Phoneme based Dialect variation of Assamese Language

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Abstract – The Assamese language is broadly classified in three major eras viz- early Assamese period, middle Assamese and modern Assamese. Influence of Sanskrit and the Magadhi Prakrit is visible in the vocabulary of the language. Banikanta Kakati has broadly classified the Assamese language into two divisions –namely Eastern Assamese and Western Assamese. Understanding the difference in the phonology, play an important role in the development of emotional TTS. (MFCC) is most popular features of speech recognition. This is a feature of vocal tract. Here the variations on this process are observed using MFCC. MFCC plays an important role in identifying speakers.

***Keywords*—** Dialect variation, Emotional TTS, G2P, MFCC

I. INTRODUCTION

"Assamese, Its Formation and Development" by Banikanta Kakati have described that there are two main dialects of Assamese, Eastern and Western[1]. But now according modern research the dialects of Assamese have four major classifications viz. Eastern group,Central group, Kamrupi group and the Goalparia group.[1] The dialect spoken in Jorhat, Sibsagar Dibrugarh, and Golaghat comes under the eastern group of modern

Assamese dialects spoken in Nagon, Marigaon, Sonitpur, Lakhimpur and Dhemaji can be classified as the Central dialect. In addition to central Assam it is also spoken in the North Bank Districts to the east of Tezpur. The Kamrupi dialect is spoken in old Kamrup district from immediately east of Guwahati to the boundary of old Goalpara district covering parts of Mangaldoi and all of Darrang district. The Goalporia dialect is spoken in the Goalpara district.

Rest of the paper is organized as follows, Section I contains the introduction of Dialects in Assamesse Language, Section II contain the description of Assamese Script, its origin and its typical properties, Section III describes the methodology used to obtain the results, Section IV contains the result and Section V defines the conclusion of the obtained results.

II. THE ASSAMESE SCRIPTS

The Assamesse scripts in Indian languages have originated from the ancient Brahmi script. The basic units of the writing system are referred to as Aksharas. The properties of Aksharas are as follows:

(1)An Akshara is an orthographic representation of a speech sound in an Indian language;
(2) Aksharas are syllabic in natre;
(3) The typical forms of Akshara are V, CV, CCV and CCCV, thus have a generalized form of C*V. Here C denotes consonant and V denotes vowel.

III. METHODOLOGY

A speech signal is continuous in nature but it can be treated independently, subdividing it into continuous frames. The objective of this paper is to study MFCC frame study on phonemes of Assamese Language. Depending upon the MFCC we can determine, if the input is a vowel or a consonant. Data is collected from the age-group of the speakers is in the range of 20 to 35 years for 4 different dialect viz. Kamrup, Barpeta and Goalpara and areas of Assam besides the standard Assamese colloquial, for the analysis on dialect variation of Assamese language using MFCC. The database for dialect variation is done in stress-free environment to pronounce properly while maintaining a flat intonation to achieve a constant pitch as far as possible. Total 12 speakers – six females and six males have completed the recording. The frequency for the kinds of recording was set on 48,000 Hz with 16bit PCM.

Mel-Frequency Cepstral Coefficients (MFCC) is most popular features of speech recognition. This is a feature of vocal tract. The coefficients of Mel-Frequency are obtained by taking the inverse Fourier transform of the log spectrum after it is warped according to the mel-scale. To represent a sound's frequency spectrum, it is an efficient approach.

MFCCs are derived in following ways: 1. The Fourier transform of a windowed excerpt of a signal is taken. 2. The log amplitudes of the spectrum obtained above is mapped onto the Mel scale, using triangular overlapping windows. 3. The Discrete Cosine Transform of the list of Mel log-amplitudes, as if it were a signal is taken. 4. The amplitudes of the resulting spectrum are the MFCCs.
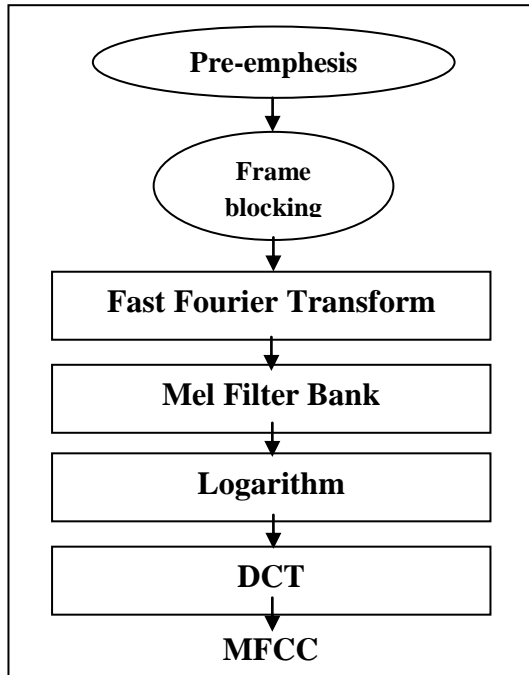

Figure 1: MFCC extraction process

Variations on this process are observed – e.g. differences in the Mel scale conversion.
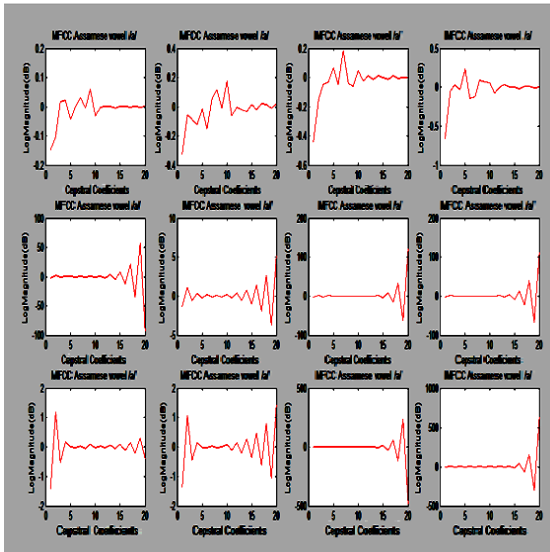

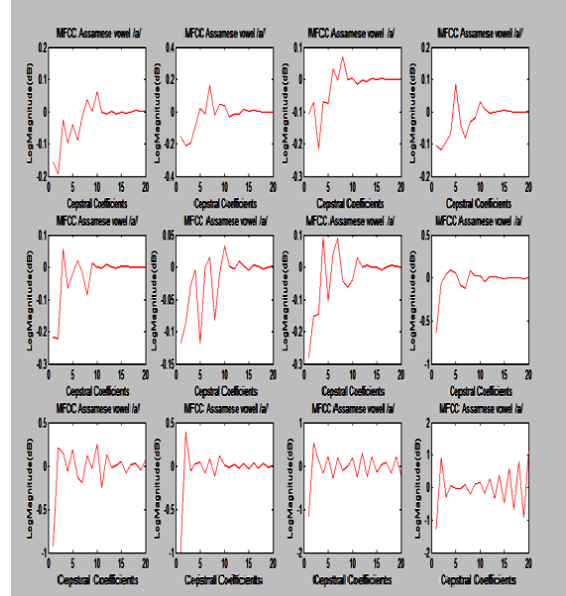Figure 2: MFCC of Assamese vowel /a/ আ for Standard Colloquial (female)

Figure 3: MFCC of Assamese vowel /a/ আ for Standard Colloquial (male)

From the above figure 2 and figure 3, it is observed that the MFCC of Vowel **/a/** আ of Assamese language has significant difference between the frames of female and male speaker. Fifteen frames are observed and out of them, frame 3,5,6,7,8,11 and 12 has visible differences. It is also observed that, the frame no 6, 9, 10, 11 and 12 shows clear distinction for female Assamese speaker and frame 10, 11 and 12 have clear distinction for male Assamese speakers with visible fluctuation
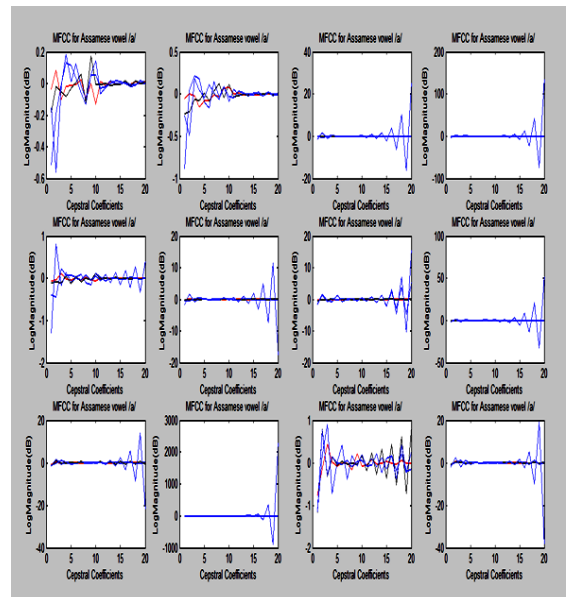

Figure 4: MFCC of Assamese vowel /i/ ই for four dialects of Assam (female)

In the above Figure 4, Assamese Vowel **/i/** ই for four different dialects of female speaker is depicted. The MFCC figure shows a significant variation between the four dialects is observed in frame 1, 2, 3 and 5. Changes are also found in the rest of frames with variation towards the end of the frame.4

IV. RESULT

The MFCC frame study shows variation in Assamese vowels /a/ আ, /e/ এ, /o/ ও and /u/ উ for both male and female when observations were performed on standard colloquial and similarities in Assamese vowels /i/ ই for both male and female. Variations are observed for semi vowels /j/ য়, female speaker of standard colloquial.

The study shows least variation in vowels /a/ আ and /i/ ই for both male and female, significant variations in vowels /e/ এ, /o/ ও and /u/ উ and semi vowels /ʋ /ৱ and /j/ য় for both male and female among four dialects of Assam viz. Kamrup, Barpeta, Goalpara and standard colloquial.

V. CONCLUSION

MFCC plays an important role in speaker identification. Features can hold speaker specific information. MFCC is widely used in commercially produced speech recognition system.

REFERENCES

[1] Dr. Golukchandra Goswami, "*Structure of Assamese*", Department of publication, Gauhati University, pp **25-32**

[2] http://www.iitg.ernet.in/rcilts/pdf/assamese.pdf .P7.

[3] Dr. Pran Hari Talukdar, *"Speech Production, Analysis and Coding Introduction to speech processing"*, Lap Lambert Academic Publishing, pp36-64.

[4] Bhargab Medhi, Prof P. H. Talukdar, LPC and MFCC Analysis of Assamese Vowel Phonemes, International Journal of Advanced Research in Computer Science and Software Engineering, Volume 5, Issue 1, January 2015 ISSN: 2277 128X,2015

[5] Md. Sahidullah , Goutam Saha, Design, analysis and experimental evaluation of block based transformation in MFCC computation for speaker recognition, Speech Communication 54 (2012) pp-543–565,2012

[6] Vibha Tiwari, MFCC and its applications in speaker recognition, International Journal on Emerging Technologies 1(1): 19-22(2010) ISSN : 0975-8364

Authors Profile

Ms Bitopi Sharma pursed MCA from NERIM, Dibrugarh University in 2008 and completed P.hD from Gauhati university in 2018.Currently working as a software developer in Directorate of Accounts and Treasuries, Assam since February, 2017. She has 8 years of research experience, 4.5 years of teaching experience.

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