

A Visual Analytics Tool for the Structural Health Monitoring of an Aircraft Panel

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Abstract : Aerospace, mechanical, and civil engineering infrastructures can take advantages from damage detection and identification strategies in terms of maintenance cost reduction and operational life improvements, as well for safety scopes. The challenge is to detect so called "barely visible impact damage" (BVID), due to low/medium energy impacts, that can progressively compromise the structure integrity. The occurrence of any local change in material properties, that can degrade the structure performance, is to be monitored using so called Structural Health Monitoring (SHM) systems, in charge of comparing the structure states before and after damage occurs. SHM seeks for any "anomalous" response collected by means of sensor networks and then analyzed using appropriate algorithms. Independently of the specific analysis approach adopted for structural damage detection and localization, textual reports, tables and graphs describing possible outlier coordinates and damage severity are usually provided as artifacts to be elaborated for information extraction about the current health conditions of the structure under investigation. Visual Analytics can support the processing of monitored measurements offering data navigation and exploration tools leveraging the native human capabilities of understanding images faster than texts and tables. Herein, a SHM system enrichment by integration of a Visual Analytics component is investigated. Analytical dashboards have been created by combining worksheets, so that a useful Visual Analytics tool is provided to structural analysts for exploring the structure health conditions examined by a Principal Component Analysis based algorithm.

Keywords : interactive dashboards, optical fibers, structural health monitoring, visual analytics

Conference Title : ICVAIV 2020 : International Conference on Visual Analytics and Information Visualisation

Conference Location : London, United Kingdom

Conference Dates : December 10-11, 2020