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Rule Based Architecture for Collaborative Multidisciplinary Aircraft Design Optimisation

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Abstract : In aircraft design, the jump from the conceptual to preliminary design stage introduces a level of complexity which cannot be realistically handled by a single optimiser, be that a human (chief engineer) or an algorithm. The design process is often partitioned along disciplinary lines, with each discipline given a level of autonomy. This introduces a number of challenges including, but not limited to: coupling of design variables; coordinating disciplinary teams; handling of large amounts of analysis data; reaching an acceptable design within time constraints. A number of classical Multidisciplinary Design Optimisation (MDO) architectures exist in academia specifically designed to address these challenges. Their limited use in the industrial aircraft design process has inspired the authors of this paper to develop an alternative strategy based on well established ideas from Decision Support Systems. The proposed rule based architecture sacrifices possibly elusive guarantees of convergence for an attractive return in simplicity. The method is demonstrated on analytical and aircraft design test cases and its performance is compared to a number of classical distributed MDO architectures.

Keywords : Multidisciplinary Design Optimisation, Rule Based Architecture, Aircraft Design, Decision Support System
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