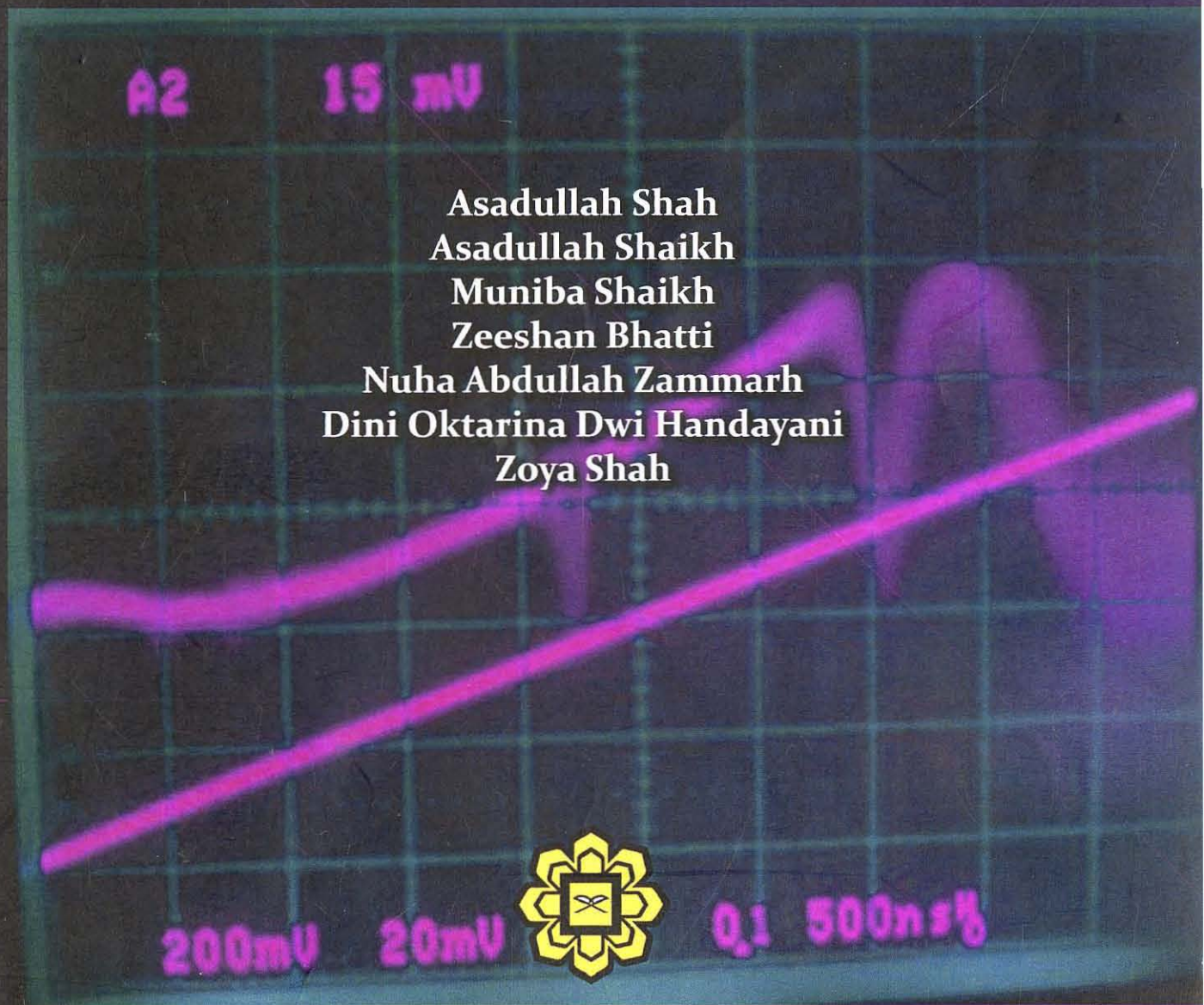
STATISTICAL TIME DIVISION MULTIPLEXING ARCHITECTURES AND DESIGN



Asadullah Shah
Asadullah Shaikh
Muniba Shaikh
Zeeshan Bhatti
Nuha Abdullah Zammarh
Dini Oktarina Dwi Handayani
Zoya Shah

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Editors

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7. Pulse Residual Excited Linear Prediction

Asadullah Shah, Muniba Shaikh
Department of Computer Science,

Kulliyyah of Information and Communication Technology,

International Islamic University of Malaysia,

Malaysia

7.0 Abstract

Pulse Residual Excited Linear Prediction (PRELP) is a variant of CELP encoding algorithm. The PREP, as its name suggests, instead of codebook, use pulses in codebook. This method reduces the searching time for a matching pulse from the codebook. In this chapter, PRELP algorithm is explained along with the design of such codebook.

The PRELP is mainly based on the three functional blocks described for CELP. But PRELP differs only in codebook design and search procedures which are discussed here. The STP and LTP are identical in both coders. In fact, the PRELP coding is an enhanced version of CELP, coding, which falls in the Algebraic Codebook Excited Linear Prediction (ACELP) category. Algebraic, because the codebook is not stored and filled with code words in advance. Rather each vector is generated in real time algebraically. The parameters of the best vectors are then selected and transmitted.

PRELP has various codebook cons figure rations. Multi-pulsed Excitation and Regular Pulse Excitation are extensively reported. The Pitch Adaptive Mixed Excitation (PAME), Fully Pulsed Excitation, and Switched Codebook Excitation are well examined. These differ in the arrangement of the pulses for each synthesis frame and the way these pulses are organised to minimise the Mean Square Error (MSE) between the original and the synthetic speech. In order to improve speech quality at very low bit rates, the codebook excitation, which matches the changing speech characteristics, is necessary.

7.1 Pulsed Codebook Excitation for CELP Coder

The excitation signal serves two purposes (a) to provide start up information for LTP memory; this of course includes the information not tracked by the LTP. This excitation signal ideally should compensate sufficiently for the information that the LTP failed to extract; (b) the fill-in information for unvoiced speech and silence periods, where the performance of the LTP is not so significant, another issue here is the complexity and the performance of the excitation signal: For example, Gaussian codebook, is permanently stored in memory with random entries for each vector. The size and the search procedure are very complex. Furthermore, since it is fixed and does not adaptively cope with the changing characteristics of the speech signal. Such pre-fixed