service robots, so that most of the consultations are undertaken by the robots, which minimizes the working pressure of the artificial customer service.

C. Services can be continuously innovated and superimposed in providing service categories. For example, the provision of multilingual services can effectively solve the problems of incomplete language coverage and language proficiency of offline customer service personnel. At the same time, it can effectively reduce the recruitment requirements of relevant personnel, thereby effectively reducing the relevant costs, so that service robots can assume the role of translator and omnipotent.

D. The reasonable deployment of services can effectively solve the limitations of current consulting services such as the fixed points and blind spots. The close and personal services to passengers have changed the model in the past that people look for services.

E. The service robot can effectively avoid the situation that the relevant consulting service function overflows to the security personnel without effective and comprehensive service provision, thus effectively improving the service quality and efficiency.

The enterprise service-oriented solutions of service robots are highly directional and unique, and most of them occur in multiple rounds of interaction in the vertical industry, thereby forming a service cooperation

ecology among enterprises with customer-centered, including service ecology, data ecology and knowledge ecology. We firmly believe that the landing of this system solution can provide more passengers with efficient and convenient travel experience, and can establish cooperation and connection with more customers, thereby creating the new airport intelligent service ecology.

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