On the value of SHM in the context of service life integrity management

This paper addresses the optimization of structural health monitoring (SHM) before its implementation on the basis of its Value of Information (VoI). The approach for the quantification of the value of SHM builds upon a service life cost assessment and generic structural performance model in conjunction with the observation, i.e. monitoring, of deterioration increments. The structural performance is described with a generic deterioration model to be calibrated to the relevant structural deterioration mechanism, such as e.g. fatigue and corrosion. The generic deterioration model allows for the incorporation of monitored damage increments and accounts for the precision of the data by considering the statistical uncertainties, i.e. the amount of monitoring data due to the monitoring period, and by considering the measurement uncertainty. The value of structural health monitoring is then quantified in the framework of the Bayesian pre-posterior decision theory as the difference between the expected service-life costs considering an optimal structural integrity management and the service life costs utilizing an optimal SHM system and structural integrity management. With an example the application of the approach is shown and the value of the monitoring period optimized SHM information is determined.

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