

Recognition of Nasalized & Non-nasalized Vowels

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Maryland Engineering Research Internship Teams
MERIT (Program) 2006

Objective & Introduction

Objective

The goal is to verify if it is beneficial to first recognize nasalization in vowels and treat the three groups of vowels separately rather than collectively for recognizing the vowel identities.

What is Nasalization?

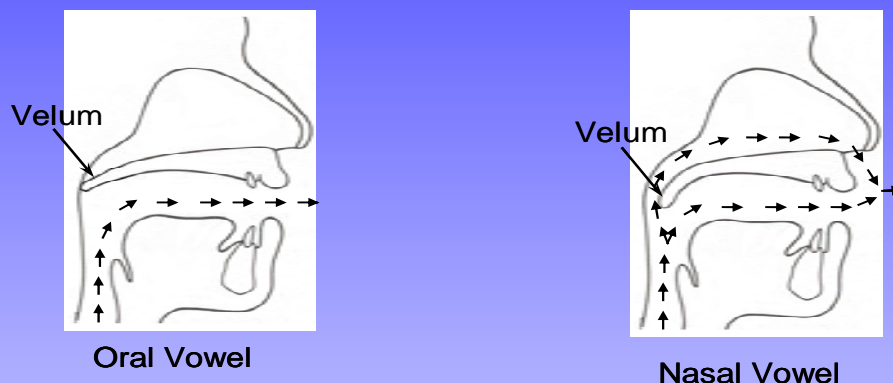
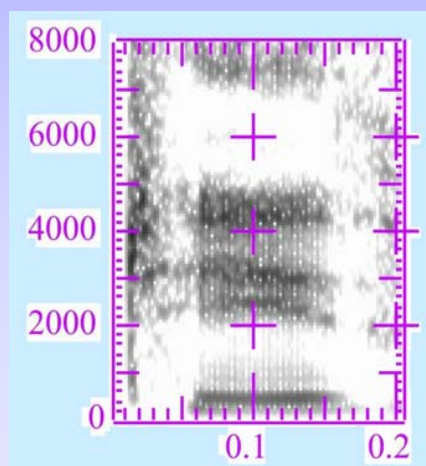
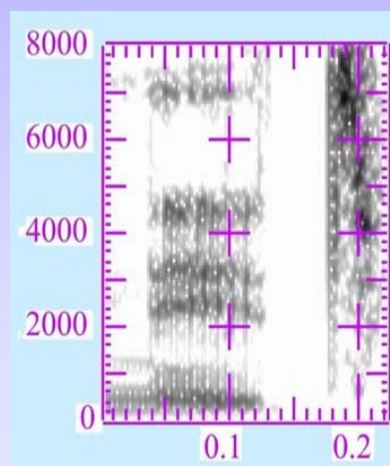


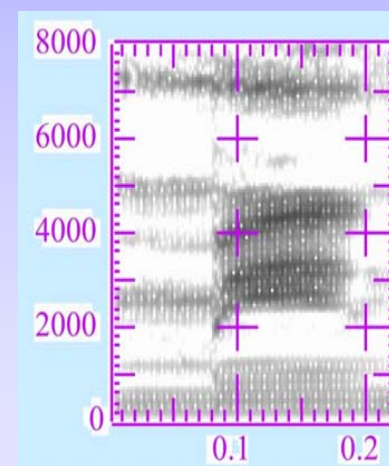
Figure 1: Production of Oral and Nasal Vowel



2(a) OV Case- iy in "Teeth"



2(b) NV Case - iy in "Need"



2(c) VN Case - iy in "Mean"

Figure 2: Spectrogram of three words spoken by the same speaker with same vowel "iy" occurring in them.

Method

- Twenty English vowels were obtained from the TIMIT database and were divided into the following categories:
 - 1) Oral Vowels (OV)
 - 2) Nasal Before Vowel (NV)
 - 3) Vowel Before Nasal (VN)
- HMMs Tool Kit was used to implement HMMs for each vowel.

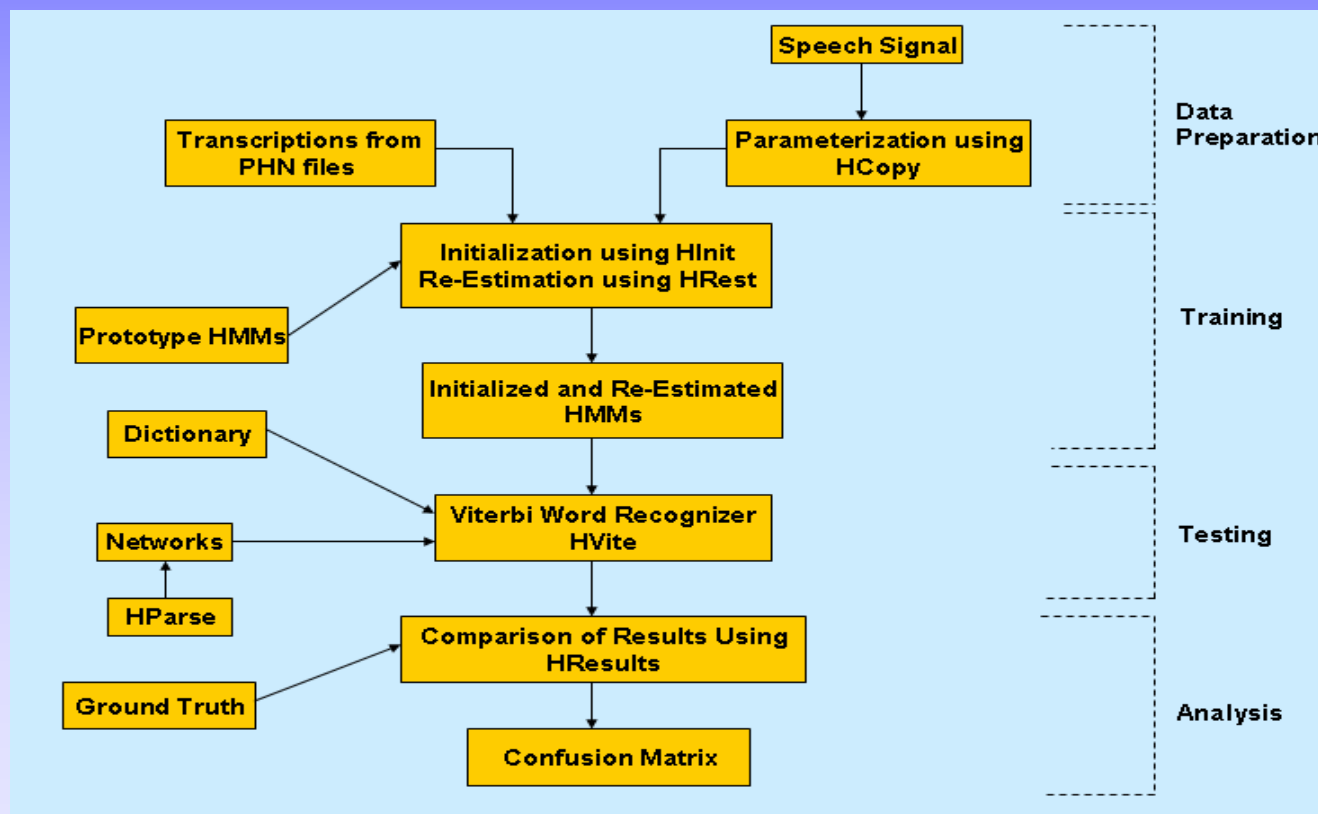


Figure 3: HTK Processing Stages

Results

Experiment-1

Training was done using vowels from all the categories. Each category was the individually tested. Table 1 shows the results.

Category	Recognition Accuracy
ALL	52.92%
OV	55%
NV	58.25%
VN	39.75%

Table 1 – Percentage Recognition Accuracy of Different categories

Experiment-2

Each category was individually trained and tested. Table 2 summarizes the results.

Category	Recognition Accuracy
ALL	52.92%
OV	56%
NV	58.04%
VN	42.86%

Table 2 – Percentage Recognition Accuracy of Different categories

Conclusion

- When the system is trained on vowels, the recognition of nasalized vowels is 17% below that of oral vowels.
- The recognition accuracy for the VN category is improved by 8% when different vowel models are created for each category.
- This result suggests that automatic recognition of vowels can be improved by first detecting nasalization and then using different models.

THANKYOU!