

## **A STUDY ON THE EFFECT OF THE NEIGHBOR PHONEMES IN NATURAL SYNTHESIS OF SPEECH**

**H.M.L.N.K. Herath<sup>1\*</sup> and J.V. Wijayakulasooriya<sup>2</sup>**

<sup>1</sup>*Postgraduate Institute of Science, University of Peradeniya, Sri Lanka*

<sup>2</sup>*Department of Electronic and Electrical Engineering, Faculty of Engineering,  
University of Peradeniya, Sri Lanka*

*\*lakminiherath0@gmail.com*

Natural synthesis of speech needs to identify the minute variations in phoneme during reproduction, which is affected by many factors. This paper presents an empirical study on the correlations between consequent phonemes in a speech signal. Short /a/ phoneme was selected for the study. In order to examine the effect of neighbouring phonemes more clearly, words which consist of three or four phonemes were chosen. Then, the correlations between all possible pairs were calculated by comparing one cycle of each /a/ sound, which are starting from same phonemes. Statistical hypothesis tests were conducted to determine the significance of the calculated correlation values. High positive correlations exist between pairs of words which are starting from same phoneme. Moderate positive correlations were obtained between the words which are starting from different phonemes.

This reveals that there is a smooth linear time variant transition between consequent phonemes. Furthermore one cycle taken from three different places, start, middle and end of the /a/ phoneme was selected and correlations between different pairs were calculated. The average correlation of starting cycle was always less than the middle cycle, which indicate that front cycles of the /a/ sounds have a clear effect from the previous phoneme. It is because the starting cycle lies within the transition region between the two neighbouring phonemes. However, when it comes to the middle cycle, /a/ sound wave form was stabilized, so the correlation values were much greater than previous values. Then, the transits to the next phoneme correlation values vary from word to word, but all the values were less than middle correlation values. It specifies the middle phoneme has a different correlation value within the phoneme when compared to the start, middle and end wave forms. This depicts there is a smooth variation within the /a/ phoneme itself. The correlation method has clearly shown that the middle phoneme follows the preceding phoneme energy to build the articulation between two phonemes, smoothly. This is a new finding in the speech synthesis research studies since the previous works have not discussed the importance of correlation in detail. Thus, we conclude that the effect of neighbouring phonemes should be strongly considered when modeling more natural speech.