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Title: Knowledge based engineering for structural design of aerospace components

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Abstract :

There have been number of attempts to develop computational processes to automate routine structural design of components. Historically, these have been with the use of 'expert systems' and the development of design languages. Early on, design processes were either with the incorporation of 'tacit' knowledge in the form of rules or the use of simple design procedures that were codified. The extensive use of Computer Aided Design (CAD), Finite element analysis (FEA) and product data management technologies has radically changed the design process. The driver for this has also been the introduction of large area networks, federated browser technologies, development of a product data management structure and more importantly acceptance of the difficulties with the use of expert systems in their present form as the panacea for automating design.

We argue in this paper that, for most part, routine design can be structured with the minimal use of tacit knowledge and describe a Knowledge Based Engineering (KBE) architecture by illustrating the design of a vertical tail of an aircraft that uses the present web and database technologies for the routine design of a typical aerospace component. This method takes into account preliminary design procedures and integrates FEA into the KBE process. This would help in examining the effect of design alternatives much faster than traditional design. While, for the design of the vertical tail, preliminary design is made with a number of simplifications and assumptions, the integrated procedures using FEA in the architecture ensures that the design simulates the real behaviour to a large extent. We believe that such architecture, if replicated for other major aerospace components, will provide the framework for creating repositories of design knowledge and data over the entire product life cycle. We argue that this architecture especially when coupled with product data structures will be useful in knowledge based engineering design of various components.