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## To set “C” factor to zero in first several iterations can not get a gaped Burg PEF

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### ABSTRACT

A simple paragraph to demonstrate that in the Burg PEF estimation process only setting “C” factor to zero in first several iterations one can not get a gaped Burg PEF.

Burg PEF estimation process uses a Levinson recursion to guarantee to get a the minimum phase PEF. The recursion is that from a n point long PEF  $(1, a_1, \dots, a_{n-1})$ , we get a n+1 point long PEF  $(1, b_1, \dots, b_n)$  by

$$\begin{bmatrix} 1 \\ b_1 \\ \vdots \\ b_{n-1} \\ b_n \end{bmatrix} = \begin{bmatrix} 1 \\ a_1 \\ \vdots \\ a_{n-1} \\ 0 \end{bmatrix} + c \begin{bmatrix} 0 \\ a_{n-1} \\ \vdots \\ a_1 \\ 1 \end{bmatrix}$$

Now let us test the way to set  $c = 0$  in first several iterations to get a gaped Burg PEF. Say we want to get a PEF with six point long gap, or in other word, we want to get six zeros between the first coefficient “1” and the first non-zero coefficient. We set  $c = 0$  for the first six iterations. After the first six iteration, we get  $(1, 0, 0, 0, 0, 0, 0)$ . Everything looks good, we get what we want, a “1” followed by six “0”. And in the seventh iteration, we do not set  $c = 0$ . So

$$\begin{bmatrix} 1 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ c_7 \end{bmatrix} = \begin{bmatrix} 1 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \end{bmatrix} + c_7 \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 1 \end{bmatrix}$$

So far everything is perfect. We get a PEF with six point long gap. However, our trouble comes. In the next iteration,

$$\begin{bmatrix} 1 \\ c_7c_8 \\ 0 \\ 0 \\ 0 \\ 0 \\ c_7 \\ c_8 \end{bmatrix} = \begin{bmatrix} 1 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ c_7 \\ 0 \end{bmatrix} + c_8 \begin{bmatrix} 0 \\ c_7 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 1 \end{bmatrix}$$

Oops, the gap begin to shrink. If we continue to perform more iterations, the gap will become shorter and shorter. After five more iterations, the gap is gone.

Now we see this is not the correct way to get a gaped PEF.