The interactive platform of Xiaozhi robot for college students' innovative skills training

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Abstract: This paper mainly discusses how to use the self-developed   Xiaozhi robot platform to improve the innovation consciousness and innovative skills of engineering students . Mainly including how to study into practice, intuitive graphical interface software of C language application to robot control, and through the human-computer interaction technology and life closely related, stimulate study interest, inspire innovative ideas, to exercise the students' experimental ability, cultivate creative enthusiasm.

Introduction

Based on the rapid advancement of artificial intelligence innovation technology, there is a significant regression relationship between students' innovation consciousness and innovative thinking traits and innovative practice. The cultivation of innovation ability is inseparable from practice. The 38cm high humanoid robot independently developed by the College of Mechanical and Electrical Engineering -Xiaozhi robot have comprehensive and stable functions. Students use this platform to develop their own imaginations, present their ideas on this standard platform, consolidate their learning, stimulate interest, train teams, and develop their abilities.

System structure

The overall design of Xiaozhi robot development platform is illustrated, including the virtual reality display system, the body sensing collection system and the humanoid robot system. The virtual reality display system is composed of the head wear display, the Wifi module, the 3D display program and the light trace module; the body sensing acquisition system is composed of the Kinect sensor andthe computer. The Wifi module and the somatosensory software consist of a humanoid robot system composed of mechanical structure and rudder, driver, visual module, attitude sensor module, robot controller, power supply and loss tube module and wireless transmission module. The wireless communication between the system uses the WIFI module UDP protocol stack to control the robot[1].

Real time control

hardware platform

Xiaozhi robot is equipped with infrared sensors, pressure sensors, loudspeakers, sonar and microphones. The control consists of two blocks of CPU to realize the joint control of the CPU, which consists of a STC12C5A60S2 drive board and a RT3530 control board, in which the RT3530 control board contains a ARM processor of 206MHz and a random access to 512MB. At the same

time, there is the external storage capacity of 4GB, and the Linux operating system and wireless data receiving module are installed. The RT3530 control board completes the reception of the wireless data. According to the received control code, the activity information of the whole robot is processed, and the control code is transmitted to the STC12C5A60S2 drive board by the RS232 bus. The STC12C5A60S2 drive board receives the RS232 data code sent by the RT3530 control board, and controls the 18 servo motors in the humanoid robot based on the control code to complete the action in various modes[2].

development platform

By developing a three-dimensional graphical programming software for robot control along with the robot, through the solid graphics of the software, the user can easily get the command to the robot, connect the robot to the computer that control the robot, start the software, open the power of the robot, and pass the computer's three-dimensional diagram. The programming software can begin to control the robot. The software can control the overall behavior of the robot, complete the functions of the robot's action control, audio control, information exchange, data editing and so on, and execute the code written.

Xiaozhi robot is based on the C language, and many of the underlying applications are completed by C program, and many functional functions are provided for students to use and algorithm research. And Keil software is used to write STC12C5A60S2 driver plate end program and ARM-Linux integrated development platform to write the RT3530 control board end program[1,2].

sensors and interfaces

The platform contains a variety of sensors, including infrared sensors, pressure sensors, loudspeakers, sonar and microphones. The sensors are integrated in the robot, so that the functions of the robot are perfect, and the users can make use of their own ideas[2,3].

(1) infrared sensor. Installed behind the robot's head, it can transmit control commands or string signals.

(2) pressure sensor. Installed on the sole of the robot, it can calculate and adjust the center of gravity position to maintain balance.

(3) loudspeaker. Installed on the chest of robot, it can play a variety of audio formats including MP3, and the volume is adjustable.

(4) sonar. Mounted on the chest of the robot, it can transmit or receive ultrasonic waves in the 60 degree ahead of the chest.

(5) microphones. Installed on top of robot head, it can collect voice from outside.

The platform can use two common communication interfaces, including Ethernet and WiFi, and WiFi is the most common communication. Ethernet is used to assist the robot to connect to the wireless network. Robots can directly access Internet through Ethernet to upgrade the system or acquire information. When the robot is connected to the Internet, a IP is obtained, and the IP of the robot is entered in the web browser. The robot can enter the web interface of the robot, enter the name and password of the robot, browse the related information of the robot, and also set some properties of the robot.

upper computer system

The host computer hardware platform is mainly a common PC, and most of the college students now have their own notebook computers. They only need to install control software when using this system. The upper computer of mobile phone is Android system, which can control APP more conveniently for mobile phone installation.

Experimental application

Xiaozhi robot can realize various functions, which can process video, recognize speech, imitate actions, etc[3].

Xiaozhi robot has its own camera and can process its collected images. The robot's own face processing algorithm can identify the human face in the environment and remember the specific face, and the robot also supports the image processing algorithm developed by the user. The researchers can develop and apply it to the robot itself.

The robot's Linux operating system can recognize two languages, including English and Chinese, and parse the semantics. The robot has four microphones located on the top of the head, which can locate the sound according to the time difference of voice transmission.

The exquisite design of Xiaozhi robot makes it able to move freely. Every part of the body is very carefully designed, which makes the activities of the robot very kind. The robot can make many people's movements, such as walking, sitting down, standing up and dancing. Xiaozhi robot can also use the external equipment to carry out action learning: as in Figure 2, the robot will be transmitted to the robot by using the body parameters collected by Kinect, and the robot will make similar actions.
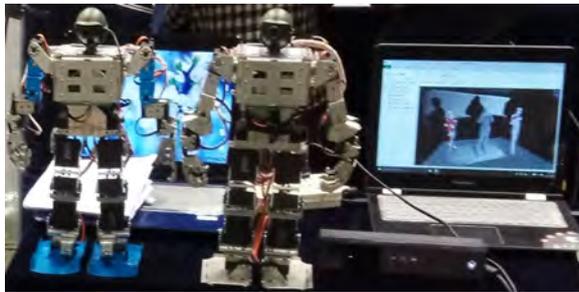

figure 1 Using Kinect to mimic the human motion system diagram

At present, this research has been applied to some sports fields, such as robot dance development and so on. And the robot action control, and the imitation of the research itself, also has a wide and in-depth exploration, for example, in an unknown environment of an unknown environment to replace people to carry out measuring and drawing, to ensure the safety of human life. The motor that can move freely in each joint can make Xiaozhi robot imitating the human posture highly. By imitating the tone color, it can be used to accompany the lonely old man. It can also be used in preschool teaching, attract children's interest in robot, reduce the pressure of teaching and improve the learning interest of children.

conclusion

In daily life, how to develop students' skills and how to develop their skills requires constant exploration and innovation. Xiaozhi robot developed by the Institute are relatively mature, and their use and basic functions are introduced. After fully understanding, the understanding of learning knowledge can be deepened effectively, and the students' interest in learning can be improved through the new things of the robot and the practical ability of the individual. Strength is one of the best choices for developing its innovative skills.

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