Function Design and Simulation Research of Intelligent Interview Guidance Robot

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Keywords: Intelligent biometrics technology, Wheeled mobile optimization A* algorithm, Interview guide robot.

Abstract. The job of the interview guide is to do a good job of checking the examinees before the interview, which has a long working procedure, long working hours and easy to be disturbed by the environment. Now design an intelligent interview guide robot to replace the guide's work. At the same time, MATLAB modeling and A* algorithm trajectory planning are used to make the interview guide robot more efficient and more intelligent.

Introduction

The task of the interviewer is quite varied. Checking documents is purely manual, time-consuming, and difficult to achieve high accuracy. While the security inspection is equipped with some electronic devices, such as metal scanners, the manual operation is easy to appear, which causes the examinee to carry the electronic cheating tool and so on. In general, the examination room and the interview room do not belong to the same examination room. If the number of examinees is much more, the interview guide for a long time and back and forth is easy to appear and relax vigilance and so on. In view of the above problems of the traditional interviewer, it is necessary to develop an intelligent robot that can replace the human service interview guidance. The intelligent interview guides the robot as the automatic control device. It can not only transmit the real-time signal to the human, but also set the program [1] in advance according to the different test field environment. The main function of the intelligent interview guidance robot is to reduce the task of the interviewer and effectively reduce the instability of human operation, as shown in Fig.1.

![Image showing the robot structure](Image)

Figure 1. Intelligent interview to guide the robot structure.

Introduction of Robot Structure

The main functions of the robot are determined according to the tasks and requirements of the interviewer. By analyzing and comparing the functional modules, we design an intelligent robot that
can guide the candidates in the interview. Through accurate and effective intelligent control procedures instead of complex manual operations, greatly enhance the efficiency, so that the preparation before the interview is more standardized and fair. Intelligent interview guide robot humanoid design, full of affinity, with man-machine interface, high-definition camera, voice system, mechanical hand, two generation identity card identification system, induction system, guidance system and so on. The working process of this robot is to use the high definition camera and the identification system of two generation identity card to complete the identification of the examinee; the manipulator can grab the security inspection equipment to complete the security inspection; the examinee completes the selection work independently through the human-computer interaction interface; the voice system can complete the reading task; the induction system and the guidance system are completed. Route guidance.

**Identification System**

The process of biometric identification technology is: with the help of advanced computer technology, the personal biometric information is put on record in the computer. When the identity information is checked and confirmed, biometric features are used to collect the biometric information of the mobile phone, and compare the information with the original records. It does not match, and its system structure is shown in Fig. 2.

![Figure 2. Structure map of biometric identification system.](image)

There are five kinds of [2] commonly used in biometrics: one is fingerprint recognition technology. Fingerprint recognition is a very mature recognition technology that utilizes the uniqueness of the texture characteristics of each person's fingers. Fingerprint recognition technology has the advantage of high accuracy and simple and convenient acquisition. The disadvantage is that the special human body with hand defects is difficult to collect and the fingerprint safety is not high. Two is the iris recognition technology. The iris is a part of the eye structure that surrounds the pupil, and the iris is unique and has the same characteristics throughout life. The advantage of iris recognition technology is non-contact recognition, and its security is high. The disadvantage is that iris recognition requires the highest hardware, algorithms and recognition conditions, and a special iris acquisition camera is needed, and a good illumination environment is needed when the iris image is taken. The three is face recognition technology. Face recognition technology mainly analyzes and compares the characteristics of facial organs in the face, such as size, proportion, distance and so on. The advantages of face recognition technology are non-contact, the use and operation process is relatively simple, and it can realize multi person recognition and improve efficiency. In recent years, face recognition technology has matured, and many mobile phones and other electronic devices have begun to focus on the introduction of face recognition technology. The drawback is that the camera needs to be equipped with high-definition cameras, and the identification of twins is not accurate enough.

**Security Inspection System**

After the identification is passed, the interviewer has to do the security check work, mainly to prevent the candidates from carrying the electronic communication items into the examination room. At present, there are many kinds of security inspection facilities in the market, and there are many differences in accuracy and cost. Our common security equipment have security inspection X light machine, security check door, handheld metal detector and so on, and use [3] in the airport station, large activity hall and other places which need security inspection. But the security check X machine only belongs to the luggage inspection special, there is X radiation danger, prohibit the human security check, so this security X machine is not suitable for the examination room to carry
on the security check to the student. The security gate belongs to the channel metal detector. It is a fixed installation testing equipment that can check the hidden metal items on the body.

**Draw Function**

In order to make an interview orderly, the examinee must draw a sequence number, have a personal interface on the face of the robot, and the examinee can draw lots on the touch screen interface of the robot's face. By drawing lots, the computer system associates the information of the examinee with the sequence number [4].

The realization of the draw function: using JAVA to design the lottery platform system for the interview, the examinee clicks the "start" button, the number on the interface starts to jump at a high speed. When the examinee presses the stop button, the number stops and the number is fixed on a number, then this number is the sequence number of the examine.

**Phonetic Function**

After waiting for the candidates to sit in the waiting room, the interviewer should reconfirm the candidates and the order number, and then read out the matters needing attention in the interview [5]. Therefore, the interview guidance robot should also have voice broadcast function, and accomplish the following two tasks: first, achieve the roll call function. The name and sequence number of the candidate is the text content of the text in the form of voice, the realization of the method is in the interview guide's computer system installed a voice synthesis software, this voice synthesis software online download is particularly convenient.

**Guide Function**

The speech synthesis system selected here has high quality speech and can convert the text into fluent, clear and natural Mandarin language; high precision text analysis technology guarantees the intelligent analysis and processing of the polyphonic and special symbols (such as punctuation, numbers) in the text, and the voice adjustment function, volume, voice speed and pitch. The dynamic adjustment function of a variety of synthetic parameters. The two is to realize the function of reading. The interview guides the robot to read the contents of the interview respondent rules and interview notes. This function is easy to achieve. The process is to recordings in advance, and then directly through the USB interface to the audio file of the recording into the robot's computer system. After the end of the call, the sound file is pause for 1 minutes and the sound file can be automatically played.

**MATLAB Modeling**

The robot's walking path is mainly linear and curve guided by intelligent interview. The walking action is mainly based on the speed difference between the two driving wheels to complete the plan[6]. Controlling the speed and steering of the two driving wheels can ensure the robot's forward, backward and turning movements as shown in Fig.3. According to the layout of the site, the robot's walking model guided by intelligent interview is shown in Fig. 4. There are four ways to realize walking model in robot. One is straight forward: the realization method is the same direction movement in the same speed of the latter two wheels; the two is the forward and the left turn: the realization method is the rear two rounds and the speed $V_{\text{left}} < V_{\text{right}}$; the three is the center of the next two rounds, reverse clockwise rotation: the realization method is the left wheel reversal, right wheel positive turn, same speed. The four is the forward and the right turn: the realization is that the last two rounds are positive and the speed is $V_{\text{left}} > V_{\text{right}}$. 

305
Motor Dynamics Model

The intelligent interview guidance robot’s guidance system is driven by two wheels. The drive uses the excited DC motor. It has the advantages of easy control and convenient speed regulation. The expression of the electromagnetic torque $T$ of the DC excited motor and the total current of the armature loop is as follows: $T = C_T \Phi I_a$

In the formula, $C_T$ is the torque constant, and the magnetic flux $\Phi$ is a single pole. The expression of the total current of the armature loop is as follows:

$$I_a = \frac{U - E_a}{R_a}$$ (1)

The $U$ is the motor terminal voltage, $E_a$ is the armature electromotive force, and $R_a$ is the total resistance of the armature loop, the expression of the armature electromotive force is $E_a$:

$$E_a = C_e \Phi n = \frac{60C_e \Phi \omega_m}{2\pi}$$ (2)

The formula $C_e$ is the electromotive force constant, $n$ is the rotor speed of the motor, and $\omega_m$ is the rotation speed of the motor rotor. The relationship between rotating speed $\omega_m$ and $v$ speed of motor rotor is as follows:

$$\omega_m = \frac{i_g v}{r_\omega}$$ (3)

In the formula, $r_\omega$ is the radius of the wheel, $i_g$ is the fixed deceleration ratio. The combined formula (1) (2) (3) can get the relationship between the electromagnetic torque $T$, the motor terminal voltage $U$ and the motor speed $v$.

$$T = \frac{C_T \Phi}{R_a} U - \frac{60C_e \Phi \omega_m}{2\pi r_\omega R_a} v$$ (4)

Simulink Model

Simulink is a visual simulation tool commonly used in Matlab software. It realizes the modeling, simulation and analysis of dynamic system through the design of block diagram. Its advantages are simple operation and no need to write large numbers of programs, so that can be constructed in complex environment. The formula (4) shows the relationship between the motor terminal voltage $U$, the electromagnetic torque $T$ and the mobile speed $v$ of the robot [7], and establishes the Simulink module according to this relationship.
Optimization of Trajectory Planning of A* Algorithm

There are some redundant paths in the traditional A* algorithm search path, which is time-consuming and is not the best. This method is called the smoothing algorithm, the generated path is smoothed according to the following steps: first, the first point in the path is the starting point of the smoothing algorithm[8]; two is to take 3 points continuously from the starting point of each path and calculate the shortest path between the 3 points, as shown from Fig.5 to Fig.6, the distance between point 1 to point 3 is more than the total distance of point 3 to 3 after point 1 to 2. Close, so the point 2 path can be deleted; three is the point 3 as the new starting point, and then continue to take 3 points to the step (2) execution; four is the path remaining point is a smooth after the new path, as shown in Fig. 7, the interview leads the robot to guide the route is faster. By optimizing the A* algorithm, the robot's walking route is more intelligent and the algorithm's execution efficiency is even higher.

Figure 5. The test map of simulation.

Figure 6. Smoothing Algorithm for 3 point fetching.

Figure 7. The optimization path of A*algorithm.

Summary

The intelligent interview guidance robot has expanded its functions on the basis of mobile robots, and has added functions such as security check, personal identification, voice interaction and so on. Based on MATLAB optimized A* algorithm to plan the walking route, the robot is more intelligent. The development of this robot effectively reduces the workload of the teacher, improves the efficiency of the work, improves the seriousness of the interview with the means of mechanization, and solves some of the cheating in the examination room. This robot can also complete the security check of airport station, high grade place and so on. Of course, if we can add real-time
communication and monitoring big data analysis technology on the original basis, perhaps the function of this guided robot will be more perfect.

Acknowledgement
This research supported by: Research on the evolution mechanism of the new format of industrial development under the cloud manufacturing service mode—Zhejiang’s example (2015C35004); the humanities and social science research of the Ministry of education "Research on the sharing strategy of Regional Vocational Education Digital Resources reservoir cloud service-13YJAZH043", "Digital resources of vocational education and user needs--14YJCZH067"and “Zhejiang’s philosophy and Social Sciences Planning Project (NO.15NDJC164YB)”.

Reference