Principal Component Analysis for Thermal Inspection of Composite Structures

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ABSTRACT:

The overall objective of the thermal inspection of composite structures project was to understand the ability to compress large amounts of data into a manageable quantity through principal component analysis. In doing this, thermal inspection systems would be more compact making them more applicable to military field use. This type of data compression is also applicable to digital photography, statistics, and signal processing, among others.

The main focus of the work I was involved in was to compress large amounts of thermal imaging data into a manageable size, to remove the high frequency temporal noise in the sample, and to become thoroughly educated in the processes of singular value decomposition and principal component analysis. I started out learning the basics of singular value decomposition and its application to principal component analysis, and then I applied it to pictures. After understanding how to compress a single frame, I moved on to principal component analysis to analyze and compress thermal data movie samples.

With the information gathered in this project, the application of these compression techniques into field environments can be researched more thoroughly and be implemented. The basic groundwork is already set for implementation into the military, but it is just a matter of time before we see it being used in the field.

KEYWORDS: singular value decomposition, principal component analysis, thermal inspection, temporal noise

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