

Exploration of the Application of Speech Recognition Technology Based on Artificial Intelligence in Daily Life

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Abstract: *Speech recognition technology provides users with a more convenient and efficient interactive experience by automatically recognizing and processing speech signals. Starting from the acquisition and processing of speech signals, the foundation of speech recognition models and algorithms, and the application research of deep learning and neural networks, this article focuses on exploring the specific applications of speech recognition technology in fields such as smart homes, smart transportation, mobile devices and smartphones, education and learning, and healthcare. By analyzing practical application scenarios in various fields, the important role of speech recognition technology in improving convenience, efficiency, and promoting intelligent development has been demonstrated.*

Keywords: Artificial intelligence; Speech recognition technology; Daily life; Application.

1. INTRODUCTION

With the rapid development of artificial intelligence technology, speech recognition, as one of its important applications, has profoundly influenced various aspects of modern society. Speech recognition technology can automatically process and understand human speech, transforming traditional human-computer interaction into a more natural and efficient communication mode. The popularization of speech recognition technology in fields such as smart homes, intelligent transportation, education, and healthcare has improved people's quality of life and promoted the construction of an intelligent society. The article will explore the practical application of speech recognition technology based on artificial intelligence in daily life, analyze the changes and impacts it brings, which has important practical significance.

2. OVERVIEW OF SPEECH RECOGNITION TECHNOLOGY BASED ON ARTIFICIAL INTELLIGENCE

The core goal of speech recognition technology is to convert speech signals into computer understandable text or instructions, which includes the acquisition, processing, and conversion of speech signals. The acquisition of voice signals usually relies on devices such as microphones to convert sound fluctuations into electrical signals, which are then converted into digital signals using signal processing techniques. By preprocessing the signal, such as denoising, echo cancellation, and enhancement processing, the accuracy of subsequent recognition can be effectively improved. The processed signal enters the feature extraction stage, and a common approach is to use methods such as Mel frequency cepstral coefficients (MFCC) to convert sound features into digital features suitable for algorithm processing.

The speech recognition model and algorithm constitute the core of the speech recognition system, mainly including acoustic models, language models, and decoding algorithms. Acoustic models are used to recognize the physical features of speech, typically based on statistical methods such as Hidden Markov Models (HMM) and Gaussian Mixture Models (GMM), which dominated early speech recognition. The language model optimizes recognition results and reduces ambiguity by calculating the probability of vocabulary appearing in sentences. The decoding algorithm is based on acoustic and language models to search for the most likely text output and ultimately achieve speech to text conversion.

In recent years, the introduction of deep learning and neural networks has greatly promoted the development of speech recognition technology. Deep learning models such as Deep Neural Networks (DNNs), Convolutional Neural Networks (CNNs), and Recurrent Neural Networks (RNNs) can automatically learn complex speech features from large-scale data and significantly improve recognition accuracy and robustness. Especially with the application of Long Short Term Memory (LSTM) networks, the limitations of traditional models in dealing with

long-term dependencies have been further addressed, making speech recognition more accurate and efficient in practical applications. The integration of these technologies enhances the performance of speech recognition and lays the foundation for achieving more natural and smooth human-computer interaction.

3. THE SPECIFIC APPLICATION OF INTELLIGENT SPEECH RECOGNITION TECHNOLOGY IN DAILY LIFE

3.1 Smart Home

With the rapid development of artificial intelligence technology, intelligent speech recognition has become an indispensable part of smart home systems, greatly changing people's lifestyles and enhancing the convenience and comfort of life. Speech recognition technology, combined with smart devices, enables users to achieve intelligent control of their home environment through simple voice commands, breaking the limitations of traditional control methods and making home life more intelligent. Key applications include: (1) voice assistants and smart speakers. Voice assistants, with their efficient speech recognition capabilities, have become indispensable assistants in modern households. Voice assistants can recognize users' natural language commands and respond accordingly, providing various services such as weather forecasts, news updates, schedule reminders, etc. Users can use voice commands to make the smart speaker play music, adjust volume, check schedules, and even control other smart home devices. This non-contact interaction method not only makes family life more convenient, but also liberates hands to a certain extent, making the handling of daily chores easier. With the continuous advancement of speech recognition technology, the accuracy and response speed of voice assistants have also been significantly improved, resulting in a smoother and more natural user experience. (2) Smart home control system. The smart home control system introduces speech recognition technology into various aspects of the home environment, making the management of home devices more intelligent and personalized. For example, users can control the lighting, air conditioning, television, curtains and other devices in their homes through voice commands, achieving automated adjustment of the home environment. With just one sentence of "turn on the lights" or "adjust the air conditioning temperature", the system can accurately recognize and execute the corresponding command. For households with multiple smart devices, voice control simplifies the operation process and avoids tedious manual settings. In addition, the smart home control system can automatically adjust the environment according to the user's daily habits. For example, the system can learn the user's daily routine, automatically adjust the indoor temperature, or automatically turn off lights and appliances at specific times, saving energy and improving living efficiency. The introduction of speech recognition technology has made these operations more interactive and user-friendly, greatly enhancing the user experience and comfort of home life.

3.2 Intelligent Transportation

With the continuous advancement of intelligent technology, the application of speech recognition systems in the field of intelligent transportation is becoming increasingly widespread. Speech recognition technology can simplify the interaction between drivers and vehicles, improve the safety, convenience, and intelligence level of driving. Speech recognition not only enhances the driving experience, but also effectively reduces the operational burden on drivers and reduces the occurrence of traffic accidents. The main applications are reflected in: (1) voice navigation systems. Voice navigation system is one of the common intelligent transportation applications in modern cars, which provides real-time navigation services to drivers through voice recognition technology. The traditional navigation system requires the driver to manually input the destination, which increases the complexity of operation and distracts attention during driving. The voice navigation system, by recognizing the driver's voice commands, allows the driver to input the destination or adjust navigation settings based solely on voice commands, freeing up their hands and improving driving safety. For example, the driver can say "navigate to the nearest gas station" or "take me home", and the system will automatically recognize and plan the path, while informing the driver of the route, distance, and remaining time through voice. The voice navigation system not only improves the efficiency and convenience of navigation, but also updates traffic conditions in real time, such as traffic congestion and accident information. By combining with onboard sensors and real-time traffic data, the voice navigation system can provide drivers with more accurate driving routes and arrival times, helping them better plan their driving routes and reduce traffic pressure. (2) Voice controlled in car system. With the continuous maturity of speech recognition technology, more and more cars are equipped with voice controlled in car systems, which are not limited to navigation, but also extend to control multiple in car functions, including entertainment, communication, air conditioning, windows, and more. With the help of in car voice assistants, drivers do not need to distract themselves from manually adjusting various devices, and can complete operations with simple voice commands. For example, drivers can control the audio system to play their favorite music, adjust the air

conditioning temperature, or make phone calls and send text messages through voice commands. Speech recognition technology is also widely used in in car parking systems. The traditional parking method requires the driver to manually operate according to the environment of the garage or parking lot, while the voice recognition parking system can help the driver accurately park through voice commands. When the driver says "automatic parking", the onboard system will automatically recognize the parking environment and control the vehicle to perform automatic parking operations, thereby improving the efficiency and safety of parking.

3.3 Mobile Devices and Smartphones

With the popularity of smartphones and mobile devices, the application of speech recognition technology in this field is becoming increasingly widespread. Voice assistants and intelligent search have become indispensable features in modern smartphones, providing users with a more convenient and intelligent operating experience. Accessibility features have brought great convenience to the lives of people with disabilities. Specifically: (1) Voice assistants and intelligent search. Voice assistants, with their powerful voice recognition capabilities, are able to understand users' natural language and perform corresponding operations. Through voice commands, users can control their mobile phones to perform various operations, such as making phone calls, sending text messages, setting reminders, checking weather, playing music, etc., without the need for manual operation, greatly improving operational efficiency. Voice assistants can not only recognize basic commands, but also deeply integrate with applications to provide more intelligent services. For example, users can search for web pages, find local shops or restaurants, receive real-time news and traffic updates through voice assistants. Voice assistants not only support ordinary daily commands, but also understand user intentions through context, providing more accurate and personalized services. The application of speech recognition technology in intelligent search is also gradually developing. Compared with traditional text search, speech search has higher efficiency and convenience. Users only need to say what they want to search for, and the speech recognition system will quickly convert it into a query command and return relevant results. Especially on mobile devices, voice search saves typing time, making the search process more natural and user-friendly. (2) Accessibility function. For visually impaired individuals, speech recognition technology can assist them in operating their smartphones through voice commands, such as making phone calls, sending text messages, and checking information, thereby achieving a more independent lifestyle. Through voice input, people with disabilities can directly interact with the device, avoiding the inconvenience of traditional input methods. For people with hearing impairments, many smart devices also provide voice to text conversion capabilities to help them communicate with others through text. Some smartphones can also convert users' voice commands into visual textual feedback, allowing people with disabilities to complete daily tasks without sound. The application of speech recognition technology in this field has greatly improved the quality of life for people with disabilities and enhanced their interaction with society.

3.4 Education and Learning

The application of speech recognition technology in the field of education, especially in language learning and classroom teaching, is becoming increasingly important. Through speech recognition, educators and students can enjoy a more intelligent and personalized learning experience, which helps to improve learning efficiency and teaching quality. The main applications include: (1) language learning tools. In language learning, speech recognition technology has been widely used for pronunciation evaluation and correction, becoming an important auxiliary tool to help students improve their language abilities. With the help of a speech recognition system, students can receive real-time evaluations of their pronunciation and immediately correct any pronunciation errors that occur. Many English learning applications and platforms utilize speech recognition technology to evaluate users' pronunciation and provide improvement suggestions. These tools will perform speech recognition, analyze the differences between user pronunciation and standard pronunciation, and display the accuracy of pronunciation through a graphical interface. Students can practice repeatedly and correct in real time, gradually improving their speech expression ability. In addition, speech evaluation can provide personalized pronunciation training based on the level and needs of different learners. By conducting a detailed analysis of each student's pronunciation, it is possible to identify their common pronunciation errors and provide targeted practice content to help overcome specific pronunciation problems. (2) Automated classroom voice transcription system. This system can convert the teacher's teaching content into text in real time and present it on the screen, providing students with clear text records. This technology can help students synchronize information in the classroom and avoid missing key knowledge points. The classroom voice transcription system can also provide students with course review and revision materials by real-time recording and analyzing the teacher's lecture content. Students can review classroom content at any time to enhance their memory and understanding, which has a significant improvement effect on their learning outcomes. The automated transcription system enhances classroom interactivity and

improves the efficiency of classroom teaching. It liberates students' hands, allowing them to focus more on understanding classroom content without having to spend time taking notes. In addition, teachers can also use these transcription records for teaching reflection, optimize teaching methods and content, in order to better meet the needs of students.

3.5 Medical and Health Care

The application of speech recognition technology in the field of healthcare has improved medical efficiency and enhanced patient experience. The main applications are reflected in: (1) voice input and transcription of medical records. In the medical environment, traditional handwriting or keyboard input methods are often time-consuming and prone to errors. The introduction of speech recognition technology enables doctors to quickly record patients' medical history, diagnosis results, and treatment plans through voice input, which not only improves work efficiency but also reduces the pressure that doctors face in daily work due to inputting information. For example, doctors can record patients' symptoms, examination results, and medication plans in detail through voice commands, and the system will automatically convert these voice contents into text to generate complete medical records. Speech recognition technology can also automatically identify and correct common medical terminology errors in medical records, ensuring the professionalism and accuracy of recorded content. (2) Voice recognition assisted health monitoring equipment. With the intelligent development of health monitoring devices, speech recognition technology is also widely used in personal health management. By combining with wearable devices or intelligent monitoring devices, voice recognition provides users with a more convenient way of health management. For example, voice assistants can be connected to health monitoring devices to provide real-time feedback to users on their physical condition, such as heart rate, blood sugar, blood pressure, and other data. Some smart health devices, such as smartwatches, health bracelets, etc., are equipped with voice recognition function. Users only need to ask the device any questions about their health status through voice, and the device can answer and provide relevant data in real time. For example, users can ask, "What are your steps today?" or "Is my heart rate normal?" and the device will automatically recognize the voice and provide feedback. This convenient interaction method can help users monitor their health status more intuitively and easily.

4. EPILOGUE

In summary, speech recognition technology based on artificial intelligence has become an indispensable part of daily life, widely used in fields such as smart homes, intelligent transportation, mobile devices, education, and healthcare. These applications enhance the convenience and efficiency of life, and provide more help and support for special groups such as people with disabilities. With the continuous advancement of technology, the application scope of speech recognition will be further expanded, and it is expected to play its unique role in more fields, promote the development of an intelligent society, and bring greater social benefits.

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