
基于 MATLAB 的数据采集与分析系统的设计

摘 要

在迅速发展的信息化时代，信号的采集与分析尤为重要。本文基于 MATLAB 软件平台设计实现语音信号的数据采集与分析，通过对信号进行预处理，从而实现信号的转换、放大、滤波和平滑处理。首先对语音信号进行时、频域分析，通过对语音识别的几种算法的分析对比，选择了动态时间伸缩算法(Dynamic Time Warping, DTW)作为识别算法，采用梅尔频率倒谱系数(MFCC)作为语音特征参数，从而建立了一个汉字和数字语音识别系统。系统设计主要分信号采集和信号分析两部分，首先利用麦克风对语音信号进行采集，然后对语音信号预处理、特征参数提取、端点检测获取语音特征信息，最后通过模板训练、DTW 识别实现语音内容的文字转换。同时，基于 MATLAB 软件开发了语音识别 GUI 界面，系统界面设计简单友好，使用方便。基于汉语语音模板库，本设计对数字、文字的平均识别率约为 96%，识别效果良好，达到了预期目标。

关键词：语音识别算法；数据采集与分析；语音信号处理；GUI

Abstract

In the rapid development of information age, signal collection and analysis is particularly important. This paper based on MATLAB software platform design to achieve voice signal data acquisition and analysis, through the signal preprocessing, so as to achieve signal conversion, amplification, filtering and smoothing processing. Firstly, the Time and frequency domain analysis of speech signal is carried out. Through the analysis and comparison of several speech recognition algorithms, the Dynamic Time Warping (DTW) algorithm is selected as the recognition algorithm, and the MFCC coefficient (MFCC) is adopted as the speech characteristic parameter. Thus, a Chinese character and digital speech recognition system is established. The system design is mainly divided into two parts: signal acquisition and signal analysis. First, the microphone is used to collect the voice signal, then the voice signal preprocessing, feature parameter extraction, endpoint detection to obtain the voice feature information, and finally through template training, DTW recognition to achieve the text conversion of voice content. At the same time, based on MATLAB software development of voice recognition GUI interface, system interface design is simple and friendly, easy to use. Based on Chinese speech template library, the average recognition rate of Numbers and characters in this design is about 96%, and the recognition effect is good, reaching the expected goal.

Key words: Speech recognition algorithm; Data acquisition and analysis; Speech signal processing; GUI