論文の内容の要旨

論文題目　Perceptually-motivated Automatic Error Classification for Japanese Lexical Prosody in Non-native Speech

（非母語話者の日本語単語発話における韻律的誤りの知覚的側面からの自動分類）

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For Japanese language learners, the acquisition of lexical prosody can be tremendously difficult. Therefore, a Computer Assisted Language Learning (CALL) system would have many benefits for them. For such systems, error classification or detection is said to be vital for generating feedback to the learner. The goal of pronunciation learning or any aspect of language learning for that matter is to acquire the correct mapping function Accurate error classification is not an easy issue to tackle, however, as the types of errors that learners can produce are many and may be unlike what is seen in Japanese productions. This means that simply choosing a group of features may not yield the best results. Since pronunciation classification is ultimately an act perception on the part of the native, in-depth analysis into the perception of natives should lead to more robust algorithms that more accurately reflect how natives map the acoustic features into linguistic categories.

In this thesis, we analyze native perception of Japanese pronunciation for the creation of algorithms to automatically classify errors. For this analysis, we employ speech continua synthesized from native speech. First, we conduct perceptual experiments on Japanese pitch accent perception and construct an algorithm for automatic classification of pitch patterns. For this, classification functions are derived based on the results of the listening tests. These classification functions are then used to automatically recognize nonnative pitch patterns. Secondly, we look into the perception of vowel length distinction. From these results, we derived an algorithm to automatically classify vowel length making use of SVMs and the knowledge gained

from the perceptual experiments. Lastly, we examined the perception of gemination and constructed a method based on these tests to automatically classify gemination for various types of consonants.

In this work, we were able obtain good results for automatic error classification in all aspects. For pitch accent we achieved around 80% correct classification of the accent kernel, LH transition, and no-transition when the agreement rate was high, and the recognition rate approximated the inter-labeler agreeement rate. In the case of automatic vowel classification, we were able to attain roughly 80% correct classification rate and performance that did not show degradation due to speaking rate. In the case of gemination, over 80% agreement rate was attained for most consonant types with some cases exceeding 90%. In addition to the engineering contributions, through this process new scientific discoveries were also made and through this process we have shown the validity of conducting perceptual experiments to develop recognition methods.