

# Abstract

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## **The Matrix Pencil Technique for Three-Dimensional Frequency Estimation**

This paper deals with the problem of estimating the three-dimensional (3-D) frequency using Matrix Pencil (MP) technique. A signal modeled by the sum of 3-D complex exponentials is considered; then a MP method is applied directly to this signal on a snapshot-by-snapshot basis; hence is computationally quite efficient to estimate the 3-D frequency with high resolution. Non-stationary in the data then has a little effect for this method, as no assumption is made about the statistics of the environment. It is applied directly to the single 3-D data snapshot without forming a covariance matrix and operates in two mainly steps first, three proposed matrices are constructed from the single 3-D data snapshot, then apply the MP approach for each matrix to extract out the 3-D frequency efficiently. Furthermore, the proposed technique is still operational when there exist identical frequencies in one more dimensions. Limited numerical examples are presented to illustrate the performance; accuracy of the proposed technique.