

研究タイトル:

# CAIを用いて中国語の発音訓練システムの開発



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キーワード: 中国語, 発音の識別, 発音の評価基準, VOTとVOT中パワーの自動測定, E-Learning

技術相談  
提供可能技術: 中国語の音声認識  
中国語の音声解析  
中国語発話教育 E-Learning

## 研究内容: 学生に向け中国語の有気音の発音訓練システム

中国語には多くの発音があるが、その殆どが日本語に無い発音なので、学生達は中国語の発音を難しく感じている。特に中国語の「無気音」と「有気音」、なかでも有気音の「そり舌音」と有気音の「舌歯音」などの発話と聞き分けを困難に感じている。帰宅後の自習も自分の発話に対して正確な評価手段もない。

本研究では、中国語話者と日本語話者の「有気音」と「無気音」の単母音の6種類と二重母音3種類の発話のVOTとVOT中のパワーを比較することにより、従来の有気音の研究の結果と異なるパターンも発見した。有気音の正確さはVOTの長さだけでなく、吐いた息のパワーにも依存することが分かった。その結果より新たな発話評価基準を確立した。

本システムの構成は中心周波数50Hz~6850Hz、幅200Hzで、35チャンネル(CH)のフィルタバンク(FB)を設計し、VOTの自動測定とVOT中パワーの自動計算のシステムを開発した。日本語話者による中国語の発話を収録し、コンピュータにより発話の正確さの重要なパラメータであるVOTを自動測定する。VOTが短すぎる時は無気音と判断する。VOTが十分長い時は有気音と判断する。VOTが一定の幅内のときにはVOT中のパワーを計算し、新たに確立した有気音の発話評価基準により有気音か無気音かの判別を行う。その時はパワーが大きければ、概ね発話の評価も高い。この発音評価システムは高い精度が得られた。下図に判定の流れを示す。

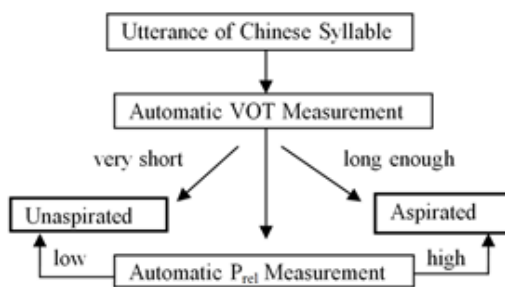


図 “有気音と“無気音”の判定流れ図

## 提供可能な設備・機器:

名称・型番(メーカー)	

# Development of pronunciation training system of Chinese by CAI



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<b>Keywords</b>	Chinese aspiration, VOT, power, Discrimination of aspirated and unaspirated sounds, E-Learning		
<b>Technical Support Skills</b>	Chinese speech recognition, Chinese utterance analysis, E-Learning system for Chinese Pronunciation		

## Research Contents Pronunciation training system of Chinese aspiration for Japanese students

Chinese aspirates are generally considered to be difficult for Japanese students to perceive and pronounce. Students utter aspirated sounds modeled after examples uttered by a native Chinese instructor, but many cannot produce the correct sounds. This is because Japanese has no aspirated sounds. To assist Japanese students in learning Chinese, we built a system that automatically evaluates the pronunciation of Chinese aspirates by Japanese students.

The length of the voice onset time (VOT) in uttering Chinese aspirated sounds has been considered to be the sole measure for evaluating the quality of pronunciation. We examined the VOT lengths and the breathing powers for 40 Japanese students and nine native Chinese speakers. The results indicated that the quality was more closely correlated to the breathing power used in uttering a sound than to the VOT within a certain VOT range, which varied among sounds.

We have developed an automatic measurement system for VOT and breathing power using a personal computer containing a 35-channel frequency filter bank, designed with MATLAB, in which the center frequency ranges from 50 to 6850 Hz with a bandwidth of 200 Hz. We can extract the spectral features of aspirated and unaspirated sounds in both VOT and voiced periods.

Figure, below, illustrates the flow of our system for automatically discriminating Chinese aspirated and unaspirated sounds. The uttered sounds are input to the computer. First, VOT is measured using the algorithm described. If the VOT is very short, the utterance is judged to be unaspirated. If it is sufficiently long, it is judged to be aspirated. If the VOT is within a certain range, If the breathing power during VOT is higher than the threshold, the utterance is judged to be aspirated. Otherwise, it is judged to be unaspirated.

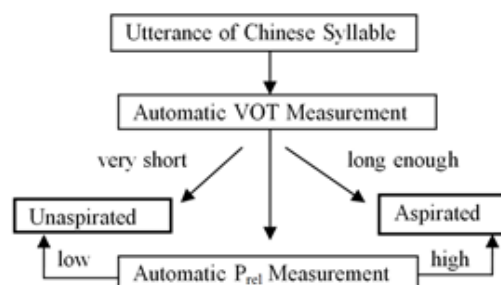


Fig. Discrimination diagram of aspirated and unaspirated sounds.

## Available Facilities and Equipment
