

Numerical Linear Algebra Final Project Proposal: Comparing the results from different least squares approximation algorithms.

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In the design of dynamic systems a modal analysis can be a very powerful tool to determine a systems natural frequencies, damping characteristics, and mode shapes. To do this the systems frequency response functions are measured experimentally and then put through a parameter estimation process to calculate the natural frequencies and damping ratios. While there are several methods (including both the time and frequency domain) for this parameter estimation process a common method is to make an autoregressive moving average model of the data and then solve this system using a least squares approximation. Because of a desire to understand the methods used in the pre-packaged software products used for these analyses a project is proposed to construct the moving average model and solve it using different least squares approximations. The least squares solution will be found using three main methods: normal equations, the SVD, and QR factorization.

After the code has been written for each of these methods the algorithms will be compared for their ease of implementation, time to run, memory usage, and accuracy using analytical systems where results are known. These results will then be compared to a commonly used software package for modal analysis, LMS Test.Lab. In this case only the results will be compared in order to try and determine the approximation method used in this software package.