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## The design and implementation of intelligent office systems based on the intelligent interactive technology

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### ABSTRACT

Office Automation refers to the use of modern office equipments, computer, communication and Internet technology to replace manual labor office staff thus greatly improve office efficiency and work quality. With further increase the pace of construction of college information, the demand for university internal information platform for building more and more urgent. For this reason, this paper designs and implements the intelligent office systems based on the intelligent interactive technology. The related technologies, Smart Home System, Kinect Sensor and Active Server Pages are introduced, and the requirement of intelligent office systems is analyzed. The design and implement solution of intelligent office systems is proposed based on the intelligent interactive technology. The experiment results show that the presented method can implement the somatosensory interaction control for smart office effectively.

### KEYWORDS

Intelligent interactive technology; Design and implementation; Intelligent office system.



## INTRODUCTION

The development of modern colleges and universities is to try to become a high-tech digital platform<sup>[1]</sup>. Nowadays, the government, enterprises and other fields have formed an intricate information network, then high speed information transmission, timely information processing and fast information storage seems to be rather crucial<sup>[2]</sup>. As the basis and important component of the administrative management informatization, OA (office automation) is a rebuilding process that realizes the integration, perfection and digitization of modern office process and organizations, which is the only way to modern administrative management and the e-government development, also the necessary condition of improving the scientificity and objectivity of decision making, enhancing democracy consciousness and increasing administrative transparency. In recent years, the rapid development of computer network technology has not only provided a powerful network information-processing platform for different departments and units of Chinese social production, but also offered a strong technical support for the leapfrog development of digital campus construction in universities. With the advent of knowledge management and informatization era, the past low-efficiency working mode and information processing mode have been far from enough to meet the requirements of modern campus network development. In order to realize the goal of “building campus network and digital platform” of Hotan Teachers College, the college should build a complete office automation system containing information collecting, processing, transmission and sharing<sup>[3]</sup>.

## RELATED TECHNOLOGIES

(1) Smart Home System. Smart home is an important application field of internet of things. The author firstly designs a smart home system based on internet of things<sup>[4]</sup>. For the convenience of scientific research and teaching experiment, this system with B/S structure employs such networking modes like ZIGBEE, Wi-Fi and RS485 to realize the information collection and command control of various household articles and execute real-time data interaction through the home gateway and database server of database management system. Web sites with ASP.NET are established in Web site server and ADO.NET is adopted to implement data interaction with database server. Users can access to the above-mentioned Web sites through Web browsers, and then realize the application of smart home system as well as the setting and control of Kinect. The structure diagram of smart home system is shown in Figure 1.

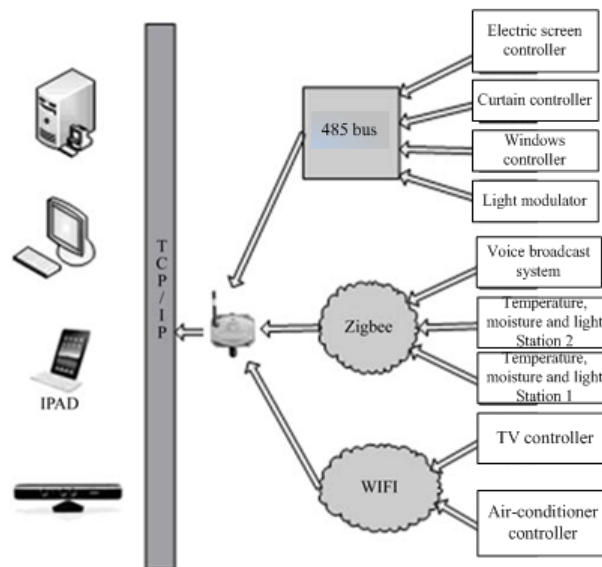


Figure 1 : Smart home system

(2) Kinect Sensor. The rudiment of Kinect sensors are sensor devices developed by Microsoft for XBOX360 and later the version “for windows” was developed for application. Kinect is a kind of three-dimensional camera sensors that can acquire color image information and depth information, realize real-time human skeleton tracking and execute the microphone voice input and speech recognition. The middle camera is a common RGB camera that can acquire color image information, and the left and right are respectively infrared emitter and infrared CMOS camera that form a 3D depth sensor, and the bottom motor can drive Kinect to rotate by 27° to left or right to realize its tracking function<sup>[5]</sup>.

The difference of Kinect lies in its CMOS infrared sensor that acquires 3D depth information in the view field through speckle emitters and 3D sensors. According to the laser speckle effect, highly-dispersed diffraction spots formed when shining a laser onto rough objects or through ground glass will form different patterns as the distance changes, and these patterns will be transmitted to the whole area for detection, then the 3D sensor collects the reflected speckle patterns in real time and finally obtains a “depth field” pattern corresponding to the whole view field through inner chip processing of Kinect. In this pattern, twenty nodes of one or two moving human images are tracked to realize human skeleton tracking. A

four-microphone group is then adopted to eliminate noises and echoes and integrates with speech recognition API of Microsoft Speech to capture all kind of information in the effect range of sound source. Based on the above-mentioned function, Kinect begins to be applied in 3D scanning, class teaching, somatosensory game library development and medical diagnosis etc.

(3) ASP Technology. ASP (Active Server Pages) is a development environment of Web Server Side launched by Microsoft, which can be used to generate and execute dynamic, interactive and highly powered Web service applications. It is closely related with IIS Server of Microsoft and can take advantage of many features of Windows operating system. ASP adopts the scripting language in VBScript and JavaScript as the development language, so it is easy to use for developers. Or more precisely, ASP is a middleware that transforms the request on Web into an interpreter in which all Scripts will be analyzed and then executed. During the process, a new COM object is built in the middleware and its attributes and modes are adopted, then more operations are done through these components. Therefore, the power of ASP does not lie in its VBScript but in background components that have extended its capability infinitely.

## REQUIREMENT ANALYSIS

During recent years, Guilin University of Aerospace Technology has worked actively to adapt to the digital demand of modern universities, enhanced self consciousness and increased the investment in manpower, materials and financial resources, which has achieved some improvements for campus informatization in infrastructure and network construction. However, the whole work is still far from the demand and remains in the initial stage of the integrated development, which are mainly reflected in inadequate demand analysis, imperfect top-level design, mismatched infrastructure, obviously lagging-behind software construction, poor safety protection and office automation not systematic enough etc. These problems have greatly restricted the further development of the informatization construction in the college. They results from both immature external environment and mistaken concepts in office automation. Main causes are:

(1) Computer infrastructure of most units with office automation is not integrated. They use independent personal computer only to complete word processing and form processing or make simple e-mail exchange through network.

(2) The function of developed application software is too single. For long period, mature office automation software products still remain to focus on the processing of words and forms, and no other user demands especially the business processing demand are included in office automation.

(3) Concept of office automation is wrongly understood and disseminated. The current understanding overemphasizes the automation of the office process and has deviated from the practical requirements of the college.

(4) The system automation disagrees with the manual operation. The introduction of computer management system in the office process will inevitably affects the current system. It is especially obvious in official document processing. Manual document processing mode has prevailed for tens of years, and there is a set of complete system and effective mode. Most office workers have been accustomed to this operation mode, so it is hard to change their work habits and some leaders and office workers even have doubts and resistance against office automation. Therefore, office automation should be popularized in right way with accurate concept.

(5) Unsatisfactory safety of the system. Since the emergence of the first computer, safety has been the most important factor that hinders the application of computers, especially during the network age, further application of Internet usually means external peep. Since the information transmission, processing and storage is highly confidential in the office automation system in the college, it is easy to become the attack target of hackers and hostile forces.

In order to ensure the security of network system, the college mainly adopts the following safety measures: controlling and managing users' permissions through the security control mechanism provided by the operating system, database, E-mail and application system; installing anti-virus software on network desktop workstations; setting firewalls and isolation devices at the joint between Intranet and Internet and adopting encryption technique for the transmission of crucial information. However, these security measures are far from enough as to the office automation system in Hotan Teachers College that usually processes dead secrets, so the system is easy to be attacked by hackers and virus, and the transmitted data may be intercepted or tampered.

## SYSTEM DESIGN

The designed system should conform to the development rules of software engineering, with a reasonable structure, high operating efficiency and satisfactory performance. The system should own good flexibility and extensibility and take advantages of existing software and hardware resources. A design scheme is proposed for the whole system process according to the function demand of office automation system. The system can work functionally only after being logged on. When logging on the system, users should input right information so that the system judges whether they have the rights to login. At the same time, information of registered users is put in Session. For safety, direct input of address in the address bar is not allowed and an error page pops up to remind users of login when unregistered users input address directly or users have logged out.

(1) Functional Design. Office automation system mainly focuses on "office automation" in application and development, including state document approval and office management. Its main function is: lining with the document examination and approval in different departments, building an examination and approval structural system that accords with

business requirements of all departments in the college so as to realize “approval automation”, thus saving time and labor cost in transmitting papers and improving approval work efficiency.

The function of office automation is: to realize automation of data processing, data protection and the whole work procedure so that office affairs of the whole organization are in a safe, controllable, well-organized and high-efficiency state. As to information processing, the office automation system should be responsible for input, output, publishing, communication, storage and recovery of information. During ordinary office affairs, often-used information includes: data, voice, words, diagrams, images. The main function of office automation is: Data processing, Word processing, Diagram processing, Graphic and image processing, Data representation and E-mail.

(2) Database Design. A website with modules like User Login, Technology Forum, Contact Us, Online Test, Online Class and News and Trends will be designed through ASP and access, and operational tests will be made on designed web pages under the server environment and client-browser. Information of personal teaching websites is managed through database. Currently, various database systems can be used in websites and this website adopts Access 2000 database system, because the size of the designed web is small, suitable for small-scale intranet, besides, ODBC driver of Access performs more efficiently and the debugging is also convenient. In order to publish database through web pages, the first job is to build a database users need, containing the building of forms, indexes and storage procedure etc.

(3) Safety Design. Databases should be protected from illegal use that may result in data leakage, change or breach. In a database system, large amounts of data are centralized and directly shared by many users. They are precious information resources and relevant safety protection measures are necessary to prevent from malicious damage and illegal access. A fully functional database system should be safe besides being able to manipulate data accurately and involved safety problems are: How to prevent illegal users from using databases, and how to guarantee data integrity.

## SYSTEM IMPLEMENTATION

In order to realize intelligent control, firstly gesture recognition and voice recognition instructions of various household articles should be defined individually. Kinect icons are listed in the homepage of smart home system, shown in Figure 2.



**Figure 2 : Control pages of smart office system**

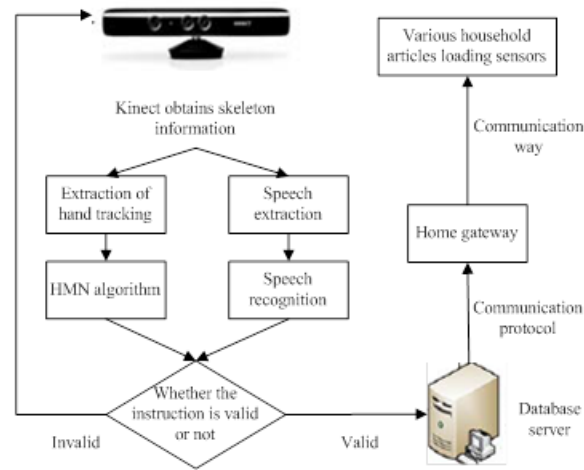
All the start instructions begin with bridging arm shape. In order to prevent wrong operations, responses must be made within five seconds after the shaping of bridging arm, or the response is invalid. Pause with T-shape, such as the pause of open or close of curtains and windows. We can select close or open of Kinect, speech and somatosensory recognition to check the power-on state. Long-term operation of Kinect in smart home system will greatly shorten its life span, so a self-protection pattern should be designed in which Kinect will stop working automatically when no bridging arm shapes begin within the defined time range.

This system employs VS 2010 as the development tool and is equipped with Kinect for windows SDK 1.6. It obtains twenty nodes information of users' skeleton, and makes judgment according to the position relation of skeleton nodes represented with special user posture, thus realizing intelligent control of smart home system.

The recognition of gesture tracking is necessary for the control of smart home system and the author adopts the gesture tracking recognition based on Hidden Markov Models in this paper. Firstly, obtain depth information of images through Kinect sensor, then determine the palm position through the hand analysis module of OpenNI and abstract the tracking features, finally train the effective tracking samples and realize tracking recognition according to Hidden Markov Models.

Speech recognition is implemented through Microsoft Speech SDK in Kinect SDK which can realize speech recognition and control. However, it does not support Chinese speech recognition at present, so English speech is employed.

Control instructions corresponding to gesture instructions and speech instructions obtained through Kinect are respectively associated with ZIGBEE, RS485 serial bus and Wi-Fi infrared control and then transmitted through gateway to realize intelligent control. The control flow of Kinect is shown in Figure 3.



**Figure 3 : Control flow of kinect**

## CONCLUSIONS

This paper designs and implements the intelligent office systems based on the intelligent interactive technology. The related technologies, Smart Home System, Kinect Sensor and Active Server Pages are introduced, and the requirement of intelligent office systems is analyzed. The design and implement solution of intelligent office systems is proposed based on the intelligent interactive technology. The experiment results show that the presented method can implement the somatosensory interaction control for smart office effectively.

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